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Constructing a Reference Event List for FINESA

Florence Rivière-Barbier

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Special Technical Report C93-07

August 25, 1993

Constructing a Reference Event List for FINESA

Florence Rivière-Barbier

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The method described in a previous report (C93-03) has been applied to a large data set of events recorded at FINESA. Groups of similar events have been defined and compared to mine locations when available. The Helsinki bulletin reported a large number of the studied events. When it was possible, the bulletin reported the mine of origin of the events which allowed us to test the consistency of our method.

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1. INTRODUCTION

This report is the third of a series presenting the results of a study using recordings of events from Scandinavia in order to construct a list of reference events for each of the Scandinavian arrays. The first report (Rivière-Barbier, 1993a) gives a thorough description of the procedure followed to define these reference events and presents the results for the ARCESS array. The second report (Rivière-Barbier, 1993b) presents the results for the NORESS array, and the third report, for the FINESA array.

The results presented in this report were obtained using data recorded at the FINESA array. Figure 26 shows a map of Scandinavia on which were superimposed the different areas that were studied independently. Twenty-four areas were studied using FINESA data: areas 28, 29, 30, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 54, 55, 56, 57, 58, 59, 60, 61 and 62.

Recordings on the vertical channel (sz) of the element FIA1 were used in the waveform comparison process. General information and the results of the processing are presented for each area in Appendix 1. Processing parameters are listed in Appendix 2. Lists of the mine locations from several sources, already provided in both previous reports, are given in Appendix 3.

2. AREA DESCRIPTION

The parameters used to characterize the areas are given below.

2.1. Latitude

Upper and lower latitude limits of the studied area are given in this field. For the part of Scandinavia described in this report, the lowest latitude is 56 degrees and the highest latitude is 66 degrees. Area sizes in latitude are 2 degrees. All latitudes given in this report are North of the Equator.

2.2. Longitude

Upper and lower longitude limits of the studied area are given in this field. For the part of Scandinavia described in this report, the smallest longitude is 18 degrees and the largest longitude is 38 degrees. Area sizes in longitude can vary from 1.0 degree to 6.0 degrees. Longitudes given in this report are East of the Greenwich meridian.

2.3. Number of events in IMS2

This is the number of events located within a particular area by the IMS and stored in the IMS2 database account at the time of the selection, January 16, 1993. At that time, the database contained events that occurred between November 1990 and January 12, 1993.

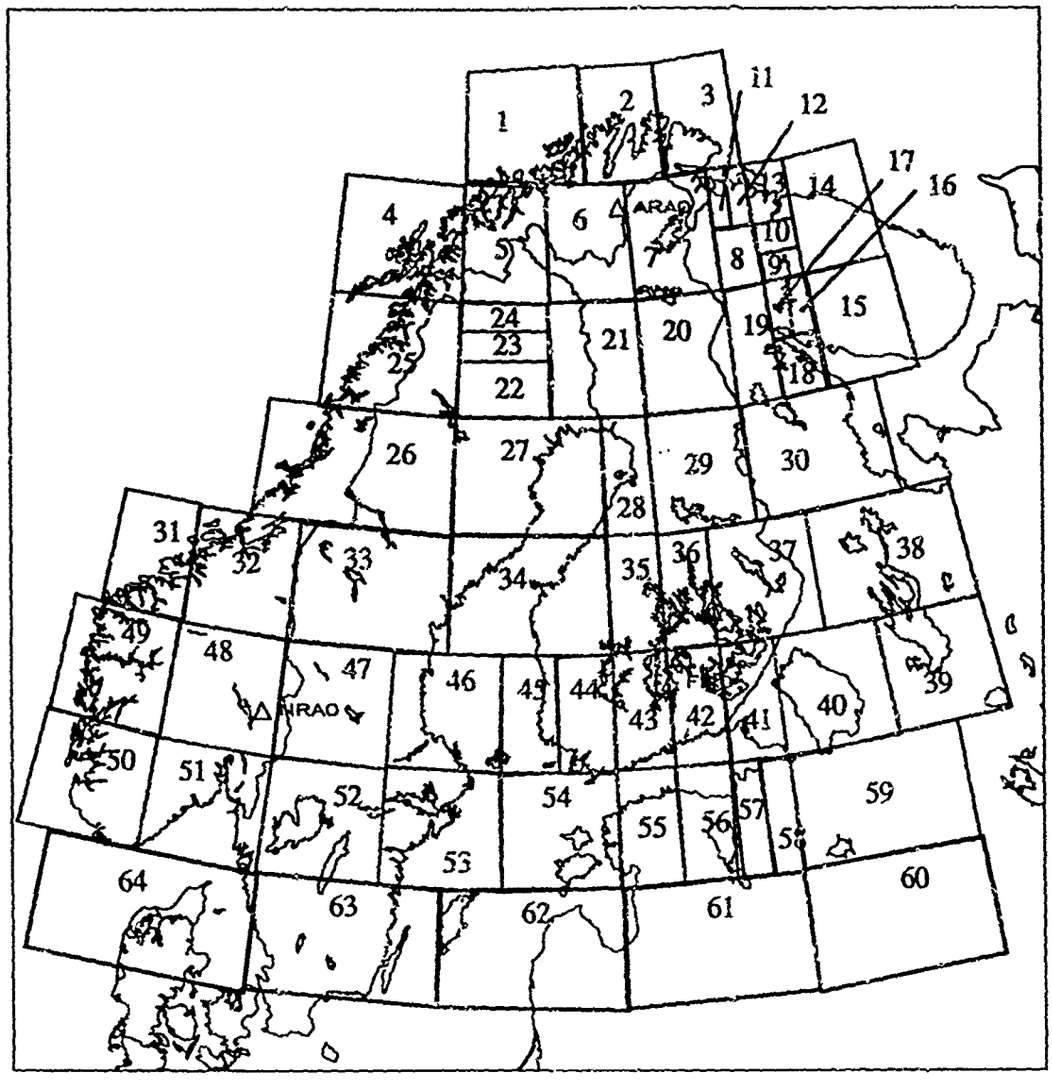

Figure 26: Map of Scandinavia showing the 64 areas that are being used to define a list of reference events for each array NORESS, ARCESS and FINESA. The arrays are represented by their central element: NRA0, ARA0, FIA0.

2.4. Local magnitude range

The local magnitude range is used to select the events from a particular area. The range is used to obtain a representative data set of the area. The events were selected based on decreasing magnitude in order to get the largest events. When no magnitude range is given, all events located in the area were used in the processing. This happened when too few large events were available for a given area.

2.5. Number of events within the magnitude range

This number is either equal to or lower than the number of events in the IMS database. Not all events located by the IMS and whose locations are stored in the database have waveforms. Technical problems at the array, software and hardware failures, and misidentification by the expert system can lead to lost of waveforms.

2.6. Number of processed events

The number of processed events is, in most cases, smaller than the *number of events within the magnitude range*. A specific length of signal is required for the computation, and the waveform segment available on disk may not be long enough. Also, an event recording can be made of two waveform segments, a case that is not handled by the processing program.

2.7. Frequency range used to process the data

For each area, a frequency range is defined to filter the data. The high frequency corner is always set to 16.0 Hz. The low frequency corner varies from 1.0 to 3.0 Hz.

2.8. Processed signal length

The signal length needed for processing should include all phases and therefore, is distance dependent. The signal length is defined to contain the beginning of the first phase and the end of the last phase associated with the event. The total length includes the signal plus 1/8 of the signal length at each end since a 10% cosine taper is applied to the data.

2.9. Number of reference events

This gives the number of events that need to be used to identify most of the events located within a given area. The table listing these reference events gives the following information:

- the event number: related to the processing;
- the IMS orid: IMS event number in the database;
- the IMS arid: IMS number for the first phase associated with the event at the array;
- the IMS wfid: IMS waveform number, in this study only waveforms recorded on the vertical channel (sz) of the element FIA1 of the array were used;
- the threshold: lowest cross-correlation value between a given reference event characterizing a group and any event in this particular group. Below this value,

events do not belong to the group represented by the reference event. When a reference event is defined for a group of only two events, no threshold value is given.
- the group: corresponds to the event classification using the cluster analysis method.

2.10. Reported mine locations

Scandinavia has a very large and important mining industry. The vast majority of the events recorded in the area are related to the mining activity either directly as mine blasts or indirectly like as induced events (tremors). In Appendix 3, lists of the different mine locations are given. These lists have four main sources: SPOT photos, the bulletin published by the University of Helsinki, the Norwegian bulletin, and Joint Operations Graphic (JOG) maps from the American Defense Mapping Agency. The mine locations found on SPOT photos are the most reliable locations but the SPOT photos available cover only a small part of the studied area. The locations provided in the Helsinki bulletin have recently been updated based on SPOT locations and on information that the Finnish researchers have obtained directly from the mines. Based on these new locations, the Helsinki mine labelling changed after May 1991. This list is probably the most complete list for Scandinavia despite the fact that some large mines located outside of Finnish territory are missing. An attempt was made to map the old Helsinki mine labels with the new labels. This mapping is shown in the table giving the new Helsinki mine locations. The Norwegian bulletin gives a list of accurate mine locations located mostly in Norway. The JOG maps give accurate mine locations but they are not recent enough: some new mines may be missing and old mines may not be active any more. For each area, a table gives:
- the label: symbol used on the IMS maps,
- the location: latitude and longitude,
- the source of information.

2.11. Number of events found in the Helsinki bulletin

The bulletin published by the University of Helsinki provided extensive lists of events occurring in Scandinavia. Most of the mining events reported in this bulletin have a "manual location" which means that the Finnish analysts visually assigned these events to a particular mine. However, for this particular area, only events with an automatic location have been reported.

A software was used to match the events reported in the Helsinki bulletin with the studied events applying the following parameters:
- the distance between associated events should not be more than 1°,
- the difference in origin time should not be more than 20 seconds.

One-thousand-six events from the Helsinki bulletin were associated with an event from the IMS database. Five-hundred-thirty-one had "manual locations" and the remain-

ing four-hundred-seventy-five events had "automatic locations".

For each area, a table listing the studied events that were found in the Helsinki bulletin based on the criteria described above gives:

- the event number: this number is related to the processing,
- the event orid: number identifying the event in the IMS database,
- the origin time: from the IMS origin table,
- the local magnitude: from the IMS origin table,
- the Helsinki location: either a latitude and longitude if the event was located automatically or a mine label if the event was located manually,
- the Helsinki identification:

if the event was located manually, the label 'EXP' (for explosion) is used;
if the event was identified as being a **quarry blast**, the label 'QB' is used;
if the event was identified as being a **probable quarry blast**, the label 'P.QB' is used;
if the event was identified as being a **local earthquake**, the label 'LB' was used;
if the event was identified as being a **regional distance event**, the label 'R' was used;
if the event was identified as being an **earthquake**, the label 'EARTH' is used;
if the event was identified as being **probably an earthquake**, the label 'P.E.' is used.

When the event was not identified in the Helsinki bulletin, no label is shown. The labels QB, P.QB, LB and R were used during the GSETT experiment only.

- the group: corresponds to the event classification using the cluster analysis method.

2.12. Events with the most reliable classification

For each area, events were sorted into groups based on their waveform similarities. A table gives the list of the events included in each group. Events with a too low signal-to-noise ratio and events that were mixed with other events on the same waveform (except when these events were very large and when they all belonged to the same group) were not included in this list. The table includes the following information:

- the event number: this number is related to the processing,
- the event orid: number identifying the event in the IMS database,
- the origin time: from the IMS origin table,
- the location: from the IMS origin table,
- the local magnitude: from the IMS origin table,
- the group: corresponds to the event classification using the cluster analysis method.

2.13. Remarks

For each area, comments are made about the events and their classification. Comparisons are made between mine locations and event locations. Any particular features seen on the data are reported.

2.14. Mine and event locations

A map showing the IMS event locations and the mine locations from the Norwegian bulletin, the Helsinki bulletin and the JOG maps are plotted for each area. This map allows the comparison between the different sets of mine locations mentioned above as well as the comparison between the event locations and the mine locations.

3. CONCLUSION

One-thousand-eight-hundred-forty-six events were processed during this study. Two-hundred-twenty-five reference events have been defined to represent the event types recorded at FINESA for distances between 0 and 7.5 degrees. Some of the reference events may be redundant when groups of events overlap boundaries between areas. Among the studied event, one-thousand-one-hundred-forty-seven events were reliably associated with a reference event

Among the studied events, one-thousand-six were found in the Helsinki bulletin including five-hundred-eighty-two events with 'manual locations', nineteen events identified as being 'quarry blasts', one event identified as being a 'probable quarry blast', five events were identified as 'local blasts', two events were identified as 'regional events', two events were identified as being earthquakes and two others as being 'probably earthquakes'.

This area shows the lowest level of natural seismicity with respect to areas surrounding ARCESS and NORESS considering the number of natural events reported in the Helsinki bulletin. None of these four events was associated with a group which means that no aftershocks of similar sizes occurred.

Reference events could not be defined for area 60 only because of a too small data set of events with too low signal-to-noise-ratios.

As already mentioned in the first report, the comparison between the mine locations and the IMS event locations pointed out the existence of bias in distance and in azimuth in the IMS locations (e.g. area 39).

This part of Scandinavia shows the largest number of reported mines. This high mine density made it more difficult to associate a reference event with a particular mine. For a few areas, despite a large number of events with tight locations, no mines have been reported (e.g. area 62).

4. REFERENCES

Rivière-Barbier, F. 1993. Constructing a Reference Event List for ARCESS. *Center for Seismic Studies Annual Technical Report C93-03*. March 1992-March 1993.

Rivière-Barbier, F. 1993. Constructing a Reference Event List for NORESS. *Center for Seismic Studies Annual Technical Report C93-06*. March 1992-March 1993.

APPENDIX 1

AREA 28

Latitude: 64 - 66°N
Longitude: 24 - 26°E
Local magnitude range: -
Number of events in IMS2: 108
Number of events within the magnitude range: 108
Number of processed events: 35
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 9 s. before *P*, 84 s. after *P*
Number of reference events: 2

Table 88: Reference events for area 28

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
3	7627	593946	437498	-	A
7	19295	743968	619120	0.83	B

Reported mine locations:

Table 89: Mine locations for area 28

Label	Latitude	Longitude	Origin
HA21	64.1	24.7	old_Hels
HM9	64.1	24.7	Hels
HA24	64.4	25.2	old_Hels
HM11	64.41	25.15	Hels
N106	64.41	25.15	Norw
HM22	65.78	24.70	Hels
N107	65.78	24.70	Norw
HA25	65.8	24.7	old_Hels
N120	65.90	24.47	Norw

Number of events found in the Helsinki bulletin: 31

Table 90: Events found in the Helsinki bulletin for area 28

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
1	3005	11/21/90	14:17:56.5	1.40	55.15	25.69	-	?
23	322356	2/4/91	12:27:38.1	1.31	65.16	25.47	-	?
26	325707	4/3/92	07:45:42.1	1.40	65.11	25.59	-	?
32	340308	9/28/92	13:07:09.2	1.60	65.11	25.64	-	?
5	15958	3/28/91	08:28:16.8	1.32	64.42	24.10	-	?
9	19325	4/25/91	17:52:15.0	1.23	64.38	24.18	LB	?
10	21337	5/2/91	12:54:52.8	1.20	64.18	24.02	-	?
18	320994	2/28/92	13:41:53.4	1.07	64.26	24.31	-	?
29	337507	8/31/92	16:13:57.4	1.08	64.66	24.36	-	?
2	8324	11/26/90	19:57:27.3	1.56	HA25		EXP	?
4	9376	1/28/91	11:56:00.1	2.13	HA25		EXP	?
6	18124	4/17/91	19:24:46.5	1.65	HA25		EXP	?
11	21747	5/3/91	17:03:59.7	1.70	HA25		EXP	?
12	22794	5/10/91	15:15:30.9	-	HA25		EXP	?
15	38405	9/6/91	17:04:50.7	1.78	HM22		EXP	?
16	41703	9/26/91	10:59:59.0	2.00	HM22		EXP	?
17	301329	11/4/91	12:15:35.7	1.68	HM22		EXP	?
19	321011	2/28/92	16:14:35.0	1.53	HM22		EXP	?
20	324243	3/19/92	12:56:32.0	1.59	HM22		EXP	?
21	321822	3/20/92	18:19:46.3	1.70	HM22		EXP	?
22	321744	3/6/92	18:14:47.6	1.47	HM22		EXP	?
24	323572	3/31/92	19:32:29.6	1.08	HM22		EXP	?
27	326832	4/9/92	17:09:22.3	1.53	HM22		EXP	?
28	332806	7/9/92	15:37:07.2	1.19	HM22		EXP	?
30	339009	9/10/92	17:09:37.4	1.74	HM22		EXP	?
31	339136	9/17/92	17:08:41.4	-	HM22		EXP	?
3	7627	1/15/91	11:55:08.2	1.92	HA25		EXP	A

Table 90: Events found in the Helsinki bulletin for area 28

Event #	IMS orid	IMS origin time		IMS ml	HEL location	HEL label	Group
13	24589	5/30/91	17:00:25.4	1.81	HA25	EXP	A
7	19295	4/19/91	17:01:54.3	1.84	HA25	EXP	B
14	259	6/7/91	18:56:11.8	2.00	HM22	EXP	B
25	323575	3/31/92	20:05:10.1	1.66	HM22	EXP	B

Events with the most reliable classification:

Table 91: Sorted events for area 28

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
3	7627	1/15/91	11:55:08.2	65.8070	25.1888	1.92	A
13	24589	5/30/91	17:00:25.4	65.8514	25.3562	1.81	A
7	19295	4/19/91	17:01:54.3	65.7607	25.1053	1.84	B
14	25900	6/7/91	18:56:11.8	65.7913	25.0167	2.00	B
25	323575	3/31/92	20:05:10.1	65.8121	25.1158	1.66	B

Remarks:

-Events from groups A and B are identified as coming from the same mine HM22 in the Helsinki bulletin.

- Events 11, 21, 30, 31 showed similatities with events from group B (same *Lg* - *P* times) and were also located at mine HM22 in the Helsinki bulletin.

- The events located South have the same *Lg* - *P* time but different shape of the *P* arrival. In the Helsinki bulletin, an automatic location is given for these events.

- Events 1, 23, 26, 32 are close to each other according to the Helsinki locations and the cluster analysis put them in the same group; this could not be confirmed visually because of too low signal-to-noise ratios. The same remark can be made for events 5, 9 ,10 , 18 and 29.

Mine and event locations:

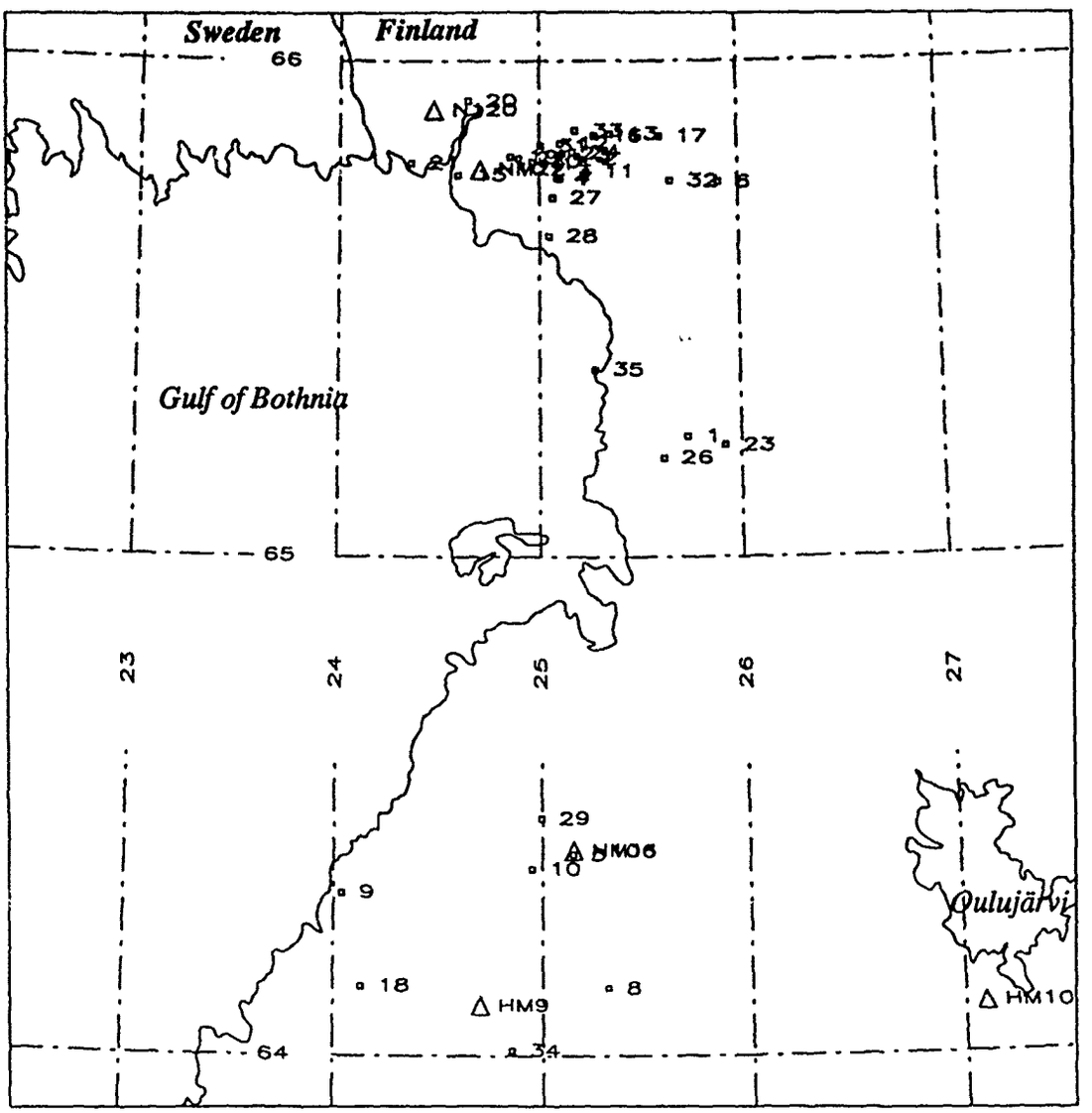

Figure 27: Mine and IMS event locations for area 28.

AREA 29

Latitude: 64- 66°N
Longitude: 26 - 30°E
Local magnitude range: -
Number of events in IMS2: 62
Number of events within the magnitude range: 62
Number of processed events: 25
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 10 s. before *P*, 90 s. after *P*
Number of reference events: 6

Table 92: Reference events for area 29

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
17	328210	1277333	2080338	0.80	A
1	10023	538536	621874	-	B
3	14427	711244	499601	-	C
5	18599	738755	581917	0.86	D
24	343478	1503612	2828433	0.86	E
6	19829	754700	699026	-	F

Reported mine locations:

Table 93: Mine locations for area 29

Label	Latitude	Longitude	Origin
HA22	64.1	27.1	old_Hels
HM10	64.1	27.1	Hels
old(HM8)	64.1	28.1	old_Hels
HM8	64.12	28.06	Hels
N126	64.12	28.06	Norw
HA23	64.2	28.0	old_Hels
HA26	65.8	28.1	old_Hels
HM25	65.8	28.1	Hels

Number of events found in the Helsinki bulletin: 18

Table 94: Events found in the Helsinki bulletin for area 29

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
4	16776	4/2/91	11:29:50.1	1.42	64.24	27.96	-	?
7	22196	5/5/91	14:55:01.3	1.67	64.26	27.96	-	?
13	313081	1/25/92	03:14:48.3	1.77	65.74	27.09	P.E.	?
18	328680	5/22/92	08:26:07.1	2.06	65.84	28.87	EART	?
19	330139	6/10/92	12:50:26.7	1.40	65.09	25.70	-	?
2	14119	3/12/91	12:14:13.4	1.52	old(HM8)		EXP	?
16	324914	4/1/92	13:27:12.9	1.38	HM8		EXP	?
10	301795	11/19/91	14:03:50.8	1.46	HM8		EXP	A
14	315379	1/31/92	13:17:31.3	-	64.14	27.44	-	A
17	328210	5/18/92	13:17:53.8	1.37	HM8		EXP	A
1	10023	11/29/90	11:09:33.5	1.55	old(HM8)		EXP	B
11	302298	12/4/91	13:17:35.6	1.48	HM8		EXP	B
3	14427	3/20/91	14:10:58.7	1.03	old(HM8)		EXP	C
21	340327	9/28/92	14:41:56.1	1.10	HM8		EXP	C
5	18599	4/16/91	10:52:50.0	1.64	old(HM8)		EXP	D
8	21860	5/3/91	07:35:25.4	1.27	65.15	25.70	-	D
6	19829	4/25/91	11:31:16.0	1.69	64.89	26.37	-	F
9	22604	5/10/91	05:04:02.1	1.49	65.01	25.44	-	F

Events with the most reliable classification:

Table 95: Sorted events for area 29

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
10	301795	11/19/91	14:03:50.8	64.2812	27.7442	1.46	A
14	315379	1/31/92	13:17:31.3	64.0141	27.5095	-	A
17	328210	5/18/92	13:17:53.8	64.0260	28.2639	1.37	A
1	10023	11/29/90	11:09:33.5	64.0977	28.9755	1.55	B
11	302298	12/4/91	13:17:35.6	64.2212	27.9764	1.48	B

Table 95: Sorted events for area 29

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
3	14427	3/20/91	14:10:58.7	64.0889	27.9812	1.03	C
21	340327	9/28/92	14:41:56.1	64.0251	28.3628	1.10	C
5	18599	4/16/91	10:52:50.0	64.2717	27.8544	1.64	D
8	21860	5/3/91	07:35:25.4	65.1929	26.0641	1.27	D
15	319416	2/21/92	11:52:10.7	64.2493	27.8388	1.73	D
22	342815	11/5/92	12:01:02.4	64.8111	27.4062	1.34	E
23	343284	11/10/92	11:43:18.8	64.7526	28.4381	1.44	E
24	343478	11/16/92	13:22:37.9	64.6468	28.1205	-	E
6	19829	4/25/91	11:31:16.0	64.9855	27.3959	1.69	F
9	22604	5/10/91	05:04:02.1	64.9271	26.9928	1.49	F

Remarks:

- Events from groups A, B and C originate from mine HM8 (HA23) according to the Helsinki bulletin.
- Events from groups E and F, located in the center of the map (Figure 28) are far from the reported mines.

Mine and event locations:

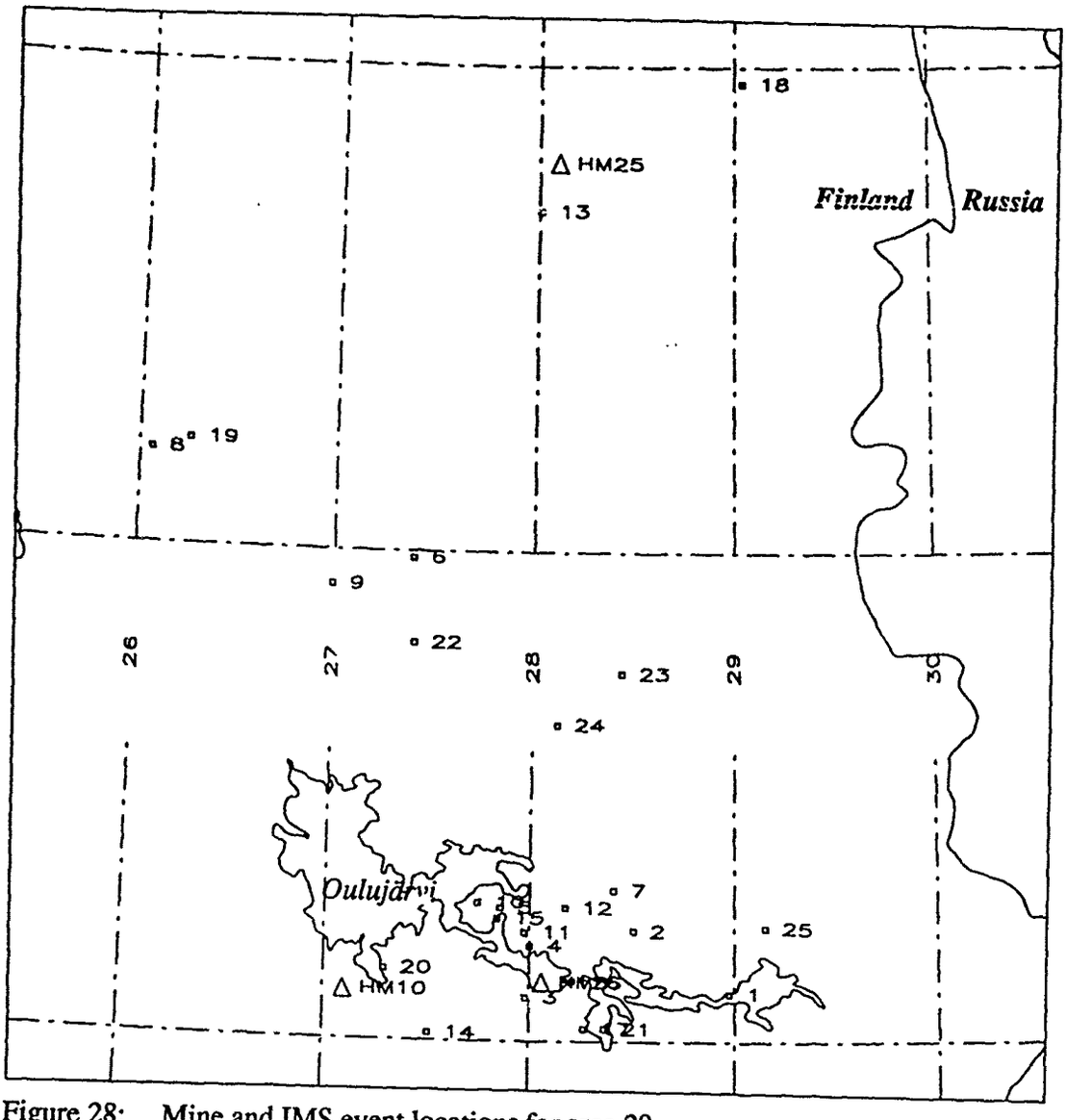

Figure 28: Mine and IMS event locations for area 29.

AREA 30

Latitude: 64 - 66° N
Longitude: 30 - 36° E
Local magnitude range: -
Number of events in IMS2: 156
Number of events within the magnitude range: 156
Number of processed events: 97
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 14 s. before *P*, 124 s. after *P*
Number of reference events: 8

Table 96: Reference events for area 30

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
47	315331	1140379	1655556	-	A
11	7858	589545	439139	-	B
44	303526	1014346	1589881	0.83	C
36	301385	1004679	1447027	0.84	D
85	343678	1504062	2841180	0.84	E
29	36719	913369	1144388	0.87	F
58	323109	1226772	1848612	-	G
74	336551	1402243	2592196	0.86	H

Reported mine locations:

Table 97: Mine locations for area 30

Label	Latitude	Longitude	Origin
HV10	64.68	30.66	Hels
HC17	64.7	30.7	old_Hels

Number of events found in the Helsinki bulletin: 75

Table 98: Events found in the Helsinki bulletin for area 30

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
20	23101	5/17/91	10:30:23.2	2.35	64.73	30.93	-	?
22	23988	5/24/91	12:00:02.1	2.59	64.67	30.67	-	?
76	338944	9/16/92	11:00:06.9	-	64.91	30.58	-	?
77	339961	9/23/92	08:57:12.0	1.91	64.30	30.35	-	?
78	340119	9/25/92	08:58:58.5	1.59	64.63	30.65	-	?
2	9494	11/28/90	12:01:18.4	2.77	HC17		EXP	?
3	10107	11/30/90	10:31:06.1	1.85	HC17		EXP	?
4	42209	12/5/90	11:47:08.3	2.26	HC17		EXP	?
6	11142	12/14/90	10:31:14.5	2.18	HC17		EXP	?
7	7261	12/25/90	11:00:38.3	2.05	HC17		EXP	?
8	4960	12/26/90	11:00:14.7	1.97	HC17		EXP	?
9	7024	12/28/90	10:31:13.6	2.23	HC17		EXP	?
10	6314	1/8/91	10:41:03.1	2.58	HC17		EXP	?
12	13175	3/6/91	10:06:54.8	1.67	HC17		EXP	?
13	14099	3/12/91	12:02:32.9	1.79	HC17		EXP	?
14	14366	3/13/91	10:01:28.4	2.08	HC17		EXP	?
15	15113	3/20/91	12:07:55.8	2.38	HC17		EXP	?
16	15524	3/22/91	12:00:12.1	1.56	HC17		EXP	?
17	16671	3/29/91	16:12:40.7	2.26	HC17		EXP	?
18	16669	3/29/91	16:13:01.5	2.30	HC17		EXP	?
19	19245	4/19/91	09:59:51.9	1.97	HC17		EXP	?
24	25678	6/5/91	12:21:08.1	2.03	HV10		EXP	?
26	31673	7/24/91	10:00:05.9	2.49	HV10		EXP	?
27	36114	8/23/91	10:31:29.6	1.72	HV10		EXP	?
28	36121	8/23/91	11:50:58.2	1.63	HV10		EXP	?
30	38090	9/4/91	10:01:44.1	1.92	HV10		EXP	?
31	40428	9/18/91	10:09:30.7	1.89	HV10		EXP	?

Table 98: Events found in the Helsinki bulletin for area 30

Event #	IMS orid	IMS origin time		IMS ml	HEL location	HEL label	Group
33	300272	10/16/91	11:00:57.0	1.93	HV10	EXP	?
34	301009	11/1/91	11:00:14.3	2.06	HV10	EXP	?
35	301013	11/1/91	11:00:20.7	2.11	HV10	EXP	?
37	301860	11/20/91	11:05:58.8	2.11	HV10	EXP	?
38	301977	11/22/91	11:00:28.6	2.21	HV10	EXP	?
42	302703	12/11/91	11:16:29.8	2.13	HV10	EXP	?
43	303196	12/20/91	11:00:05.9	1.97	HV10	EXP	?
46	313692	1/17/92	11:00:31.4	2.30	HV10	EXP	?
49	319360	2/19/92	12:26:30.0	2.78	HV10	EXP	?
50	319402	2/21/92	11:01:53.5	2.72	HV10	EXP	?
53	319737	3/4/92	11:20:19.2	2.22	HV10	EXP	?
54	320299	3/11/92	10:00:02.7	1.99	HV10	EXP	?
55	322306	3/13/92	10:01:23.5	1.90	HV10	EXP	?
56	320979	3/18/92	10:00:36.1	2.67	HV10	EXP	?
57	321730	3/20/92	10:00:23.9	2.55	HV10	EXP	?
62	326369	4/29/92	09:07:18.5	1.91	HV10	EXP	?
63	327312	5/8/92	09:00:35.3	2.44	HV10	EXP	?
65	329812	6/5/92	09:01:28.0	2.06	HV10	EXP	?
66	331053	6/19/92	09:12:53.5	2.01	HV10	EXP	?
68	332632	7/8/92	09:00:08.8	2.22	HV10	EXP	?
69	332865	7/10/92	10:00:09.4	2.32	HV10	EXP	?
70	333605	7/17/92	10:01:57.7	2.31	HV10	EXP	?
71	334046	7/22/92	09:00:01.2	2.08	HV10	EXP	?
72	334786	7/31/92	09:32:45.7	1.83	HV10	EXP	?
73	335821	8/14/92	08:59:37.5	1.90	HV10	EXP	?
47	315331	1/24/92	10:18:51.9	2.68	HV10	EXP	A
59	325713	4/3/92	09:04:52.4	2.62	HV10	EXP	A
11	7858	1/16/91	10:10:54.5	2.15	HC17	EXP	B

Table 98: Events found in the Helsinki bulletin for area 30

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
1	5892	11/16/90	12:41:20.4	2.65	HC17		EXP	C
5	300010	12/7/90	10:02:26.1	2.41	HC17		EXP	C
41	302782	12/6/91	10:36:24.2	2.27	HV10		EXP	C
44	303526	12/25/91	11:04:46.1	2.68	HV10		EXP	C
48	315353	1/31/92	10:00:44.5	2.62	HV10		EXP	C
60	326491	4/8/92	10:01:49.2	2.73	HV10		EXP	C
61	325447	4/22/92	09:00:25.3	2.44	HV10		EXP	C
36	301385	11/6/91	11:22:24.9	2.36	HV10		EXP	D
40	302781	12/6/91	10:14:50.2	2.08	HV10		EXP	D
25	28157	6/26/91	11:00:13.3	2.67	HV10		EXP	E
39	302406	11/29/91	11:00:27.0	2.17	HV10		EXP	E
67	332092	7/1/92	09:50:14.1	2.28	HV10		EXP	E
23	24848	5/31/91	10:40:37.2	2.53	64.64	30.84	-	F
29	36719	8/28/91	12:00:31.7	2.25	HV10		EXP	F
45	313144	1/10/92	11:02:14.3	2.50	HV10		EXP	F
64	327905	5/15/92	09:22:22.2	2.20	HV10		EXP	F
58	323109	3/25/92	10:00:08.6	2.94	HV10		EXP	G
75	337847	9/4/92	09:00:06.9	2.24	64.53	30.83	-	G
32	300151	10/2/91	14:31:25.3	2.41	HV10		EXP	H
74	336551	8/21/92	09:09:29.4	2.07	64.61	30.71	-	H

Events with the most reliable classification:

Table 99: Sorted events for area 30

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
47	315331	1/24/92	10:18:51.9	64.7161	31.0024	2.68	A
59	325713	4/3/92	09:04:52.4	64.6812	30.6402	2.62	A
11	7858	1/16/91	10:10:54.5	64.6787	30.8695	2.15	B
87	343866	11/20/92	09:59:48.7	64.6071	31.2084	1.99	B

Table 99: Sorted events for area 30

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
1	5892	11/16/90	12:41:20.4	64.6455	30.8761	2.65	C
5	300010	12/7/90	10:02:26.1	64.8053	31.4884	2.41	C
41	302782	12/6/91	10:36:24.2	64.7337	30.4234	2.27	C
44	303526	12/25/91	11:04:46.1	64.6965	30.3746	2.68	C
48	315353	1/31/92	10:00:44.5	64.7431	30.8949	2.62	C
52	319734	3/4/92	11:08:47.9	64.6877	30.7038	2.38	C
60	326491	4/8/92	10:01:49.2	64.6365	31.4732	2.73	C
61	325447	4/22/92	09:00:25.3	64.6782	30.6175	2.44	C
36	301385	11/6/91	11:22:24.9	64.5590	31.3018	2.36	D
40	302781	12/6/91	10:14:50.2	64.7089	30.6132	2.08	D
92	345757	12/18/92	09:59:59.8	64.6281	30.5839	-	D
25	28157	6/26/91	11:00:13.3	64.7586	30.4693	2.67	E
39	302406	11/29/91	11:00:27.0	64.7167	30.7461	2.17	E
67	332092	7/1/92	09:50:14.1	64.8007	32.9261	2.28	E
85	343678	11/18/92	10:20:07.6	64.6116	31.0726	2.69	E
23	24848	5/31/91	10:40:37.2	64.7029	30.8697	2.53	F
29	36719	8/28/91	12:00:31.7	64.6505	31.0328	2.25	F
45	313144	1/10/92	11:02:14.3	64.7120	30.4328	2.50	F
64	327905	5/15/92	09:22:22.2	64.6953	30.6164	2.20	F
58	323109	3/25/92	10:00:08.6	64.6750	30.7476	2.94	G
75	337847	9/4/92	09:00:06.9	64.5894	30.9218	2.24	G
32	300151	10/2/91	14:31:25.3	64.7046	30.5705	2.41	H
74	336551	8/21/92	09:09:29.4	64.6493	31.2611	2.07	H
96	347918	1/15/93	09:59:49.1	64.6506	30.9391	2.04	H

Remarks:

- Most of the events located in this area are identified in the Helsinki bulletin as originating from mine HV10 (HC17).
- Except for a few events, the locations are tight around this mine.
- Most of these events are found on the cluster tree at a cross-correlation level

greater than 0.72, including the events that could not be identified because of too low signal-to-noise ratios.

Mine and event locations:

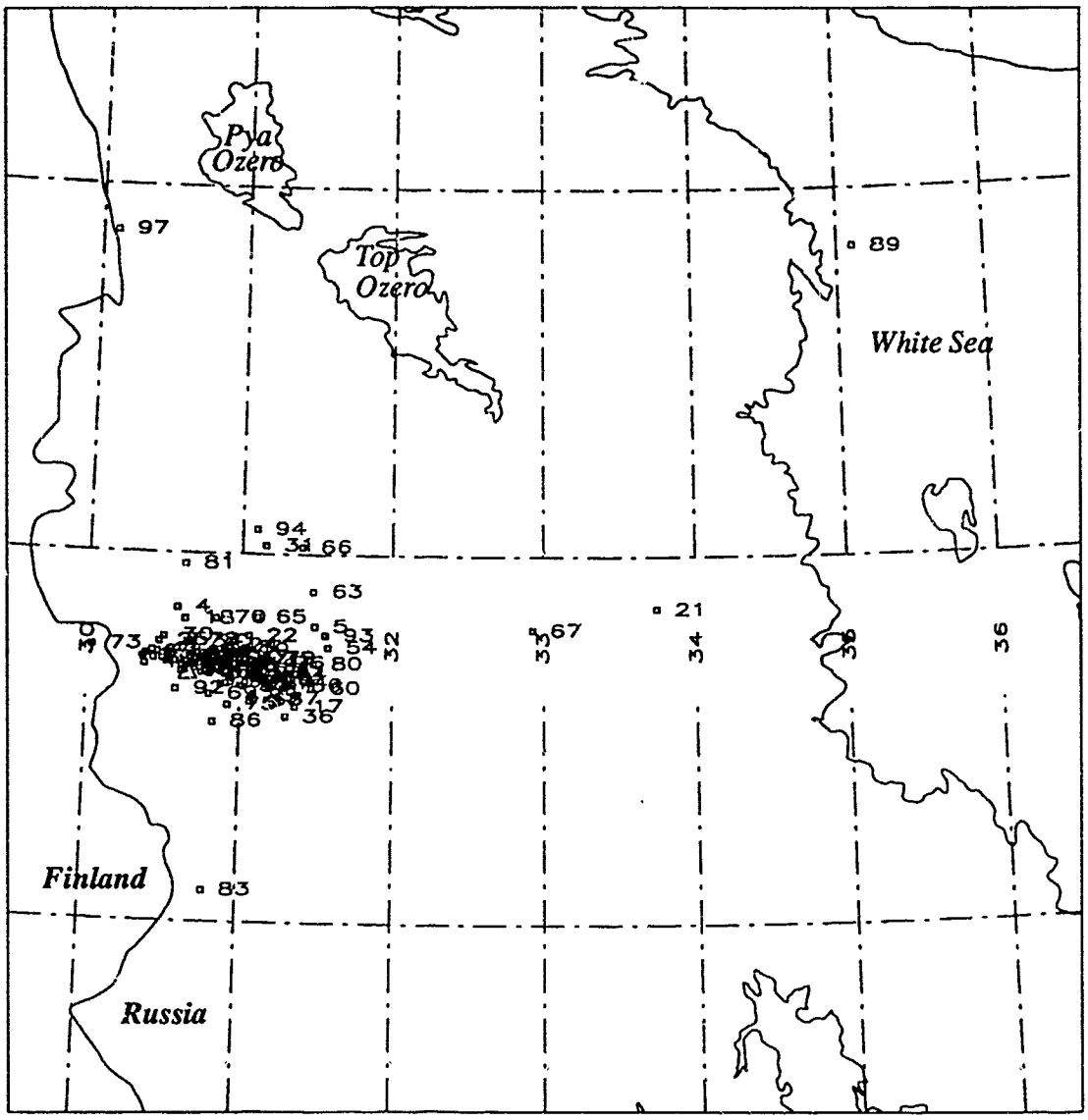

Figure 29: Mine and IMS event locatoins for area 30.

AREA 34

Latitude: 62 - 64°N
Longitude: 18 - 24°E
Local magnitude range: > 1.0
Number of events in IMS2: 395
Number of events within the magnitude range: 83
Number of processed events: 69
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 7 s. before *P*, 67 s. after *P*
Number of reference events: 11

Table 100: Reference events for area 34

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
10	13811	705875	485950	0.85	A
48	322157	1226518	1845105	-	B
1	2752	529297	591967	-	C
59	329124	1286176	2105542	0.93	D
26	34078	877580	1089833	0.94	E
46	320401	1214436	1797882	0.94	F
17	23405	789048	794109	-	G
61	330243	1289893	2156926	-	H
29	38170	926091	1204364	0.90	I
55	326941	1238531	2014800	0.89	J
13	15228	711216	499913	0.85	K

Reported mine locations:

Table 101: Mine locations for area 34

Label	Latitude	Longitude	Origin
HA9	62.6	23.6	old_Hels
HM21	62.6	23.6	Hels
HA10	62.7	23.2	old_Hels
HM20	62.7	23.2	Hels

Table 101: Mine locations for area 34

Label	Latitude	Longitude	Origin
HA11	62.8	22.9	old_Hels
HM14	62.8	22.9	Hels
N218	63.86670	20.21670	Norw
N215	63.91670	20.10	Norw
N219	63.91670	20.30	Norw
N217	63.93330	20.06670	Norw

Number of events found in the Helsinki bulletin: 51

Table 102: Events found in the Helsinki bulletin for area 34

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
3	3003	11/21/90	13:31:31.8	1.56	63.24	21.65	-	?
6	5987	1/4/91	13:33:26.1	1.51	63.84	23.07	-	?
9	13564	3/13/91	09:33:52.2	1.60	62.74	22.31	-	?
11	13925	3/15/91	11:44:24.9	1.51	63.70	22.87	-	?
16	19677	4/29/91	09:47:13.7	1.87	62.59	22.41	QB	?
19	24239	5/29/91	10:58:52.6	1.65	62.59	22.48	-	?
22	25858	6/7/91	07:32:56.0	1.66	63.38	21.01	-	?
23	25859	6/7/91	07:34:05.4	1.88	63.40	21.11	-	?
24	27857	6/27/91	11:44:55.0	1.61	62.82	22.89	-	?
33	300451	10/21/91	13:04:12.9	1.72	63.57	21.57	-	?
34	300450	10/21/91	13:05:20.5	1.72	63.60	21.33	-	?
35	300449	10/21/91	13:08:28.4	1.80	63.60	21.34	-	?
37	312863	1/7/92	13:05:11.2	1.71	62.75	22.94	-	?
38	312869	1/7/92	15:59:57.8	1.78	63.65	22.96	-	?
41	315671	2/3/92	14:42:10.7	1.66	62.73	22.94	-	?
42	315686	2/4/92	11:46:08.5	1.74	62.79	22.97	-	?
43	315642	2/3/92	10:47:06.8	1.69	62.45	22.28	-	?
44	320729	2/27/92	14:46:00.7	1.55	63.82	22.76	-	?

Table 102: Events found in the Helsinki bulletin for area 34

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
45	322256	3/10/92	11:48:35.5	1.64	63.53	22.25	-	?
47	322827	3/17/92	13:49:11.5	1.84	63.68	22.81	-	?
53	326496	4/8/92	10:57:33.7	1.64	62.60	22.51	-	?
58	330462	5/22/92	23:06:27.3	2.71	63.87	21.32	P.E.	?
7	12807	3/8/91	11:58:38.0	1.54	63.64	23.21	-	A
14	18911	4/18/91	09:18:49.3	1.52	63.62	23.31	-	A
48	322157	3/24/92	13:21:28.7	1.60	63.66	22.86	-	B
51	325709	4/3/92	08:10:06.7	1.54	63.69	22.77	-	B
1	2752	11/19/90	12:20:21.5	1.64	62.85	22.88	-	C
20	24789	5/31/91	08:29:24.5	1.54	62.68	22.85	-	D
57	327811	5/14/92	12:15:42.0	1.75	62.63	22.84	-	D
59	329124	5/27/92	11:47:29.1	1.79	62.69	22.86	-	D
62	330248	6/11/92	15:23:23.8	1.73	62.75	22.97	-	D
64	332492	7/6/92	13:19:53.2	1.50	62.74	22.81	-	D
4	10246	12/3/90	14:31:52.6	1.83	62.79	22.91	-	E
18	23934	5/24/91	09:17:31.9	1.77	62.79	22.91	-	E
26	34078	8/6/91	09:20:34.9	1.81	62.81	22.91	-	E
32	300204	10/15/91	11:10:15.9	1.80	62.80	22.89	-	E
46	320401	3/12/92	14:49:48.7	1.59	62.54	22.48	-	F
17	23405	5/20/91	10:54:21.7	1.97	62.52	22.41	-	G
56	326943	5/4/92	14:48:10.3	1.74	62.56	22.36	-	G
61	330243	6/11/92	13:56:46.0	1.58	62.75	22.91	-	H
29	38170	9/5/91	10:50:37.5	1.77	62.79	22.83	-	I
30	39561	9/16/91	11:30:53.1	1.59	62.80	22.84	-	I
31	40625	9/20/91	09:08:08.7	1.78	62.83	22.85	-	I
67	335715	8/13/92	08:48:48.1	1.65	62.87	22.95	-	I
55	326941	5/4/92	14:35:57.8	1.85	62.48	21.43	-	J
65	333394	7/15/92	10:02:22.0	1.50	62.49	21.36	-	J

Table 102: Events found in the Helsinki bulletin for area 34

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
8	13750	3/11/91	14:20:23.0	1.61	62.73	22.91	-	K
13	15228	3/20/91	17:14:41.2	1.68	62.67	22.99	-	K
28	36876	8/27/91	08:40:58.3	1.69	62.87	22.91	-	K
39	312224	1/14/92	12:24:40.6	1.68	62.72	22.90	-	K
40	313697	1/17/92	11:05:24.6	1.77	62.72	22.93	-	K

Events with the most reliable classification:

Table 103: Sorted events for area 34

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
7	12807	3/8/91	11:58:38.0	63.5575	23.9416	1.54	A
10	13811	3/14/91	14:21:21.8	63.6098	23.9017	1.52	A
14	18911	4/18/91	09:18:49.3	63.6635	23.9695	1.52	A
48	322157	3/24/92	13:21:28.7	63.5386	23.7115	1.60	B
51	325709	4/3/92	08:10:06.7	63.8696	23.5099	1.54	B
1	2752	11/19/90	12:20:21.5	62.8828	23.1934	1.64	C
25	31730	7/25/91	09:11:30.0	62.8636	23.4801	1.55	C
20	24789	5/31/91	08:29:24.5	62.7673	23.1197	1.54	D
57	327811	5/14/92	12:15:42.0	62.7371	23.1440	1.75	D
59	329124	5/27/92	11:47:29.1	62.7227	23.1045	1.79	D
62	330248	6/11/92	15:23:23.8	62.7338	23.1760	1.73	D
64	332492	7/6/92	13:19:53.2	62.7174	23.1034	1.50	D
4	10246	12/3/90	14:31:52.6	62.8962	23.1271	1.83	E
18	23934	5/24/91	09:17:31.9	62.8396	23.3030	1.77	E
26	34078	8/6/91	09:20:34.9	62.7982	23.0728	1.81	E
32	300204	10/15/91	11:10:15.9	62.9269	23.3003	1.80	E
46	320401	3/12/92	14:49:48.7	62.6178	22.6427	1.59	F
50	325613	4/2/92	10:43:00.5	62.6192	22.6771	1.53	F
52	326480	4/8/92	07:57:24.4	62.6178	22.6236	1.55	F

Table 103: Sorted events for area 34

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
17	23405	5/20/91	10:54:21.7	62.6143	22.5923	1.97	G
56	326943	5/4/92	14:48:10.3	62.6456	22.7417	1.74	G
61	330243	6/11/92	13:56:46.0	62.7891	23.1160	1.58	H
66	334528	7/28/92	11:40:25.9	62.7478	23.2271	1.56	H
29	38170	9/5/91	10:50:37.5	62.8673	23.4120	1.77	I
30	39561	9/16/91	11:30:53.1	62.8104	23.3626	1.59	I
31	40625	9/20/91	09:08:08.7	62.8633	23.3137	1.78	I
67	335715	8/13/92	08:48:48.1	62.8267	23.4460	1.65	I
54	326214	4/27/92	13:01:10.3	62.5239	21.8211	1.70	J
55	326941	5/4/92	14:35:57.8	62.4881	21.8304	1.85	J
60	329704	6/3/92	15:36:56.2	62.5268	21.9545	1.52	J
65	333394	7/15/92	10:02:22.0	62.4985	21.9949	1.50	J
8	13750	3/11/91	14:20:23.0	62.7866	23.0959	1.61	K
12	14634	3/15/91	11:03:20.0	62.7469	23.2190	1.78	K
13	15228	3/20/91	17:14:41.2	62.7545	23.1162	1.68	K
28	36876	8/27/91	08:40:58.3	62.8130	23.3419	1.69	K
36	302756	12/5/91	15:28:34.0	62.7752	23.2387	1.60	K
39	312224	1/14/92	12:24:40.6	62.9083	23.4760	1.68	K
40	313697	1/17/92	11:05:24.6	62.7868	22.9635	1.77	K
69	346237	12/15/92	13:47:22.4	62.7872	23.2433	1.75	K

Remarks:

- All of the event locations reported in the Helsinki bulletin were automatic.
- About a third of these events could not be assigned to a group.

Mine and event locations:

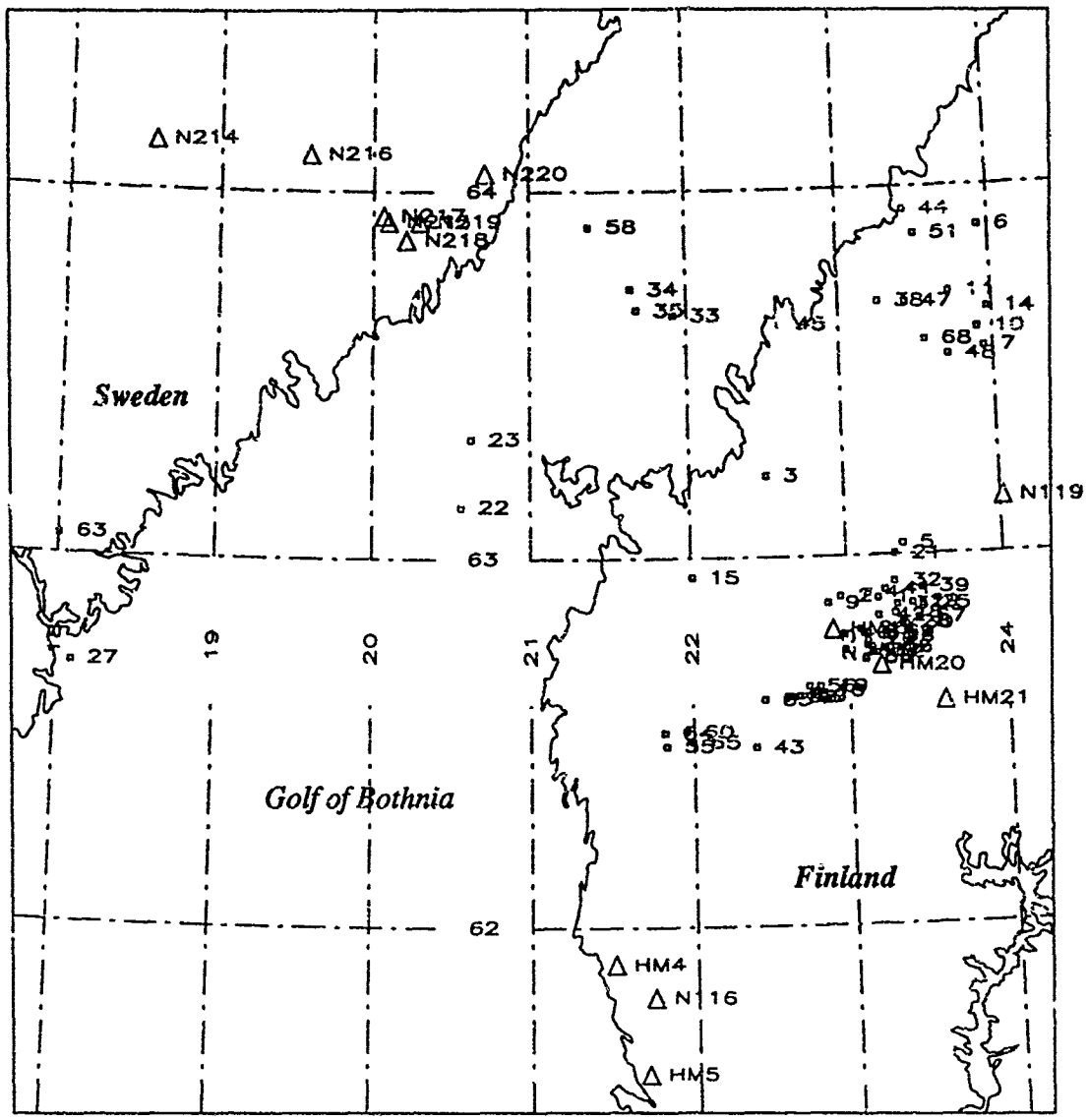

Figure 30: Mine ans IMS event locations for area 34.

AREA 35

Latitude: 62 - 64°N
Longitude: 24 - 26°E
Local magnitude range: > 1.3
Number of events in IMS2: 372
Number of events within the magnitude range: 71
Number of processed events: 46
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 7 s. before *P*, 67 s. after *P*
Number of reference events: 11

Table 104: Reference events for area 35

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
35	326822	1231870	1932039	-	A
34	326811	1231741	1930710	-	B
1	3205	530406	593251	0.90	C
10	14237	709998	489063	0.85	D
22	35558	898263	1140899	0.83	E
4	10048	538625	622618	-	F
11	15576	713434	508085	0.84	G
28	312962	1031431	1610362	0.87	H
30	315332	1140390	1655574	-	I
45	346652	1557977	2888518	-	J
18	34288	878753	1091063	-	K

Reported mine locations:

Table 105: Mine locations for area 35

Label	Latitude	Longitude	Origin
N119	63.15	24.02	Norw
HA20	63.8	25.1	old_Hels
HM24	63.85	25.05	Hels
N105	63.85	25.05	Norw

Number of events found in the Helsinki bulletin: 30

Table 106: Events found in the Helsinki bulletin for area 35

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
2	9519	11/28/90	09:55:34.4	1.94	63.91	24.86	-	?
3	26438	11/28/90	13:08:45.2	1.52	63.84	23.28	-	?
5	10064	11/29/90	13:31:24.6	1.56	62.04	25.55	-	?
6	11147	12/14/90	11:30:41.5	1.30	63.14	24.01	-	?
13	16830	4/3/91	07:58:48.1	1.50	63.73	24.25	-	?
14	17915	4/12/91	11:05:49.7	1.43	64.28	23.86	-	?
15	19139	4/25/91	08:26:37.6	1.36	63.63	23.68	-	?
17	34282	8/6/91	21:20:01.0	1.50	62.30	24.56	-	?
21	33797	8/9/91	10:59:05.7	1.42	63.84	25.09	-	?
29	312772	1/14/92	12:42:06.5	1.37	64.21	25.40	-	?
40	340433	9/30/92	09:34:27.2	1.37	63.80	25.69	-	?
27	300210	10/15/91	12:19:01.7	2.34	HA19		EXP	?
35	326822	4/9/92	14:39:09.7	1.44	HA19		EXP	A
34	326811	4/9/92	09:22:59.7	1.42	62.83	24.17	-	B
36	325006	4/16/92	09:26:50.8	1.34	62.81	24.18	-	B
1	3205	11/20/90	12:57:00.7	1.63	HM24		EXP	C
38	330801	6/15/92	14:22:32.6	1.55	63.89	24.85	-	C
39	332197	7/2/92	10:42:47.0	1.38	HM24		EXP	C
10	14237	3/19/91	09:51:55.6	1.33	63.74	24.27	-	D
12	15943	3/25/91	12:45:27.3	1.42	63.74	24.23	-	D
16	32149	7/26/91	15:17:39.7	1.57	HM24		EXP	E
20	34535	8/8/91	10:57:18.5	1.35	63.85	25.11	-	E
22	35558	8/23/91	10:42:54.1	1.40	HM24		EXP	E
32	320003	3/9/92	19:25:25.6	1.52	HA19		EXP	F
11	15576	3/22/91	20:24:18.3	1.31	HA19		EXP	G
26	41727	9/26/91	14:29:37.6	1.79	HA19		EXP	H
28	312962	1/2/92	12:33:11.5	1.63	63.65	26.14	-	H

Table 106: Events found in the Helsinki bulletin for area 35

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
30	315332	1/24/92	11:00:47.4	1.36	62.20	25.80	-	I
18	34288	8/6/91	22:39:59.9	1.45	62.91	25.66	-	K
19	34322	8/7/91	22:40:00.0	1.33	62.90	25.65	-	K

Events with the most reliable classification:

Table 107: Sorted events for area 35

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
35	326822	4/9/92	14:39:09.7	63.7470	25.8598	1.44	A
37	329734	6/4/92	07:22:37.5	63.5129	25.9678	1.34	A
34	326811	4/9/92	09:22:59.7	62.8476	24.2790	1.42	B
36	325006	4/16/92	09:26:50.8	62.8572	24.1311	1.34	B
1	3205	11/20/90	12:57:00.7	63.8473	25.3709	1.63	C
38	330801	6/15/92	14:22:32.6	63.7371	25.4701	1.55	C
39	332197	7/2/92	10:42:47.0	63.6902	25.5080	1.38	C
10	14237	3/19/91	09:51:55.6	63.7253	24.6689	1.33	D
12	15943	3/25/91	12:45:27.3	63.7788	24.7880	1.42	D
44	346118	12/22/92	13:17:17.0	63.7305	25.4785	1.46	D
9	12896	3/8/91	20:25:23.7	63.6238	25.9875	1.35	E
16	32149	7/26/91	15:17:39.7	63.8302	25.4430	1.57	E
22	35558	8/23/91	10:42:54.1	63.6705	25.7377	1.40	E
41	344724	12/1/92	12:18:49.5	63.6047	25.8844	1.41	E
4	10048	11/29/90	12:37:46.4	63.6545	25.9435	1.83	F
32	320003	3/9/92	19:25:25.6	63.6071	25.9094	1.52	F
33	323077	3/23/92	20:25:10.7	63.6795	25.5182	1.37	F
11	15576	3/22/91	20:24:18.3	63.5982	25.9168	1.31	G
43	345713	12/17/92	12:18:39.3	63.5902	25.7336	1.51	G
26	41727	9/26/91	14:29:37.6	63.7064	25.9920	1.79	H
28	312962	1/2/92	12:33:11.5	63.6698	25.9595	1.63	H

Table 107: Sorted events for area 35

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
42	345505	12/9/92	12:31:12.9	63.6827	25.8463	1.57	H
30	315332	1/24/92	11:00:47.4	62.1497	25.8568	1.36	I
31	313525	1/30/92	12:38:39.9	62.6647	25.0960	1.32	I
45	346652	12/29/92	11:07:47.2	62.6135	24.0811	1.67	J
46	347272	1/7/93	10:16:20.5	62.6516	24.0751	1.44	J
18	34288	8/6/91	22:39:59.9	62.9252	25.7280	1.45	K
19	34322	8/7/91	22:40:00.0	62.8999	25.7021	1.33	K

Remarks:

- Eleven (11) groups were defined for only forty-six (46) events. Most of them include only two or three events.
- According to the Helsinki bulletin, most of the events from groups A, F and H originate from mine HM 13 while most of the events from groups C and E originate from mine HM24.

Mine and event locations:

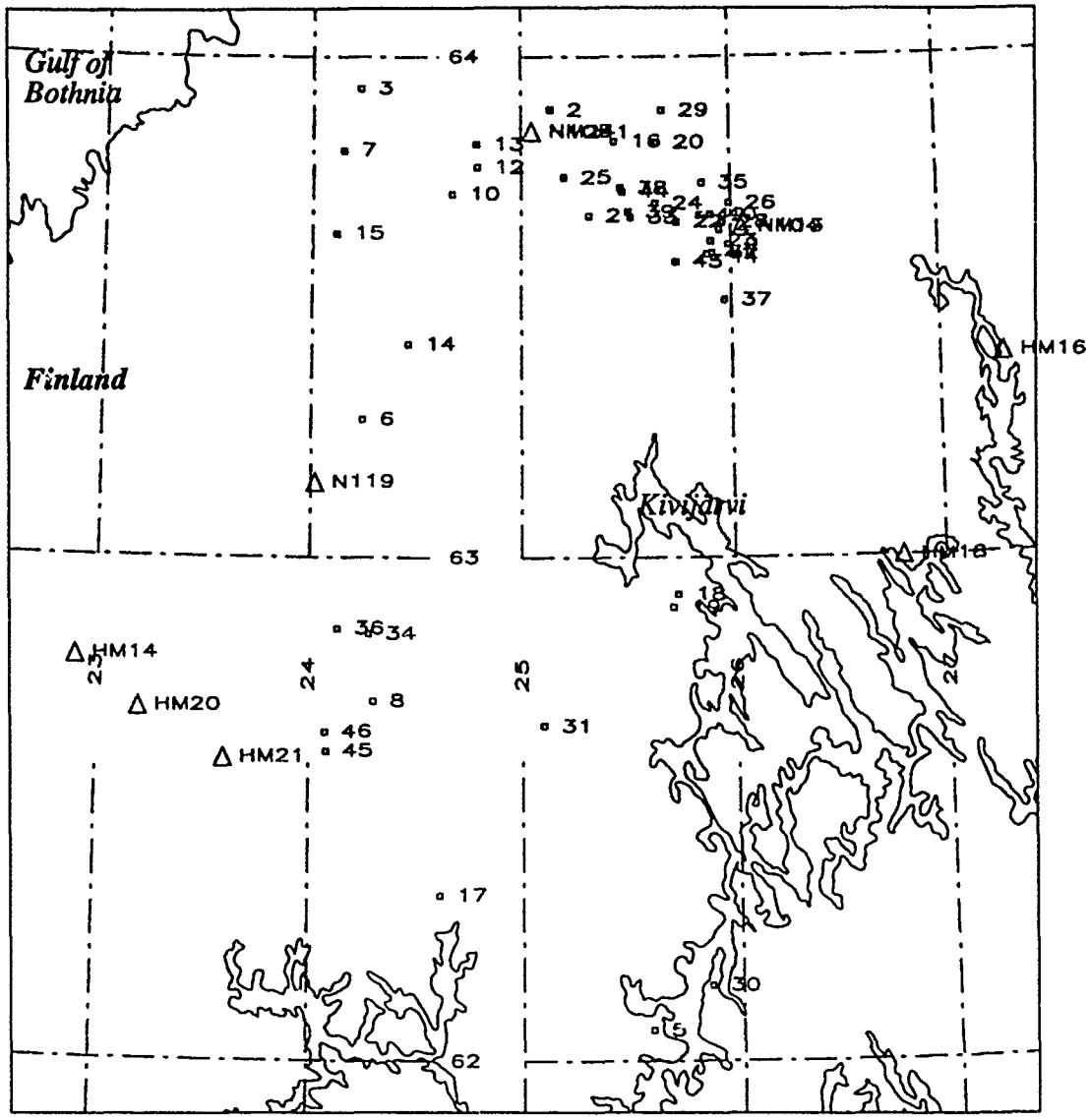

Figure 31: Mine and IMS event locations for area 35.

AREA 36

Latitude: 62 - 64°N
Longitude: 26 - 28°E
Local magnitude range: > 1.5
Number of events in IMS2: 391
Number of events within the magnitude range: 152
Number of processed events: 115
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 6 s. before *P*, 56 s. after *P*
Number of reference events: 16

Table 108: Reference events for area 36

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
5	314421	560830	658069	0.86	A
23	19362	755810	706014	0.85	B
21	19215	743302	617995	-	C
44	302463	1008867	1469806	0.85	D
34	39284	932885	1219786	0.89	E
26	21328	762464	727902	0.83	F
64	321683	1206931	1777833	0.86	G
37	301022	1003650	1432288	0.82	H
94	340869	1460111	2743707	-	I
40	301526	1005874	1419328	0.81	J
53	312989	1030795	1605190	0.74	K
41	301865	1006924	1425166	0.90	L
28	22470	786349	762012	0.83	M
82	333862	1356235	2325478	0.87	N
11	14471	705294	485557	0.84	O
7	7920	589637	439637	0.85	P

Reported mine locations:

Table 109: Mine locations for area 36

Label	Latitude	Longitude	Origin
HM6	62.07	27.41	Hels
N118	62.07	27.41	Norw
HA7	62.1	27.4	old_Hels
HA14	63.0	26.8	old_Hels
HM18	63.0	26.8	Hels
old(HM7)	63.1	27.7	old_Hels
HM7	63.12	27.74	Hels
N124	63.12	27.74	Norw
HM17	63.16	27.99	Hels
N125	63.16	27.99	Norw
HA15	63.2	27.8	old_Hels
HA17	63.4	27.3	old_Hels
HM16	63.4	27.3	Hels
HM13	63.66	26.05	Hels
N104	63.66	26.05	Norw
HA19	63.7	26.00	old_Hels

Number of events found in the Helsinki bulletin: 84

Table 110: Events found in the Helsinki bulletin for area 36

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
24	20027	4/26/91	06:47:38.0	1.52	62.09	27.33	LB	?
25	21161	4/29/91	11:00:48.2	2.08	63.08	27.72	QB	?
65	319971	3/9/92	13:23:05.0	1.52	64.22	27.44	-	?
66	320331	3/11/92	13:05:00.3	1.64	62.04	26.61	-	?
80	330018	6/9/92	07:21:38.2	1.53	62.86	27.51	-	?
27	21036	5/7/91	18:35:16.4	1.59	HA19		EXP	?
29	23265	5/22/91	11:57:17.7	1.53	HA19		EXP	?
33	37667	9/3/91	05:28:02.4	1.51	HM17		EXP	?
48	302532	12/2/91	11:34:04.3	1.50	HM7		EXP	?
52	303358	1/8/92	12:14:44.8	2.03	HM7		EXP	?
56	312780	1/14/92	13:52:02.6	1.63	HM17		EXP	?
59	315359	1/31/92	12:19:44.1	1.85	HM13		EXP	?
60	315653	2/3/92	12:06:50.6	2.05	HM7		EXP	?
61	318341	2/24/92	12:01:55.9	1.65	HM7		EXP	?
71	324589	4/13/92	10:58:05.6	1.97	HM7		EXP	?
79	329581	6/2/92	14:41:14.2	1.59	HM7		EXP	?
5	314421	12/21/90	12:24:57.6	1.60	63.56	27.61	-	A
12	14147	3/18/91	11:01:33.6	1.62	63.62	27.21	-	B
19	18054	4/17/91	15:49:21.1	2.10	63.62	27.20	-	B
23	19362	4/26/91	06:32:03.6	1.55	63.67	27.28	-	B
21	19215	4/19/91	07:16:12.1	1.66	HA19		EXP	C
47	302463	11/29/91	20:24:59.2	1.70	HM13		EXP	D
34	39284	9/10/91	11:18:51.0	1.77	63.66	26.01	-	E
55	313139	1/10/92	08:08:33.1	1.85	HM13		EXP	E
14	15239	3/21/91	11:58:40.6	1.93	old(HM7)		EXP	F
26	21328	5/2/91	11:11:43.6	2.00	63.11	27.79	-	F
32	35005	8/9/91	11:16:07.7	1.63	HM7		EXP	F

Table 110: Events found in the Helsinki bulletin for area 36

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
50	303199	12/20/91	12:05:09.9	1.81	HM7		EXP	F
57	313659	1/16/92	12:00:38.3	2.14	HM7		EXP	F
75	327803	5/14/92	10:59:21.0	1.64	HM7		EXP	F
77	328913	5/25/92	10:56:49.1	1.77	HM7		EXP	F
89	336149	8/18/92	10:59:37.9	1.66	HM7		QB	F
92	340148	9/25/92	11:04:04.9	1.66	63.07	27.86	-	F
64	321683	3/6/92	12:11:15.7	2.00	HM7		EXP	G
74	326617	4/30/92	11:01:01.8	2.01	HM7		EXP	G
78	329117	5/27/92	11:03:10.1	2.01	HM7		EXP	G
15	15972	3/28/91	12:25:48.1	1.84	old(HM7)		EXP	H
31	25890	6/7/91	10:59:12.8	2.04	HM7		EXP	H
37	301022	11/1/91	12:05:01.4	1.83	HM7		EXP	H
42	301979	11/22/91	11:58:29.8	1.80	HM7		EXP	H
45	302426	12/3/91	12:06:26.5	1.71	HM7		EXP	H
46	302368	12/10/91	12:00:43.7	1.59	HM7		EXP	H
54	311906	1/9/92	11:58:48.4	1.73	HM7		EXP	H
83	333964	7/21/92	11:01:16.8	1.76	HM17		EXP	H
88	335655	8/12/92	10:57:19.9	1.53	HM7		EXP	H
91	337256	8/28/92	10:57:52.6	1.81	63.09	27.76	-	H
93	340763	9/30/92	12:06:41.8	1.72	63.10	27.76	-	H
17	17601	4/11/91	10:58:22.1	1.51	63.13	27.42	-	J
20	18930	4/18/91	11:15:46.6	1.61	old(HM7)		EXP	J
36	300277	10/18/91	09:50:29.1	1.71	HM7		EXP	J
40	301526	11/18/91	12:03:20.9	1.53	HM7		EXP	J
51	303329	1/3/92	12:08:45.6	1.89	HM7		EXP	J
69	324860	4/1/92	11:00:54.4	1.67	HM7		EXP	J
81	332559	7/7/92	10:58:12.2	1.73	HM7		EXP	J
85	334693	7/30/92	10:57:05.5	1.91	HM7		EXP	J

Table 110: Events found in the Helsinki bulletin for area 36

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
2	26160	11/26/90	11:56:07.8	2.11	old(HM7)		EXP	K
30	25533	6/5/91	11:01:37.5	2.01	HM7		EXP	K
53	312989	12/30/91	12:01:26.9	2.05	HM7		EXP	K
58	313645	1/30/92	12:02:08.6	2.20	HM7		EXP	K
62	320946	2/28/92	12:01:25.8	1.99	HM7		EXP	K
67	321546	3/12/92	12:15:46.7	2.14	HM7		EXP	K
70	325617	4/2/92	11:01:46.6	2.08	HM7		EXP	K
38	301328	11/4/91	12:01:39.5	1.70	HM7		EXP	L
41	301865	11/20/91	11:59:00.1	1.72	HM7		EXP	L
43	301928	11/27/91	12:03:39.7	1.78	HM7		EXP	L
68	323805	3/25/92	12:21:20.7	1.61	HM7		EXP	L
1	5776	11/15/90	12:01:07.0	1.77	old(HM7)		EXP	M
28	22470	5/9/91	11:06:12.8	2.11	63.14	27.71	-	M
72	325018	4/16/92	10:58:49.8	1.53	HM7		EXP	M
82	333862	7/20/92	11:06:09.0	1.88	HM7		EXP	N
4	4352	12/19/90	12:13:23.1	2.10	old(HM7)		EXP	O
6	314587	12/28/90	11:57:51.0	1.79	old(HM7)		EXP	O
11	14471	3/14/91	12:15:15.0	1.90	old(HM7)		EXP	O
13	14920	3/19/91	12:26:53.4	2.16	old(HM7)		EXP	O
49	303085	12/19/91	12:06:43.6	2.12	HM7		EXP	O
84	334241	7/24/92	10:56:32.5	1.92	HM7		EXP	O
87	335572	8/11/92	11:02:26.2	1.82	HM7		EXP	O
7	7920	1/16/91	12:00:06.5	1.74	old(HM7)		EXP	P
8	8318	1/21/91	12:04:32.3	1.58	old(HM7)		EXP	P
10	12927	2/6/91	11:58:01.1	1.73	old(HM7)		EXP	P
18	17603	4/11/91	11:02:36.1	1.65	old(HM7)		EXP	P
63	321574	3/3/92	12:01:02.4	1.72	HM7		EXP	P

Table 110: Events found in the Helsinki bulletin for area 36

Event #	IMS orid	IMS origin time		IMS ml	HEL location	HEL label	Group
73	325565	4/23/92	10:58:27.5	2.07	HM7	EXP	P
76	328393	5/20/92	11:07:44.2	1.76	HM7	EXP	P

Events with the most reliable classification:

Table 111: Sorted events for area 36

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
3	10142	12/17/90	10:55:13.1	63.4938	27.7374	1.59	A
5	314421	12/21/90	12:24:57.6	63.5106	27.7232	1.60	A
9	9263	2/6/91	10:34:42.7	63.4116	27.5956	1.57	A
12	14147	3/18/91	11:01:33.6	63.5812	27.8029	1.62	B
19	18054	4/17/91	15:49:21.1	63.3508	27.5781	2.10	B
23	19362	4/26/91	06:32:03.6	63.4870	27.8077	1.55	B
21	19215	4/19/91	07:16:12.1	63.6574	26.1676	1.66	C
97	342229	10/26/92	12:19:17.7	63.6637	26.1693	1.52	C
44	302463	11/29/91	20:24:59.2	63.6279	26.2647	1.70	D
102	343239	11/11/92	14:40:13.0	63.8157	26.3615	1.64	D
16	15476	3/28/91	20:55:03.5	63.4695	26.1130	1.51	E
34	39284	9/10/91	11:18:51.0	63.6406	26.1865	1.77	E
39	301387	11/6/91	12:19:21.0	63.6793	26.1311	1.64	E
55	313139	1/10/92	08:08:33.1	63.6092	26.1680	1.85	E
103	343792	11/17/92	12:18:52.4	63.6288	26.3661	1.61	E
106	344261	11/25/92	08:13:50.2	63.5776	26.1245	1.59	E
114	346758	12/30/92	12:18:34.7	63.5493	26.1651	1.70	E
14	15239	3/21/91	11:58:40.6	63.1032	27.5487	1.93	F
26	21328	5/2/91	11:11:43.6	63.1237	27.6405	2.00	F
32	35005	8/9/91	11:16:07.7	63.1626	27.5623	1.63	F
50	303199	12/20/91	12:05:09.9	63.1164	27.8321	1.81	F
57	313659	1/16/92	12:00:38.6	63.1137	27.6097	2.14	F

Table 111: Sorted events for area 36

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
75	327803	5/14/92	10:59:21.0	62.9929	27.8295	1.64	F
77	328913	5/25/92	10:56:49.1	63.0648	27.6025	1.77	F
89	336149	8/18/92	10:59:37.9	63.0455	27.5428	1.66	F
92	340148	9/25/92	11:04:04.9	63.1662	27.5730	1.66	F
98	342471	10/30/92	11:56:31.4	63.2602	27.7324	1.71	F
108	344664	11/30/92	12:16:25.3	63.1012	27.3710	1.75	F
112	346662	12/29/92	11:58:31.9	63.0824	27.7414	1.55	F
115	347435	1/8/93	11:58:07.2	62.9846	27.6600	1.51	F
64	321683	3/6/92	12:11:15.7	63.0818	27.9050	2.00	G
74	326617	4/30/92	11:01:01.8	63.1311	27.6643	2.01	G
78	329117	5/27/92	11:03:10.1	63.0704	27.3629	2.01	G
15	15972	3/28/91	12:25:48.1	63.1435	27.6239	1.84	H
31	25890	6/7/91	10:59:12.8	63.0872	27.4440	2.04	H
37	301022	11/1/91	12:05:01.4	63.1372	27.5267	1.83	H
42	301979	11/22/91	11:58:29.8	63.1482	27.5910	1.80	H
45	302426	12/3/91	12:06:26.5	63.1188	27.6427	1.71	H
46	302368	12/10/91	12:00:43.7	63.2022	27.4661	1.59	H
54	311906	1/9/92	11:58:48.4	63.0722	27.6553	1.73	H
83	333964	7/21/92	11:01:16.8	63.1071	27.4335	1.76	H
88	335655	8/12/92	10:57:19.9	63.0285	27.5913	1.53	H
91	337256	8/28/92	10:57:52.6	63.1087	27.7098	1.81	H
93	340763	9/30/92	12:06:41.8	63.3429	27.8111	1.72	H
96	341035	10/9/92	11:59:28.5	63.1054	27.6355	1.59	H
113	346752	12/30/92	12:01:31.6	63.1520	27.5809	1.77	H
94	340869	10/6/92	11:58:26.8	63.1135	27.7114	1.71	I
110	345155	12/8/92	12:14:17.4	63.0762	27.7950	1.76	I
17	17601	4/11/91	10:58:22.1	63.1179	27.4636	1.51	J
20	18930	4/18/91	11:15:46.6	63.1167	27.6114	1.61	J

Table 111: Sorted events for area 36

Event #	IMS crid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
36	300277	10/18/91	09:50:29.1	63.0790	27.5017	1.71	J
40	301526	11/18/91	12:03:20.9	63.1494	27.5726	1.53	J
51	303329	1/3/92	12:08:45.6	63.1424	27.4177	1.89	J
69	324860	4/1/92	11:00:54.4	63.0582	27.8177	1.67	J
81	332559	7/7/92	10:58:12.2	63.0651	27.5555	1.73	J
85	334693	7/30/92	10:57:05.5	62.9845	27.7838	1.91	J
2	26160	11/26/90	11:56:07.8	63.1065	27.4837	2.11	K
30	25533	6/5/91	11:01:37.5	63.1103	27.6671	2.01	K
53	312989	12/30/91	12:01:26.9	63.1124	27.4593	2.05	K
58	313645	1/30/92	12:02:08.6	63.1236	27.4678	2.20	K
62	320946	2/28/92	12:01:25.8	63.1113	27.5541	1.99	K
67	321546	3/12/92	12:15:46.7	63.0539	27.8346	2.14	K
70	325617	4/2/92	11:01:46.6	63.1015	27.5260	2.08	K
99	342781	11/3/92	11:58:07.9	63.1223	27.4685	2.00	K
38	301328	11/4/91	12:01:39.5	63.0958	27.7164	1.70	L
41	301865	11/20/91	11:59:00.1	63.1438	27.1662	1.72	L
43	301928	11/27/91	12:03:39.7	63.0905	27.4669	1.78	L
68	323805	3/25/92	12:21:20.7	63.1274	27.4196	1.61	L
1	5776	11/15/90	12:01:07.0	63.2891	27.6013	1.77	M
28	22470	5/9/91	11:06:12.8	63.1702	27.6694	2.11	M
72	325018	4/16/92	10:58:49.8	63.0344	27.6234	1.53	M
100	342811	11/5/92	11:57:39.9	63.0706	27.6167	1.61	M
101	343286	11/10/92	11:57:28.7	63.1033	27.6046	1.65	M
82	333862	7/20/92	11:06:09.0	62.9582	27.4725	1.88	N
95	340980	10/8/92	12:14:43.2	63.0953	27.5938	1.66	N
104	343885	11/20/92	11:57:09.5	63.0875	27.6897	1.78	N
111	345709	12/17/92	12:01:13.8	63.0977	27.5744	1.64	N
4	4352	12/19/90	12:13:23.1	63.1096	27.5434	2.10	O

Table 111: Sorted events for area 36

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
6	314587	12/28/90	11:57:51.0	63.1735	27.6028	1.79	O
11	14471	3/14/91	12:15:15.0	63.1008	27.8345	1.90	O
13	14920	3/19/91	12:26:53.4	63.1117	27.6180	2.16	O
49	303085	12/19/91	12:06:43.6	63.1305	27.5147	2.12	O
84	334241	7/24/92	10:56:32.5	63.0978	27.5057	1.92	O
87	335572	8/11/92	11:02:26.2	63.1018	27.5187	1.82	O
90	336925	8/25/92	11:04:56.1	63.1056	27.3673	1.85	O
7	7920	1/16/91	12:00:06.5	63.1226	27.8878	1.74	P
8	8318	1/21/91	12:04:32.3	63.1348	27.3445	1.58	P
10	12927	2/6/91	11:58:01.1	63.0903	27.4557	1.73	P
18	17603	4/11/91	11:02:36.1	63.1235	27.3124	1.65	P
63	321574	3/3/92	12:01:02.4	63.1382	27.4628	1.72	P
73	325565	4/23/92	10:58:27.5	63.0922	27.4542	2.07	P
76	328393	5/20/92	11:07:44.2	63.1025	27.7769	1.76	P
107	344523	11/27/92	11:57:21.4	63.1040	27.6408	1.76	P

Remarks:

- Two clusters of events are clearly seen on the map (Figure 32). The cluster located in the middle of the map consists of events from groups F through P and the cluster located North-West of the map consists of events from groups C, D and E.
- According to the identification found in the Helsinki bulletin these two clusters correspond to mines HM7 and HM13, respectively.
- Events from groups A and B are located North of the largest cluster. The closest mine is HM16.

Mine and event locations:

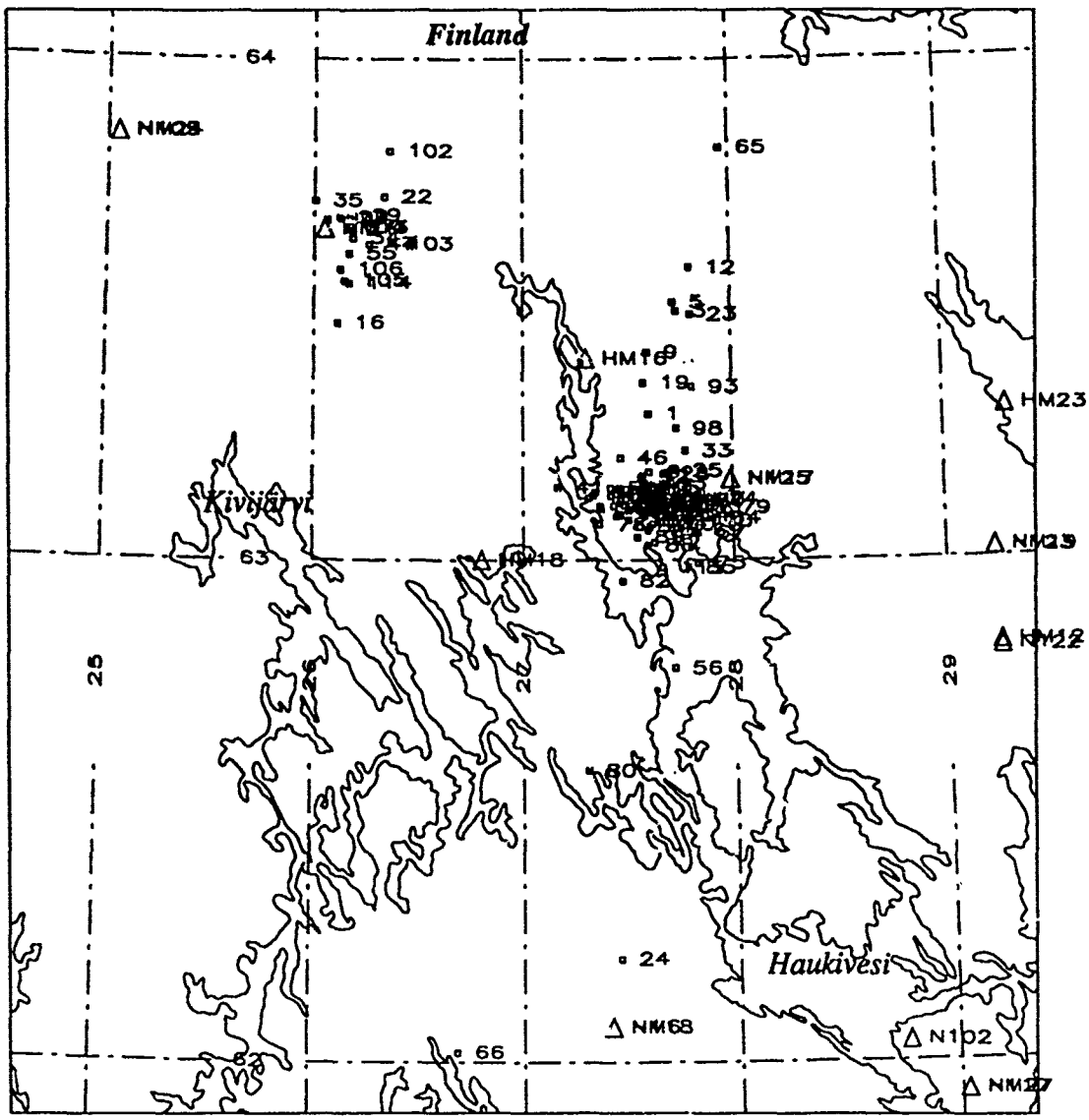

Figure 32: Mine and IMS event locations for area 36.

AREA 37

Latitude: 62 - 64°N
Longitude: 28 - 32°E
Local magnitude range: > 1.0
Number of events in IMS2: 143
Number of events within the magnitude range: 111
Number of processed events: 83
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 7 s. before *P*, 67 s. after *P*
Number of reference events: 10

Table 112: Reference events for area 37

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
5	5000	566230	452534	-	A
70	340567	1459257	2733693	0.83	B
67	337677	1422788	2637663	0.87	C
79	344780	1523011	2872938	0.79	D
54	328579	1284437	2083000	0.84	E
7	6199	576788	687586	0.80	F
17	19697	751100	673150	0.83	G
4	3350	546193	640231	0.86	H
23	23905	791965	800148	0.82	I
12	16841	725735	556912	-	J

Reported mine locations:

Table 113: Mine locations for area 37

Label	Latitude	Longitude	Origin
N102	62.04	28.77	Norw
HA8	62.5	30.1	old_Hels
HM15	62.5	30.1	Hels
old(HM12)	62.8	29.2	old_Hels
HA12	62.8	29.3	old_Hels

Table 113: Mine locations for area 37

Label	Latitude	Longitude	Origin
N122	62.82	29.25	Norw
HM12	62.83	29.25	Hels
HA13	62.9	28.7	old_Hels
HM19	63.02	29.23	Hels
N123	63.02	29.23	Norw
HA16	63.2	28.1	old_Hels
HM23	63.3	29.3	Hels
HA18	63.5	29.6	old_Hels

Number of events found in the Helsinki bulletin: 38

Table 114: Events found in the Helsinki bulletin for area 37

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
6	5854	1/3/91	13:30:35.0	1.30	64.23	28.04	-	?
16	18770	4/22/91	11:32:47.9	1.72	62.30	30.16	-	?
36	302699	12/12/91	12:33:58.2	1.33	63.09	27.57	-	?
37	302975	12/18/91	11:15:56.2	1.61	63.49	29.66	-	?
48	323584	3/24/92	16:12:42.1	1.06	64.45	27.65	-	?
20	22135	5/6/91	07:03:55.5	1.13	old(HM8)		EXP	?
22	23386	5/23/91	12:29:55.4	1.18	old(HM12)		EXP	?
25	27871	6/27/91	13:33:20.8	1.01	HM7		EXP	?
31	37029	8/29/91	11:01:05.3	2.04	HM7		EXP	?
32	38171	9/5/91	10:59:04.5	1.84	HM7		EXP	?
39	313412	1/28/92	12:04:54.8	1.19	HM8		EXP	?
42	320051	3/9/92	15:01:21.3	1.36	HM8		EXP	?
57	329830	6/5/92	10:59:54.9	1.71	HM7		EXP	?
60	334445	7/27/92	13:42:35.2	1.32	HM8		EXP	?
62	335160	8/5/92	11:43:09.6	1.07	HM8		EXP	?
63	336325	8/19/92	11:32:07.1	1.00	HM8		EXP	?

Table 114: Events found in the Helsinki bulletin for area 37

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
64	337274	8/28/92	11:27:13.4	1.09	HM8		EXP	?
66	337621	9/2/92	07:51:01.7	1.12	HM17		EXP	?
5	5000	12/28/90	09:33:36.0	1.62	61.99	30.88	-	A
10	14395	3/13/91	14:20:33.0	1.84	HC13		EXP	B
26	32975	7/30/91	16:10:06.7	1.88	61.85	30.68	-	B
35	302407	11/29/91	11:04:14.0	2.16	HC13		EXP	B
61	334645	7/29/92	15:12:21.4	1.46	62.26	30.32	-	B
68	338437	9/10/92	07:28:47.0	1.36	62.28	30.20	-	B
67	337677	9/2/92	13:31:50.2	1.56	63.12	29.13	-	C
65	337487	8/31/92	13:13:58.8	1.27	63.05	29.17	-	E
7	6199	1/7/91	13:29:19.1	1.46	old(HM12)		EXP	F
28	33459	8/2/91	14:10:32.2	1.25	HM12		EXP	F
17	19697	4/22/91	12:59:35.8	1.61	63.15	28.19	QB	G
19	19075	4/24/91	16:19:59.0	1.53	63.15	27.99	-	G
44	324186	3/19/92	07:35:50.9	1.50	HM7		EXP	G
9	14509	3/15/91	07:58:21.3	1.59	63.13	28.17	-	I
23	23905	5/23/91	13:12:56.6	1.63	63.14	28.09	-	I
29	34101	8/6/91	11:22:55.2	1.16	HM17		EXP	I
30	36896	8/27/91	11:00:32.1	1.49	HM17		EXP	I
38	313145	1/10/92	11:13:23.9	1.75	HM17		EXP	I
12	16841	4/3/91	11:01:01.5	1.87	old(HM7)		EXP	J
50	326017	4/6/92	11:03:11.2	1.65	HM7		EXP	J

Events with the most reliable classification:

Table 115: Sorted events for area 37

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
5	5000	12/28/90	09:33:36.0	62.0013	30.3167	1.62	A
45	321374	3/19/92	11:37:10.5	62.0402	30.3640	1.22	A

Table 115: Sorted events for area 37

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
10	14395	3/13/91	14:20:33.0	62.0585	30.3131	1.84	B
26	32975	7/30/91	16:10:06.7	62.0539	30.4339	1.88	B
35	302407	11/29/91	11:04:14.0	62.0520	30.3040	2.16	B
58	332540	7/7/92	08:14:40.0	62.0109	30.1788	1.36	B
61	334645	7/29/92	15:12:21.4	62.0001	30.1944	1.46	B
68	338437	9/10/92	07:28:47.0	62.1566	30.3450	1.36	B
70	340567	10/1/92	10:54:52.2	62.0483	30.1182	1.34	B
67	337677	9/2/92	13:31:50.2	62.8760	28.9077	1.56	C
74	341773	10/21/92	11:24:49.6	62.9394	29.0463	1.30	C
77	343828	11/19/92	11:34:59.3	62.8647	28.9596	1.37	C
78	344277	11/25/92	11:17:41.4	62.8065	28.9868	1.36	C
81	346240	12/15/92	14:46:55.9	62.9952	29.2609	1.55	C
1	2012	11/13/90	18:25:58.3	63.0570	28.9262	1.18	D
8	7765	1/15/91	12:45:53.2	63.0643	29.0112	1.21	D
15	18251	4/18/91	16:17:47.5	63.0350	28.9646	1.15	D
18	18916	4/23/91	17:37:46.7	62.9925	28.7612	1.08	D
24	25409	6/7/91	00:48:10.7	63.0300	28.7748	1.11	D
41	319305	2/25/92	13:39:43.8	62.9860	29.2219	1.08	D
43	320865	3/18/92	11:50:09.6	63.0032	29.0515	1.14	D
49	322393	3/25/92	09:09:52.0	62.9022	29.0462	1.15	D
69	338776	9/14/92	10:09:05.6	62.8573	29.0893	1.10	D
79	344780	12/2/92	11:52:25.5	62.9436	28.9282	1.11	D
80	345338	12/11/92	09:32:24.8	63.0099	28.9192	1.01	D
54	328579	5/21/92	14:14:41.1	62.8173	29.1034	1.37	E
59	332638	7/8/92	09:20:15.1	62.9002	28.9872	1.03	E
65	337487	8/31/92	13:13:58.8	62.8412	28.9716	1.27	E
75	342616	11/2/92	12:47:31.5	62.8219	29.1154	1.16	E
2	2664	11/16/90	13:24:28.3	62.8363	29.1256	1.20	F

Table 115: Sorted events for area 37

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
7	6199	1/7/91	13:29:19.1	62.7913	29.4036	1.46	F
28	33459	8/2/91	14:10:32.2	62.8496	29.1227	1.25	F
56	329762	6/4/92	10:30:54.7	62.8701	29.0643	1.02	F
82	346987	12/21/92	12:44:48.4	62.9128	29.1985	1.05	F
17	19697	4/22/91	12:59:35.8	63.1192	28.2458	1.61	G
19	19075	4/24/91	16:19:59.0	63.0425	28.0293	1.53	G
44	324186	3/19/92	07:35:50.9	63.1732	28.1556	1.50	G
3	8309	11/26/90	13:42:40.2	62.8464	29.3799	1.67	H
4	3350	12/7/90	13:41:30.3	62.6867	29.0579	1.31	H
11	15340	3/27/91	13:51:28.8	62.6666	29.5106	1.40	H
46	321804	3/20/92	12:33:29.0	62.7582	29.0127	1.28	H
51	324102	4/8/92	12:00:20.0	62.7262	29.0407	1.32	H
9	14509	3/15/91	07:58:21.3	63.0116	28.1697	1.59	I
23	23905	5/23/91	13:12:56.6	63.1706	28.4109	1.63	I
29	34101	8/6/91	11:22:55.2	63.0203	28.7731	1.16	I
30	36896	8/27/91	11:00:32.1	63.2065	28.2492	1.49	I
38	313145	1/10/92	11:13:23.9	63.1604	28.0689	1.75	I
12	16841	4/3/91	11:01:01.5	63.0904	28.0177	1.87	J
50	326017	4/6/92	11:03:11.2	63.1297	28.1816	1.65	J

Remarks:

- According to the identification reported in the Helsinki bulletin, events from group B originate from mine HC13 whose location is in area 40; events from groups G and J are from mine HM7; events from group I are from mine HM17.
- Events from groups C, D, E, F and H form a tight cluster located between mines HM12 and HM23. No events has been reported as originating from these mines.

Mine and event locations:

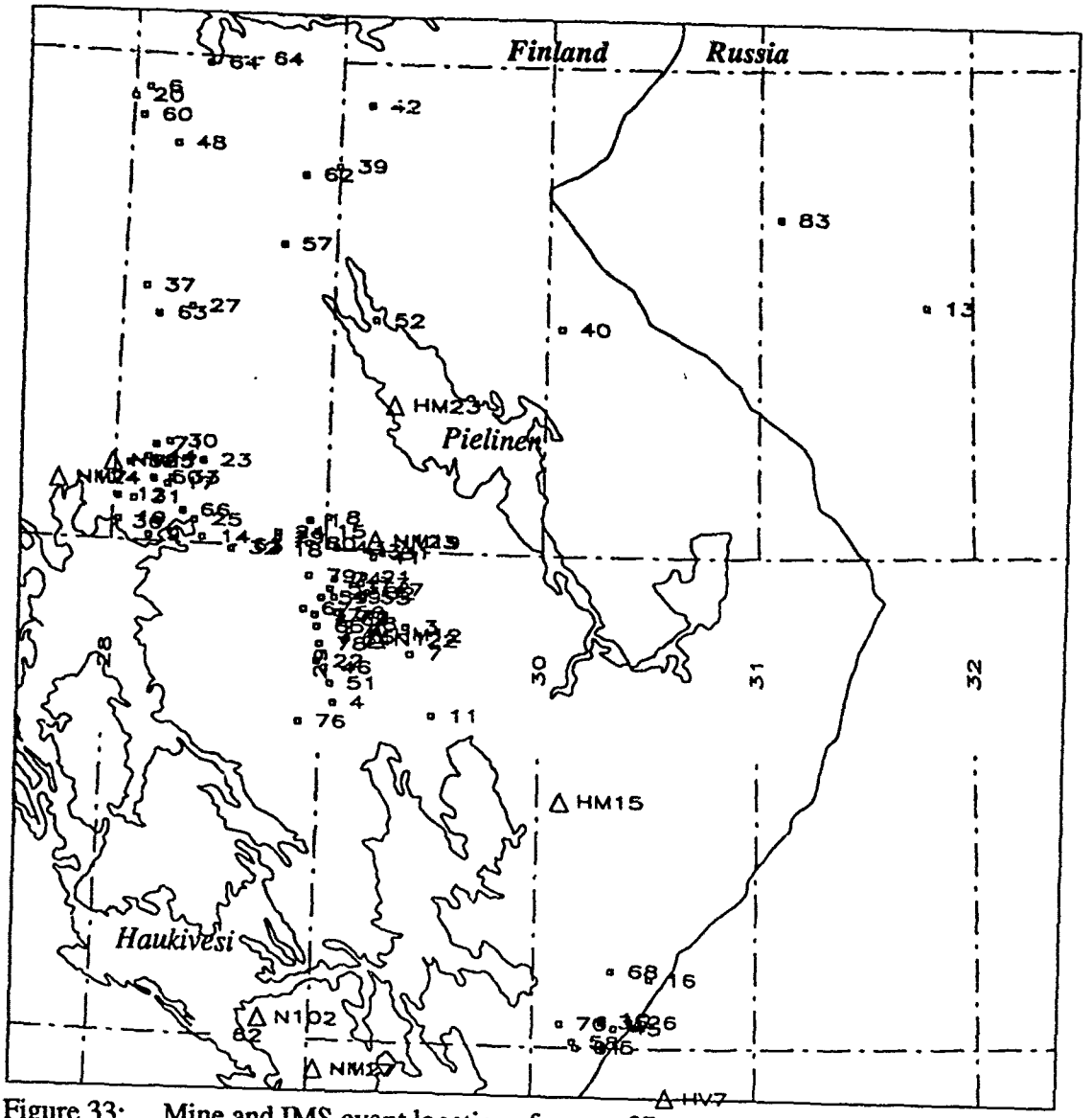

Figure 33: Mine and IMS event locations for area 37.

AREA 38

Latitude: 62 - 64°N
Longitude: 32 - 38°E
Local magnitude range: -
Number of events in IMS2: 68
Number of events within the magnitude range: 68
Number of processed events: 49
Frequency range used to process the data: 2- 16 Hz
Processed signal length: 11 s. before *P*, 96 s. after *P*
Number of reference events: 5

Table 116: Reference events for area 38

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
22	40626	947381	1248082	0.84	A
6	13162	693370	445025	0.87	B
12	18204	737869	586717	0.80	C
8	14918	709946	489342	0.86	D
49	346755	1558359	2888807	0.90	E

Reported mine locations:

Table 117: Mine locations for area 38

Label	Latitude	Longitude	Origin
HC16	62.2	34.3	old_Hels
HV9	62.2	34.3	Hels

Number of events found in the Helsinki bulletin: 21

Table 118: Events found in the Helsinki bulletin for area 38

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
15	24008	5/24/91	18:21:07.1	1.76	62.29	35.02	-	?
26	313033	1/11/92	12:11:59.2	1.95	62.86	34.41	-	?
27	312836	12/27/91	12:21:00.9	1.63	HV9		EXP	?
29	315639	2/3/92	09:08:56.5	2.29	62.91	34.49	-	?

Table 118: Events found in the Helsinki bulletin for area 38

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
35	327235	5/7/92	12:16:03.2	1.87	61.83	35.47	-	?
30	319370	2/19/92	14:00:26.1	1.81	HV9		EXP	?
34	324881	3/26/92	12:59:25.9	1.90	HC15		EXP	?
22	40626	9/20/91	09:27:56.6	1.94	HV9		EXP	A
31	319719	3/4/92	10:02:02.5	2.11	62.87	34.37	-	A
1	10145	11/30/90	10:06:35.8	1.85	HV9		EXP	B
5	13162	3/6/91	09:04:08.9	2.09	HV9		EXP	B
16	25524	6/5/91	09:23:32.1	2.20	63.01	34.66	-	B
25	302290	12/4/91	11:59:14.4	2.02	HV9		EXP	B
12	18204	4/15/91	12:01:21.2	2.14	HV9		EXP	C
13	22812	5/15/91	13:08:28.0	1.88	HV9		EXP	C
2	4351	12/19/90	12:00:17.3	2.05	HV9		EXP	C
24	301690	11/15/91	13:29:29.5	1.95	62.23	34.58	-	C
39	329832	6/5/92	11:07:47.4	1.79	HV9		EXP	C
3	7212	12/27/90	11:05:34.4	2.54	62.27	35.98	-	E
10	15715	3/27/91	10:21:09.1	2.32	61.61	35.19	-	E
44	336164	8/18/92	13:54:52.4	2.03	61.76	35.23	-	E

Events with the most reliable classification:

Table 119: Sorted events for area 38

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
22	40626	9/20/91	09:27:56.6	62.9832	34.6840	1.94	A
31	319719	3/4/92	10:02:02.5	62.8718	34.9184	2.11	A
36	327578	5/12/92	11:08:48.8	62.9031	37.2948	-	A
43	333597	7/17/92	09:19:27.6	63.0828	33.9967	1.90	A
46	340115	9/25/92	07:45:13.7	62.8188	37.7646	2.08	A
1	10145	11/30/90	10:06:35.8	62.9784	34.4105	1.85	B
5	13162	3/6/91	09:04:08.9	62.9528	34.7181	2.09	B

Table 119: Sorted events for area 38

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
6	13162	3/6/91	09:04:08.9	62.9528	34.7181	2.09	B
11	17626	4/10/91	11:01:47.0	62.3577	33.3759	1.94	B
16	25524	6/5/91	09:23:32.1	62.7726	35.0206	2.20	B
20	32138	7/26/91	09:02:45.8	62.6940	34.9505	2.04	B
25	302290	12/4/91	11:59:14.4	62.8629	34.6730	2.02	B
2	4351	12/19/90	12:00:17.3	62.2618	34.4603	2.05	C
7	14374	3/13/91	11:47:22.2	62.2601	34.6316	2.07	C
12	18204	4/15/91	12:01:21.2	62.2877	34.4458	2.14	C
13	22812	5/15/91	13:08:28.0	62.2287	34.4440	1.88	C
24	301690	11/15/91	13:29:29.5	62.2229	34.5329	1.95	C
28	315412	1/27/92	11:44:50.9	62.1901	34.7962	2.03	C
32	322850	3/23/92	12:39:23.8	62.0457	34.6186	1.84	C
37	327669	5/13/92	11:32:56.0	62.0109	37.1262	-	C
39	329832	6/5/92	11:07:47.4	62.2342	34.3606	1.79	C
48	345661	12/16/92	13:44:41.6	62.3397	36.2735	2.12	C
8	14918	3/19/91	11:59:54.5	62.2466	34.3549	2.00	D
14	23222	5/21/91	13:06:29.7	62.3471	32.6637	1.48	D
18	27407	6/27/91	12:40:59.3	62.3558	34.3461	1.64	D
3	7212	12/27/90	11:05:34.4	62.3523	35.7595	2.54	E
10	15715	3/27/91	10:21:09.1	62.0093	35.4863	2.32	E
44	336164	8/18/92	13:54:52.4	62.1050	36.0205	2.03	E
49	346755	12/30/92	12:34:28.8	62.4073	35.7154	2.01	E

Remarks:

- Events from groups A, B and C were identified as originating from mine HV9 in the Helsinki bulletin.
- The events from groups A and B are systematically located further north (about 70 km) than the events from group C, located close to mine HV9.
- Events from group E are consistently located on the East side of Onezhskoye Ozero.

Mine and event locations:

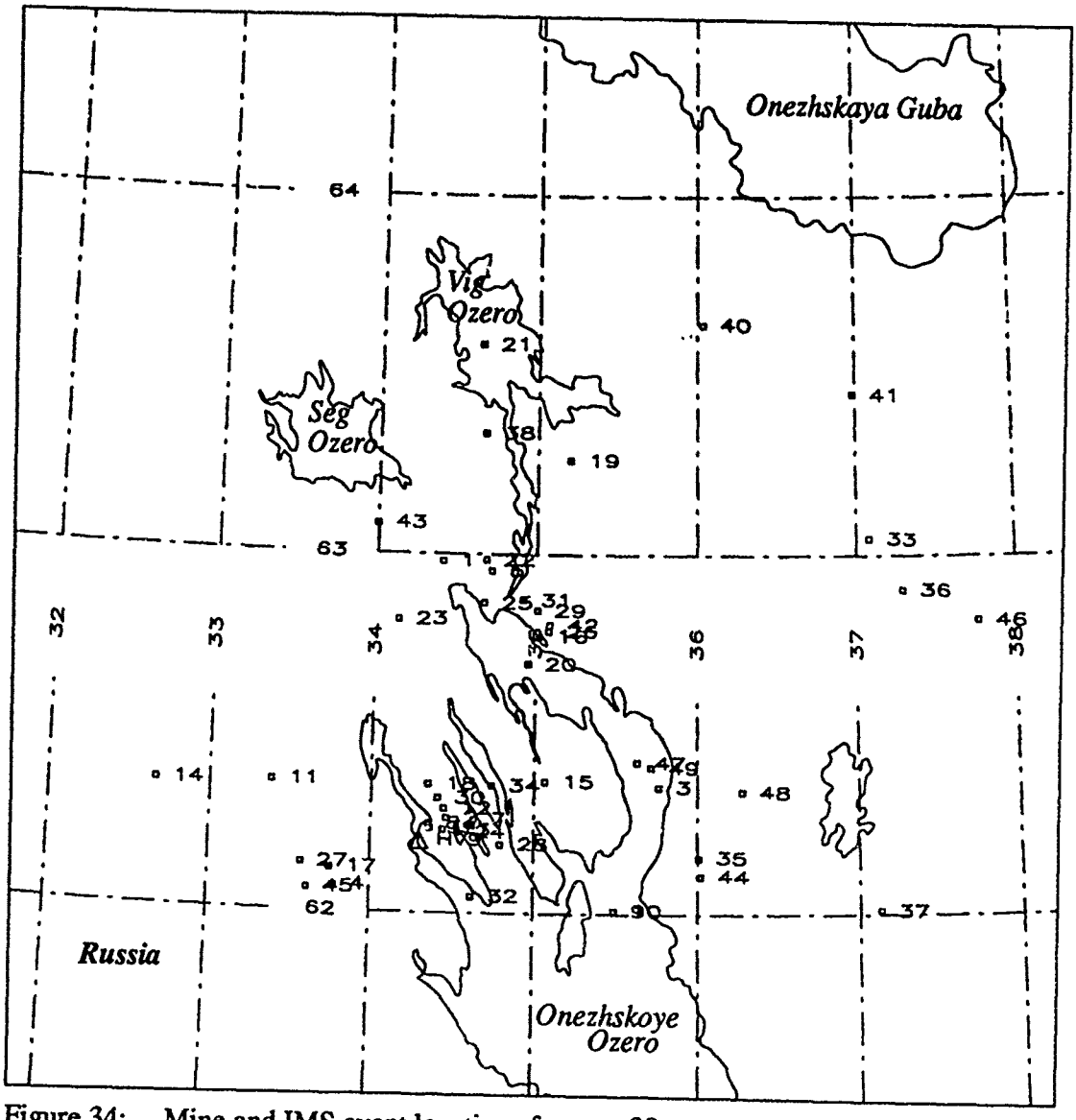

Figure 34: Mine and IMS event locations for area 38.

AREA 39

Latitude: 60 - 62°N
Longitude: 34 - 38°E
Local magnitude range: -
Number of events in IMS2: 74
Number of events within the magnitude range: 74
Number of processed events: 52
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 11 s. before *P*, 96 s. after *P*
Number of reference events: 6

Table 120: Reference events for area 39

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
52	346733	1558226	2888691	0.82	A
38	330513	1286389	2109544	0.86	B
13	22606	778897	782190	0.88	C
23	37695	922620	1191962	0.81	D
29	303126	1013876	1616101	0.82	E
34	325106	1234135	1958844	0.84	F

Reported mine locations:

Table 121: Mine locations for area 39

Label	Latitude	Longitude	Origin
HC15	61.4	34.3	old_Hels
HV6	61.4	34.3	Hels

Number of events found in the Helsinki bulletin: 21

Table 122: Events found in the Helsinki bulletin for area 39

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
36	326578	4/30/92	08:55:08.8	2.00	HV6		EXP	?
5	14909	3/19/91	09:23:20.8	2.15	HV6		EXP	A
10	19814	4/25/91	08:55:43.4	2.10	61.29	34.60	R	A

Table 122: Events found in the Helsinki bulletin for area 39

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
22	36328	8/29/91	09:05:39.6	1.88	HV6		EXP	A
32	320697	2/27/92	09:14:49.8	1.91	61.46	34.29	-	A
43	334597	7/29/92	08:20:44.5	1.95	HV6		EXP	A
7	16506	4/4/91	12:27:05.8	2.11	HV6		EXP	C
13	22606	5/10/91	08:56:57.4	2.03	HV6		EXP	C
18	25726	6/6/91	09:04:58.1	2.08	HV6		EXP	C
4	13188	3/6/91	11:30:51.0	2.27	61.89	35.39	-	E
17	24264	5/29/91	13:06:58.1	2.15	61.73	35.11	-	E
29	303126	1/5/92	10:06:24.6	1.96	61.74	34.90	-	E
2	42263	12/6/90	10:54:40.2	2.54	HV6		EXP	F
3	6026	1/5/91	14:19:45.7	2.34	HV6		EXP	F
12	22149	5/6/91	10:51:57.0	2.12	HV6		EXP	F
15	24007	5/24/91	17:33:47.0	2.11	HV6		EXP	F
28	301684	11/15/91	12:46:47.4	2.40	HV6		EXP	F
33	323542	3/27/92	13:32:48.0	2.30	HV6		EXP	F
34	325106	4/17/92	12:50:49.6	2.14	61.71	34.95	-	F
41	331385	6/23/92	12:07:33.2	2.28	HV6		EXP	F
44	334610	7/29/92	10:31:53.1	2.00	HV6		EXP	F

Events with the most reliable classification:

Table 123: Sorted events for area 39

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
1	32622	11/29/90	09:06:18.7	61.5110	34.6264	1.86	A
5	14909	3/19/91	09:23:20.8	61.5657	34.5142	2.15	A
10	19814	4/25/91	08:55:43.4	61.4988	34.7699	2.10	A
22	36328	8/29/91	09:05:39.6	61.5342	34.6204	1.88	A
32	320697	2/27/92	09:14:49.8	61.7032	34.6465	1.91	A
39	329741	6/4/92	08:28:02.2	61.5211	34.8665	1.94	A

Table 123: Sorted events for area 39

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
43	334597	7/29/92	08:20:44.5	61.6353	34.8043	1.95	A
45	338253	9/9/92	08:25:36.8	61.6932	34.9905	2.00	A
47	342304	10/28/92	09:18:43.4	61.7959	34.0616	1.56	A
52	346733	12/30/92	09:43:17.6	61.5804	34.7946	1.90	A
16	24253	5/25/91	08:32:13.9	60.8217	37.2734	1.98	B
20	34133	8/7/91	11:04:38.8	60.9580	36.8569	2.20	B
38	330513	5/28/92	07:50:24.9	60.7432	37.4416	2.11	B
7	16506	4/4/91	12:27:05.3	61.6308	34.4089	2.11	C
8	17570	4/11/91	09:09:42.0	61.6722	34.6378	1.96	C
13	22606	5/10/91	08:56:57.4	61.3864	34.9276	2.03	C
18	25726	6/6/91	09:04:58.1	61.5401	34.8421	2.08	C
21	35135	8/9/91	13:27:24.6	61.5370	34.7302	1.91	C
27	301378	11/6/91	09:50:37.4	61.5476	34.7635	2.05	C
30	311903	1/9/92	11:32:20.1	61.5020	34.7697	2.02	C
40	330190	6/11/92	07:25:26.3	61.5351	37.0996	2.22	C
42	332166	7/2/92	07:52:39.6	61.3288	36.8926	2.41	C
23	37695	9/3/91	11:14:05.2	60.2869	34.1479	1.76	D
35	326199	4/27/92	[illegible]49:56.7	60.1736	34.1361	1.92	D
4	13188	3/6/91	11:30:51.0	61.9286	35.7538	2.27	E
11	20040	4/26/91	11:33:40.4	61.9317	35.7285	2.36	E
17	24264	5/29/91	13:06:58.1	61.9668	35.8939	2.15	E
29	303126	1/5/92	10:06:24.6	61.9548	35.9595	1.96	E
2	42263	12/6/90	10:54:40.2	61.2230	35.0884	2.54	F
3	6026	1/5/91	14:19:45.7	61.4333	34.9744	2.34	F
12	22149	5/6/91	10:51:57.0	61.4662	35.3537	2.12	F
15	24007	5/24/91	17:33:47.0	61.5689	35.4016	2.11	F
19	32941	7/31/91	14:55:27.3	61.4705	35.1370	1.97	F
25	40455	9/18/91	14:26:20.8	61.5081	35.5072	2.03	F

Table 123: Sorted events for area 39

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
28	301684	11/15/91	12:46:47.4	61.4942	35.1291	2.40	F
31	315296	1/29/92	11:30:25.3	61.5012	35.1933	2.42	F
33	323542	3/27/92	13:32:48.0	61.4323	35.0372	2.30	F
34	325106	4/17/92	12:50:49.6	61.2848	35.5999	2.14	F
37	328411	5/20/92	12:06:07.1	61.3059	36.0699	2.32	F
41	331385	6/23/92	12:07:33.2	61.4180	35.2373	2.28	F
44	334610	7/29/92	10:31:53.1	61.1958	35.9824	2.00	F
49	344652	11/30/92	09:48:02.7	61.9587	35.2105	2.14	F
51	346352	12/25/92	10:33:46.0	61.8508	35.2156	2.20	F

Remarks:

- Events from group A, C and F are located on the West side of Onezshkoye Ozero, events from group F being located south of events from groups A and C.
- These events are identified as originating from mine HV6 in the Helsinki bulletin. The difference between the mine location and the event locations shows a clear bias in distance: the events being located to far from the array.
- Events from group E are located on the East side of the lake far from any reported mine.

Mine and event locations:

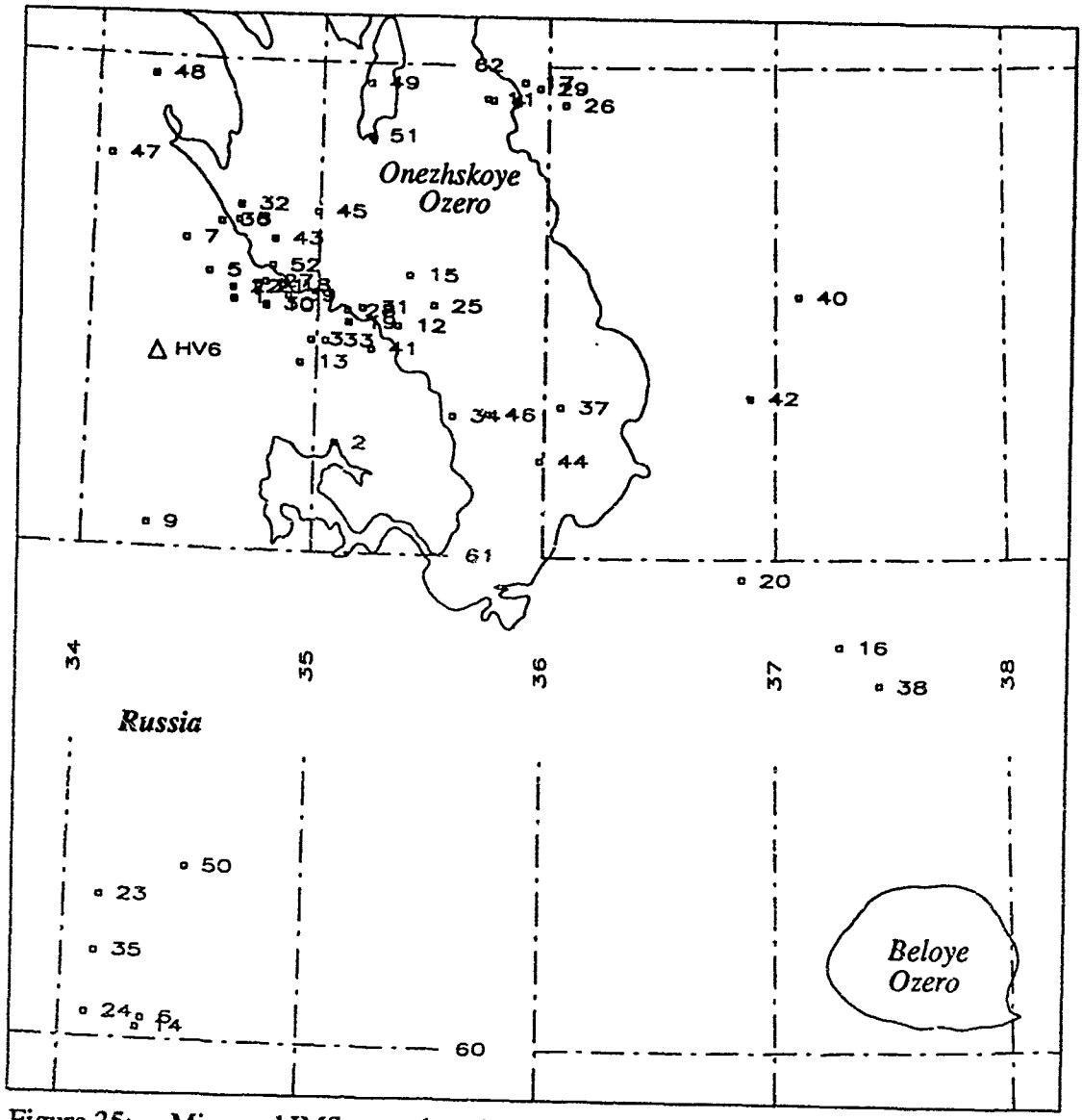

Figure 35: Mine and IMS event locations for area 39.

AREA 40

Latitude: 60 - 62°N
Longitude: 30 - 34°E
Local magnitude range: > 1.0
Number of events in IMS2: 176
Number of events within the magnitude range: 142
Number of processed events: 113
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 6 s. before *P*, 56 s. after *P*
Number of reference events: 11

Table 124: Reference events for area 40

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
1	2902	518155	633625	0.82	A
45	37101	902406	1153420	0.83	B
73	323548	1227695	1859076	0.80	C
81	329308	1286814	2115610	0.83	D
83	331311	1291195	2170948	0.85	E
26	17946	734361	578908	0.88	F
87	332488	1325832	2246134	0.79	G
6	26536	539137	623287	0.81	H
93	335191	1380107	2440183	0.80	I
38	24674	800739	871986	0.82	J
30	19816	754553	698648	0.81	K

Reported mine locations:

Table 125: Mine locations for area 40

Label	Latitude	Longitude	Origin
SC19	60.852	30.096	SPOT
HC11	61.1	30.2	old_Hels
HV2	61.1	30.3	Hels
HC14	61.4	31.6	old_Hels

Table 125: Mine locations for area 40

Label	Latitude	Longitude	Origin
HV4	61.4	31.6	Hels
HC12	61.5	30.4	old_Hels
HV3	61.5	30.4	Hels
SC14	61.604	31.283	SPOT
SC17	61.664	31.654	SPOT
SC15b	61.666	31.144	SPOT
SC15a	61.672	31.139	SPOT
SC16	61.691	31.274	SPOT
HC13	61.9	30.6	old_Hels
HV7	61.9	30.6	Hels
SC18b	61.946	30.606	SPOT
SC18a	61.952	30.575	SPOT

Number of events found in the Helsinki bulletin: 66

Table 126: Events found in the Helsinki bulletin for area 40

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
58	301670	11/15/91	10:12:15.8	1.83	60.14	30.88	-	?
67	318336	2/24/92	11:48:11.0	2.03	61.60	31.44	-	?
99	337473	8/31/92	11:07:15.7	1.41	62.26	30.37	-	?
104	339885	9/24/92	10:11:58.5	1.18	61.91	30.64	-	?
105	339899	9/24/92	12:36:18.8	1.69	60.51	29.05	-	?
3	5893	11/16/90	13:01:21.9	2.35	HV7		EXP	?
5	3304	11/22/90	10:01:18.6	1.60	HV6		EXP	?
24	16604	4/2/91	09:48:17.8	1.85	HV8		EXP	?
43	33395	8/2/91	09:19:55.5	1.94	HV2		EXP	?
48	38949	9/9/91	14:39:39.5	1.54	HV2		EXP	?
60	303285	12/22/91	09:22:31.6	1.96	HV7		EXP	?
65	315681	2/4/92	09:03:08.4	1.33	HV7		EXP	?

Table 126: Events found in the Helsinki bulletin for area 40

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
66	319396	2/21/92	10:11:32.6	1.86	HV7		EXP	?
76	325915	4/24/92	13:32:59.7	1.83	HV4		EXP	?
86	332216	7/2/92	12:39:30.7	1.58	HV2		EXP	?
1	2902	11/5/90	09:46:23.1	1.88	HV4		EXP	A
18	9011	1/25/91	13:52:35.5	1.78	61.72	31.42	-	A
28	19277	4/19/91	13:08:41.4	1.98	HV4		EXP	A
14	4850	12/26/90	08:47:56.8	1.90	HV4		EXP	B
32	20050	4/26/91	13:28:10.2	1.70	61.30	31.56	R	B
36	24880	5/31/91	12:55:56.6	2.38	61.52	31.73	-	B
41	28315	6/26/91	13:47:52.9	2.36	HV4		EXP	B
45	37101	8/26/91	15:19:58.7	1.94	HV4		EXP	B
55	41786	9/27/91	13:13:33.2	2.03	HV4		EXP	B
57	301393	11/6/91	12:58:50.6	2.18	HV4		EXP	B
61	312853	12/27/91	14:19:40.4	2.17	HV4		EXP	B
70	321811	3/20/92	13:32:39.4	2.25	61.63	31.49	-	B
13	4341	12/19/90	11:01:30.8	2.05	HV7		EXP	C
23	16667	3/29/91	13:41:28.0	2.11	HV7		EXP	C
31	19848	4/25/91	12:42:54.1	1.98	61.86	30.66	QB	C
49	39492	9/13/91	11:43:04.6	2.12	HV7		EXP	C
73	323548	3/27/92	14:27:09.4	2.14	HV7		EXP	C
79	328083	5/14/92	11:48:24.1	2.18	HV7		EXP	C
89	333593	7/17/92	09:04:57.3	1.91	61.95	30.57	-	C
101	338294	9/9/92	13:35:55.6	1.65	61.77	30.41	-	C
9	300021	12/7/90	11:13:37.6	2.40	61.68	31.36	-	D
20	14915	3/19/91	11:27:01.1	1.73	HV4		EXP	D
39	25503	6/7/91	17:47:06.3	1.69	61.64	32.01	-	D
54	41649	9/25/91	13:19:51.7	1.91	61.82	31.98	-	D
72	324880	3/26/92	12:35:54.1	2.06	HV4		EXP	D

Table 126: Events found in the Helsinki bulletin for area 40

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
81	329308	5/29/92	12:40:21.2	1.86	61.66	31.51	-	D
97	335764	8/13/92	14:43:53.1	1.30	HV4		EXP	D
7	10108	11/30/90	15:07:45.3	2.46	HV4		EXP	E
83	331311	6/15/92	12:15:20.5	2.16	HV4		EXP	E
15	7211	12/27/90	10:36:58.6	2.58	61.75	30.79	-	F
17	8998	1/25/91	12:20:30.2	2.20	61.86	30.66	-	F
22	14831	3/23/91	12:07:25.8	2.49	HV7		EXP	F
26	17946	4/13/91	11:52:34.4	2.60	61.71	30.92	-	F
56	41811	9/28/91	12:05:09.5	2.16	61.73	30.93	-	F
74	324906	4/1/92	13:16:24.4	2.26	HV7		EXP	F
78	326421	4/29/92	13:49:36.2	2.04	HV7		EXP	F
82	329355	5/30/92	09:21:36.1	2.20	HV7		EXP	F
90	334694	7/30/92	11:17:29.9	2.19	HV7		EXP	F
25	17623	4/10/91	10:10:09.0	1.26	HV7		EXP	G
27	17962	4/17/91	08:46:46.9	1.48	HV7		EXP	G
35	21895	5/13/91	08:52:24.4	1.30	HV7		EXP	G
46	37681	9/3/91	09:04:48.9	1.44	HV7		EXP	G
50	40061	9/17/91	09:48:34.1	1.21	61.89	30.77	-	G
75	323988	4/7/92	11:14:21.8	1.27	HV7		EXP	G
87	332488	7/6/92	12:40:56.4	1.13	HV7		EXP	G
2	2577	11/16/90	09:47:09.7	1.53	HV7		EXP	H
6	26536	11/30/90	09:50:21.6	1.65	HV7		EXP	H
12	4325	12/18/90	08:59:28.4	1.50	HV7		EXP	H
93	335191	8/5/92	17:05:43.6	1.59	62.27	30.27	-	I
100	338085	9/7/92	10:03:05.6	1.46	62.27	30.22	-	I
106	340145	9/25/92	10:14:48.2	1.52	62.25	30.30	-	I

Events with the most reliable classification:

Table 127: Sorted events for area 40

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
1	2902	11/5/90	09:46:23.1	61.4206	31.5463	1.88	A
18	9011	1/25/91	13:52:35.5	61.7084	30.6925	1.78	A
28	19277	4/19/91	13:08:41.4	61.6668	31.2316	1.98	A
59	302435	11/29/91	13:31:53.2	61.6705	31.2057	1.67	A
14	4850	12/26/90	08:47:56.8	61.7026	31.4193	1.90	B
32	20050	4/26/91	13:28:10.2	61.7144	31.2038	1.70	B
36	24880	5/31/91	12:55:56.6	61.6919	31.4185	2.38	B
41	28315	6/26/91	13:47:52.9	61.8417	31.0215	2.36	B
45	37101	8/26/91	15:19:58.7	61.6875	31.3852	1.94	B
55	41786	9/27/91	13:13:33.2	61.6775	31.4571	2.03	B
57	301393	11/6/91	12:58:50.6	61.5956	31.4569	2.18	B
61	312853	12/27/91	14:19:40.4	61.7685	31.1586	2.17	B
70	321811	3/20/92	13:32:39.4	61.6423	31.1856	2.25	B
92	335009	8/3/92	14:47:37.3	61.3309	32.4088	1.88	B
107	340658	10/2/92	13:38:51.6	61.5511	31.6699	2.09	B
13	4341	12/19/90	11:01:30.8	61.9988	30.3831	2.05	C
23	16667	3/29/91	13:41:28.0	61.9566	30.2798	2.11	C
31	19848	4/25/91	12:42:54.1	61.8495	30.4024	1.98	C
49	39492	9/13/91	11:43:04.6	61.9847	30.3024	2.12	C
73	323548	3/27/92	14:27:09.4	61.9738	30.2863	2.14	C
79	328083	5/14/92	11:48:24.1	61.8107	30.5116	2.18	C
89	333593	7/17/92	09:04:57.3	61.9097	30.2014	1.91	C
101	338294	9/9/92	13:35:55.6	61.9516	30.3117	1.65	C
111	345348	12/11/92	11:29:55.1	61.8819	30.3339	2.11	C
9	300021	12/7/90	11:13:37.6	61.4478	31.4259	2.40	D
20	14915	3/19/91	11:27:01.1	61.7377	30.8636	1.73	D
39	25503	6/7/91	17:47:06.3	61.4777	31.0107	1.69	D

Table 127: Sorted events for area 40

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
54	41649	9/25/91	13:19:51.7	61.8165	31.1715	1.91	D
72	324880	3/26/92	12:35:54.1	61.5620	31.3258	2.06	D
81	329308	5/29/92	12:40:21.2	61.8497	31.0239	1.86	D
97	335764	8/13/92	14:43:53.1	61.6918	30.9421	1.30	D
7	10108	11/30/90	15:07:45.3	61.6138	31.4351	2.46	E
83	331311	6/15/92	12:15:20.5	61.5868	31.2454	2.16	E
15	7211	12/27/90	10:36:58.6	61.8000	30.5897	2.58	F
17	8998	1/25/91	12:20:30.2	61.9445	30.4421	2.20	F
22	14831	3/23/91	12:07:25.8	61.8386	30.5979	2.49	F
26	17946	4/13/91	11:52:34.4	61.8100	30.6573	2.60	F
56	41811	9/28/91	12:05:09.5	61.9510	30.3265	2.16	F
74	324906	4/1/92	13:16:24.4	61.8598	30.6496	2.26	F
78	326421	4/29/92	13:49:36.2	61.6617	30.3737	2.04	F
82	329355	5/30/92	09:21:36.1	61.8016	30.5480	2.20	F
90	334694	7/30/92	11:17:29.9	61.7679	30.4744	2.19	F
110	344616	11/29/92	08:47:48.8	61.7122	31.0917	2.45	F
21	14527	3/21/91	08:08:53.9	61.8622	30.1692	1.07	G
25	17623	4/10/91	10:10:09.0	61.8760	30.3096	1.26	G
27	17962	4/17/91	08:46:46.9	61.8575	30.4523	1.48	G
35	21895	5/13/91	08:52:24.4	61.6858	30.3469	1.30	G
42	31633	7/26/91	11:58:14.4	61.7089	30.3440	1.09	G
46	37681	9/3/91	09:04:48.9	61.7007	30.3042	1.44	G
50	40061	9/17/91	09:48:34.1	61.7605	30.4164	1.21	G
62	313199	1/15/92	09:55:33.5	61.6292	30.4499	1.41	G
69	320350	3/12/92	09:08:08.6	61.6275	30.5375	1.45	G
71	322502	3/26/92	10:02:52.9	61.7710	30.4628	1.37	G
75	323988	4/7/92	11:14:21.8	61.6123	30.3807	1.27	G
77	326189	4/27/92	09:55:14.8	61.8337	30.5772	1.28	G

Table 127: Sorted events for area 40

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
87	332488	7/6/92	12:40:56.4	61.4625	30.4270	1.13	G
112	346807	12/21/92	10:06:42.4	61.7397	30.3775	1.11	G
2	2577	11/16/90	09:47:09.7	61.6811	30.5572	1.53	H
6	26536	11/30/90	09:50:21.6	61.9257	30.5018	1.65	H
12	4325	12/18/90	08:59:28.4	61.8840	30.4305	1.50	H
16	7420	1/21/91	10:00:47.4	61.7782	30.3760	1.68	H
108	341978	10/23/92	09:53:24.2	61.7753	30.3595	1.13	H
34	21467	5/10/91	07:10:03.8	61.9125	30.3869	1.45	I
93	335191	8/5/92	17:05:43.6	61.9750	30.2042	1.59	I
100	338085	9/7/92	10:03:05.6	61.9941	30.2170	1.46	I
106	340145	9/25/92	10:14:48.2	61.9756	30.3747	1.52	I
38	24674	6/1/91	13:41:11.0	60.8217	30.5311	1.34	J
102	338727	9/13/92	14:28:47.8	60.7252	30.4375	1.14	J
19	14367	3/13/91	10:11:55.9	61.8843	31.0453	1.09	K
30	19816	4/25/91	09:38:11.9	61.5369	30.8114	1.31	K
68	322252	3/10/92	10:30:01.8	61.6459	31.0231	1.24	K

Remarks:

- Events from groups A, B, D and E are identified as originating from mine HV4 in the Helsinki bulletin, and events from groups C, F, G and H from mine HV7.
- The locations of these events are tight are mostly surrounding mine HV7.
- Two mines were located on SPOT photos in the vicinity of mine HV7 while no mines located close to mine HV4 were found on SPOT photos.

Mine and event locations:

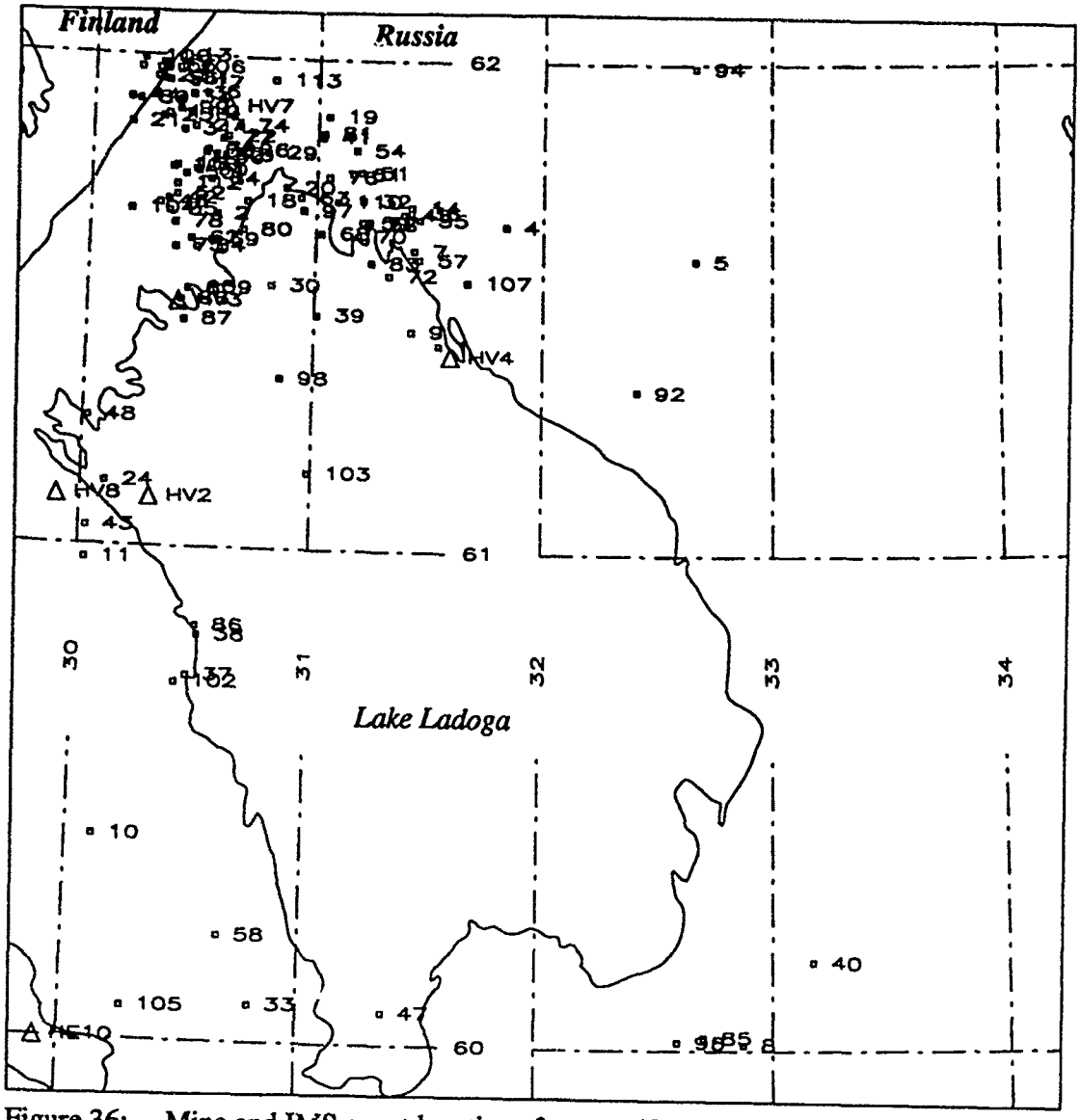

Figure 36: Mine and IMS event locations for area 40.

AREA 41

Latitude: 60 - 62°N
Longitude: 28 - 30°E
Local magnitude range: > 2.0
Number of events in IMS2: 620
Number of events within the magnitude range: 168
Number of processed events: 124
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 5 s. before *P*, 45 s. after *P*
Number of reference events: 17

Table 128: Reference events for area 41

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
2	3256	533060	477286	0.82	A
107	337963	1412722	2608665	0.86	B
78	320892	1195166	1752426	0.86	C
59	301688	1006238	1412392	0.83	D
111	337670	1422775	2637609	0.92	E
86	323143	1228691	1874016	0.94	F
121	344673	1522640	2869074	0.90	G
19	13741	702220	468787	0.90	H
82	321840	1215144	1807971	0.89	I
8	4867	564791	449045	0.84	J
36	23894	791945	800130	0.89	K
31	19735	753171	660646	0.89	L
35	22201	771792	749703	0.97	M
113	340382	1458799	2724966	0.90	N
24	16794	724962	551140	0.88	O
97	329554	1287663	2127532	0.89	P
45	27875	823356	925350	0.77	Q

Reported mine locations:

Table 129: Mine locations for area 41

Label	Latitude	Longitude	Origin
HB15	60.0	29.9	old_Hels
SB15	60.019	29.742	SPOT
HE10A	60.02	29.74	Hels
SC3b	60.581	29.064	SPOT
SC3a	60.599	29.073	SPOT
HC3	60.6	29.2	old_Hels
HV11	60.6	29.2	Hels
SC2	60.699	29.178	SPOT
HC1	60.7	28.7	old_Hels
HC2	60.7	29.0	old_Hels
HV12	60.7	28.7	Hels
HV5	60.7	29.0	Hels
SC1a	60.747	28.836	SPOT
SC1c	60.749	28.854	SPOT
SC1b	60.753	28.846	SPOT
HC4	60.8	29.3	old_Hels
HC7	60.8	29.5	old_Hels
HV13	60.8	29.5	Hels
HV1B	60.8	29.3	Hels
SC0	60.816	28.711	SPOT
SC4c	60.843	28.989	SPOT
SC4b	60.849	28.979	SPOT
SC4a	60.851	28.99[illegible]	SPOT
HC5	60.9	29.3	old_Hels
HC6	60.9	29.4	old_Hels
HV1A	60.9	29.4	Hels
HV1C	60.9	29.3	Hels

Table 129: Mine locations for area 41

Label	Latitude	Longitude	Origin
H?1	60.90	29.35	new_Hels
H?2	60.95	29.18	new_Hels
SC6	60.951	29.175	SPOT
SC7	60.961	29.312	SPOT
SC8	60.969	28.880	SPOT
SC9	60.974	29.054	SPOT
SC10	60.985	29.275	SPOT
SC5b	60.999	29.026	SPOT
SC5c	61.005	29.043	SPOT
SC5a	61.008	29.016	SPOT
HV1	61.01	29.04	Hels
N114	61.03	28.18	Norw
HV8	61.1	29.9	Hels
HV8	61.14	29.87	new_Hel
SC11c	61.120	29.902	SPOT
SC11b	61.132	29.823	SPOT
SC11a	61.133	29.845	SPOT
N103	61.18	28.04	Norw
SC12d	61.199	29.727	SPOT
SC12c	61.201	29.731	SPOT
SC12b	61.204	29.727	SPOT
SC12a	61.208	29.727	SPOT
SC13	61.270	29.804	SPOT
HM27	61.94	29.03	Hels
N117	61.94	29.03	Norw

Number of events found in the Helsinki bulletin: 113

Table 130: Events found in the Helsinki bulletin for area 41

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
6	5225	12/22/90	16:48:33.8	2.05	HV1C		EXP	?
13	9426	1/30/91	12:57:46.4	2.01	HV12		EXP	?
56	301026	11/1/91	12:48:25.6	2.36	H?1		EXP	?
60	301968	11/22/91	09:57:20.9	2.00	HV1B		EXP	?
61	302127	11/23/91	13:26:34.1	2.01	H?1		EXP	?
66	303553	12/25/91	13:19:34.0	2.17	H?1		EXP	?
70	313222	1/30/92	09:54:02.4	2.26	HV5		EXP	?
71	315424	1/27/92	13:59:39.5	2.24	HV1B		EXP	?
73	315670	2/3/92	13:54:44.6	2.41	H?2		EXP	?
74	317867	2/8/92	13:58:06.9	2.43	H?1		EXP	?
75	317818	2/20/92	12:30:55.2	2.02	H?1		EXP	?
89	324817	4/15/92	11:59:14.4	2.03	H?1		EXP	?
2	3256	11/22/90	11:37:09.6	2.06	HV8		EXP	A
12	5880	1/4/91	11:02:13.8	2.00	HV8		EXP	A
29	19276	4/19/91	12:58:08.5	2.03	HV8		EXP	A
53	41654	9/25/91	14:30:53.4	2.08	61.01	29.88	-	B
107	337963	8/26/92	11:28:27.0	2.41	60.96	30.27	-	B
58	301517	11/14/91	09:21:49.3	2.06	HV8		EXP	C
63	302707	12/12/91	14:27:34.6	2.16	HV8		EXP	C
68	303570	12/26/91	09:59:34.5	2.33	HV8		EXP	C
78	320892	2/28/92	08:37:42.1	2.25	HV2		EXP	C
87	326566	4/9/92	08:38:04.4	2.27	HV8		EXP	C
90	324820	4/15/92	12:16:52.8	2.39	HV2		EXP	C
109	337234	8/28/92	08:27:27.3	2.06	61.05	29.91	-	C
34	19471	4/26/91	12:13:14.8	2.09	60.99	29.03	QB	D
59	301688	11/15/91	13:19:28.5	2.10	60.97	29.03	-	D
77	320712	2/27/92	12:00:31.5	2.09	HV1		EXP	D

Table 130: Events found in the Helsinki bulletin for area 41

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
104	334782	7/31/92	08:51:45.5	2.03	HV1		EXP	D
112	340380	9/29/92	12:20:16.0	2.24	60.87	29.16	-	D
16	11149	12/14/90	11:52:04.7	2.22	HC6		EXP	E
37	23990	5/24/91	12:01:59.9	2.17	60.91	29.03	-	E
62	302423	11/29/91	13:03:10.2	2.23	H?1		EXP	E
84	324148	3/25/92	12:30:12.2	2.19	H?1		EXP	E
95	328399	5/20/92	11:17:06.0	2.06	HV1B		EXP	E
111	337670	9/2/92	13:27:08.5	2.19	60.89	29.11	-	E
17	13468	3/7/91	11:11:24.1	2.30	HV5		EXP	F
86	323143	3/31/92	09:52:50.9	2.43	HV1B		EXP	F
3	10045	11/29/90	12:29:10.6	2.71	H?1		EXP	G
5	10178	12/17/90	12:51:58.1	2.06	HV1B		EXP	G
27	17635	4/11/91	13:21:38.0	2.18	HV1C		EXP	G
46	30849	7/17/91	12:57:56.6	2.25	HV1B		EXP	G
49	36738	8/28/91	15:32:26.2	2.14	HC6		EXP	G
64	303101	12/19/91	12:59:34.3	2.26	H?2		EXP	G
80	322269	3/10/92	15:25:51.6	2.04	H?1		EXP	G
92	325583	4/23/92	13:00:02.2	2.09	H?1		EXP	G
100	331718	6/26/92	14:00:31.0	2.16	H?2		EXP	G
11	7114	12/28/90	12:27:33.9	2.15	HV1C		EXP	H
19	13741	3/11/91	12:29:44.7	2.17	60.95	29.03	-	H
30	19727	4/24/91	12:07:05.1	2.32	60.96	29.30	QB	H
33	19840	4/25/91	12:10:26.6	2.24	61.00	29.17	QB	H
88	326816	4/9/92	12:36:33.0	2.20	HV1		EXP	H
15	322084	1/31/91	12:38:45.7	2.14	60.93	29.12	-	I
22	15981	3/28/91	14:49:15.2	2.38	HC6		EXP	I
39	26851	5/31/91	13:55:23.2	2.18	60.89	29.12	-	I
42	28303	6/26/91	12:31:59.3	2.24	HV1C		EXP	I

Table 130: Events found in the Helsinki bulletin for area 41

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
47	31450	7/23/91	13:44:57.8	2.26	60.96	29.13	-	I
54	41789	9/27/91	13:24:24.4	2.36	HV1C		EXP	I
57	301162	11/1/91	13:28:28.0	2.26	HV1B		EXP	I
7	7266	12/25/90	12:28:48.0	2.18	HV1C		EXP	I
72	313652	1/30/92	12:27:04.0	2.39	HV1		EXP	I
82	321840	3/14/92	08:58:43.2	2.23	HV1B		EXP	I
83	324240	3/19/92	12:28:28.8	2.10	60.92	29.11	-	I
94	326394	4/29/92	11:58:49.8	2.27	HV1B		EXP	I
99	331007	6/18/92	12:13:27.4	2.31	HV1B		EXP	I
106	335746	8/13/92	11:59:48.4	2.25	HV1B		EXP	I
110	337477	8/31/92	11:58:02.6	2.18	60.90	29.04	-	I
8	4867	12/26/90	10:07:27.5	2.29	60.83	29.21	-	J
20	15111	3/20/91	11:59:50.9	2.10	HV13		EXP	J
28	18618	4/17/91	09:48:31.6	2.12	HC6		EXP	J
41	28299	6/26/91	12:04:19.3	2.07	HC6		EXP	J
36	23894	5/23/91	13:03:17.9	2.23	60.90	29.17	-	K
51	41060	9/19/91	12:58:04.4	2.34	HV1B		EXP	K
81	322321	3/13/92	13:15:40.8	2.48	HV1B		EXP	K
103	333547	7/16/92	17:36:25.8	2.31	HV1B		EXP	K
108	337139	8/27/92	10:05:00.5	2.22	60.88	29.26	-	K
114	340752	9/30/92	10:52:15.5	2.14	60.85	29.30	-	K
4	42281	12/6/90	14:22:38.6	2.39	60.89	29.09	-	L
10	7231	12/27/90	12:30:36.0	2.28	HV1B		EXP	L
14	9428	1/30/91	12:59:33.1	2.28	60.89	29.11	-	L
18	13503	3/7/91	12:37:41.0	2.21	HC6		EXP	L
25	16846	4/3/91	12:25:23.0	2.07	60.91	29.16	-	L
26	16842	4/5/91	12:54:23.1	2.21	60.90	29.07	-	L
31	19735	4/24/91	13:10:52.4	2.38	60.90	29.21	QB	L

Table 130: Events found in the Helsinki bulletin for area 41

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
43	27868	6/27/91	13:08:04.0	2.44	HC6		EXP	L
52	41648	9/25/91	13:13:47.5	2.31	HV1B		EXP	L
67	303555	12/25/91	14:25:59.8	2.23	HV1B		EXP	L
69	312781	1/14/92	13:59:45.5	2.40	H?2		EXP	L
76	320310	2/26/92	12:45:24.0	2.20	H?2		EXP	L
85	324150	3/25/92	13:58:55.3	2.13	H?1		EXP	L
91	325118	4/17/92	16:04:14.4	2.29	H?2		EXP	L
98	329766	6/4/92	11:21:22.4	2.09	H?2		EXP	L
102	332337	7/3/92	12:19:07.2	2.34	HV13		EXP	L
35	22201	5/6/91	16:07:33.9	2.08	60.48	29.19	-	M
50	39512	9/13/91	15:18:41.4	2.05	HC6		EXP	M
1	2916	11/5/90	12:00:20.9	2.20	HV5		EXP	N
9	314533	12/26/90	11:32:32.3	2.23	HV5		EXP	N
32	19820	4/25/91	10:42:59.8	2.07	60.66	29.07	QB	N
93	325902	4/24/92	11:24:35.6	2.00	HV5		EXP	N
96	329217	5/28/92	12:07:08.5	2.33	60.70	28.89	-	N
101	332004	6/30/92	10:31:48.3	2.06	HV5		EXP	N
113	340382	9/29/92	13:37:29.3	2.22	60.69	28.91	-	N
24	16794	4/2/91	14:14:25.9	2.13	HV11		EXP	O
38	24173	5/28/91	16:13:44.5	2.09	60.51	29.09	-	O
48	33208	8/1/91	14:33:17.6	2.33	HV11		EXP	O
23	16666	3/29/91	13:38:51.1	2.42	HV1C		EXP	P
55	300380	10/17/91	14:14:40.5	2.35	HV1C		EXP	P
65	303482	1/4/92	13:28:08.6	2.44	HV1		EXP	P
79	320007	3/5/92	13:25:59.6	2.30	HV1B		EXP	P
97	329554	6/2/92	11:05:27.7	2.13	HV1		EXP	P
105	335546	8/11/92	08:14:00.1	2.21	H?2		EXP	P
40	25822	6/7/91	05:39:35.6	2.37	60.09	29.70	-	Q

Table 130: Events found in the Helsinki bulletin for area 41

Event #	IMS orid	IMS origin time		IMS ml	HEL location	HEL label	Group
44	27876	6/27/91	15:22:30.8	2.47	HB15	EXP	Q
45	27875	6/27/91	15:22:46.2	2.41	HB15	EXP	Q

Events with the most reliable classification:

Table 131: Sorted events for area 41

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
2	3256	11/22/90	11:37:09.6	61.2444	29.9481	2.06	A
12	5880	1/4/91	11:02:13.8	60.9972	29.8384	2.00	A
29	19276	4/19/91	12:58:08.5	61.1662	29.8519	2.03	A
53	41654	9/25/91	14:30:53.4	61.1160	29.8721	2.08	B
107	337963	8/26/92	11:28:27.0	61.1624	29.9036	2.41	B
116	340972	10/8/92	09:00:12.1	61.0904	29.6115	2.17	B
21	15937	3/25/91	09:23:50.6	61.2111	29.7828	2.12	C
58	301517	11/14/91	09:21:49.3	61.1913	29.7234	2.06	C
63	302707	12/12/91	14:27:34.6	61.2929	29.6193	2.16	C
68	303570	12/26/91	09:59:34.5	61.1700	29.8476	2.33	C
78	320892	2/28/92	08:37:42.1	61.1425	29.7457	2.25	C
87	326566	4/9/92	08:38:04.4	61.0833	29.7222	2.27	C
90	324820	4/15/92	12:16:52.8	61.0987	29.6843	2.39	C
109	337234	8/28/92	08:27:27.3	61.3923	29.6666	2.06	C
115	340913	10/7/92	08:33:12.7	61.0975	29.5950	2.15	C
118	342460	10/30/92	09:29:35.0	61.1769	29.5981	2.18	C
34	19471	4/26/91	12:13:14.8	61.0163	28.9885	2.09	D
59	301688	11/15/91	13:19:28.5	60.7901	29.0768	2.10	D
77	320712	2/27/92	12:00:31.5	60.6265	29.2609	2.09	D
104	334782	7/31/92	08:51:45.5	60.7977	28.7579	2.03	D
112	340380	9/29/92	12:20:16.0	60.9282	28.8799	2.24	D
16	11149	12/14/90	11:52:04.7	61.1143	29.1495	2.22	E

Table 131: Sorted events for area 41

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
37	23990	5/24/91	12:01:59.9	60.8010	28.9650	2.17	E
62	302423	11/29/91	13:03:10.2	60.8295	29.0339	2.23	E
84	324148	3/25/92	12:30:12.2	60.9235	29.0555	2.19	E
95	328399	5/20/92	11:17:06.0	60.6261	28.9167	2.06	E
111	337670	9/2/92	13:27:08.5	60.8694	28.9657	2.19	E
17	13468	3/7/91	11:11:24.1	60.6367	28.7195	2.30	F
86	323143	3/31/92	09:52:50.9	60.6848	28.8267	2.43	F
3	10045	11/29/90	12:29:10.6	60.9135	29.1308	2.71	G
5	10178	12/17/90	12:51:58.1	60.7626	29.0893	2.06	G
27	17635	4/11/91	13:21:38.0	60.9333	28.9391	2.18	G
46	30849	7/17/91	12:57:56.6	60.8532	29.1580	2.25	G
49	36738	8/28/91	15:32:26.2	60.8771	28.9491	2.14	G
64	303101	12/19/91	12:59:34.3	60.7879	28.8513	2.26	G
80	322269	3/10/92	15:25:51.6	60.9024	29.0363	2.04	G
92	325583	4/23/92	13:00:02.2	60.8059	28.9224	2.09	G
100	331718	6/26/92	14:00:31.0	60.8495	28.9236	2.16	G
117	342332	10/28/92	14:08:19.8	60.8168	28.7854	2.11	G
121	344673	11/30/92	13:26:19.5	60.9453	28.9512	2.14	G
11	7114	12/28/90	12:27:33.9	60.9510	29.1047	2.15	H
19	13741	3/11/91	12:29:44.7	60.9057	29.0184	2.17	H
30	19727	4/24/91	12:07:05.1	60.9774	29.0764	2.32	H
33	19840	4/25/91	12:10:26.6	60.8911	29.1350	2.24	H
88	326816	4/9/92	12:36:33.0	60.7839	29.0073	2.20	H
7	7266	12/25/90	12:28:48.0	60.7757	29.0775	2.18	I
15	322084	1/31/91	12:38:45.7	60.5679	29.5727	2.14	I
22	15981	3/28/91	14:49:15.2	60.8964	28.9630	2.38	I
39	26851	5/31/91	13:55:23.2	61.0296	29.1136	2.18	I
42	28303	6/26/91	12:31:59.3	60.9296	29.0053	2.24	I

Table 131: Sorted events for area 41

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
47	31450	7/23/91	13:44:57.8	60.8522	29.0181	2.26	I
54	41789	9/27/91	13:24:24.4	60.8023	29.0225	2.36	I
57	301162	11/1/91	13:28:28.0	60.8421	29.0986	2.26	I
72	313652	1/30/92	12:27:04.0	60.8641	29.0772	2.39	I
82	321840	3/14/92	08:58:43.2	60.8112	29.0642	2.23	I
83	324240	3/19/92	12:28:28.8	60.7969	28.8618	2.10	I
94	326394	4/29/92	11:58:49.8	60.9113	28.8979	2.27	I
99	331007	6/18/92	12:13:27.4	60.4223	29.6311	2.31	I
106	335746	8/13/92	11:59:48.4	60.8868	28.8609	2.25	I
110	337477	8/31/92	11:58:02.6	60.8027	29.0352	2.18	I
123	346296	12/24/92	12:31:11.1	61.0709	28.4513	2.09	I
8	4867	12/26/90	10:07:27.5	60.8304	29.3120	2.29	J
20	15111	3/20/91	11:59:50.9	60.9640	29.1867	2.10	J
28	18618	4/17/91	09:48:31.6	60.9743	29.1737	2.12	J
41	28299	6/26/91	12:04:19.3	60.8990	29.1658	2.07	J
36	23894	5/23/91	13:03:17.9	60.8876	29.2229	2.23	K
51	41060	9/19/91	12:58:04.4	60.8889	29.2465	2.34	K
81	322321	3/13/92	13:15:40.8	60.8646	29.2043	2.48	K
103	333547	7/16/92	17:36:25.8	60.8354	29.1047	2.31	K
108	337139	8/27/92	10:05:00.5	60.9454	29.0562	2.22	K
114	340752	9/30/92	10:52:15.5	60.8530	29.1460	2.14	K
4	42281	12/6/90	14:22:38.6	60.8663	29.1896	2.39	L
10	7231	12/27/90	12:30:36.0	60.8285	29.2287	2.28	L
14	9428	1/30/91	12:59:33.1	60.8543	29.1522	2.28	L
18	13503	3/7/91	12:37:41.0	60.7843	29.2368	2.21	L
25	16846	4/3/91	12:25:23.0	60.9399	29.1064	2.07	L
26	16842	4/5/91	12:54:23.1	60.9089	29.1254	2.21	L
31	19735	4/24/91	13:10:52.4	60.8370	29.0447	2.38	L

Table 131: Sorted events for area 41

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
43	27868	6/27/91	13:08:04.0	60.8655	29.1162	2.44	L
52	41648	9/25/91	13:13:47.5	60.7717	29.1907	2.31	L
67	303555	12/25/91	14:25:59.8	60.8111	29.2945	2.23	L
69	312781	1/14/92	13:59:45.5	60.8370	29.1531	2.40	L
76	320310	2/26/92	12:45:24.0	60.8561	29.0856	2.20	L
85	324150	3/25/92	13:58:55.3	60.9381	29.0615	2.13	L
91	325118	4/17/92	16:04:14.4	60.8865	29.0724	2.29	L
98	329766	6/4/92	11:21:22.4	61.0758	28.3872	2.09	L
102	332337	7/3/92	12:19:07.2	60.8702	28.9692	2.34	L
120	344301	11/25/92	15:08:53.3	61.0735	28.5034	2.16	L
124	346750	12/30/92	11:32:04.2	60.9339	29.0409	2.39	L
35	22201	5/6/91	16:07:33.9	60.5477	29.3998	2.08	M
50	39512	9/13/91	15:18:41.4	60.6124	28.9164	2.05	M
1	2916	11/5/90	12:00:20.9	60.8538	29.0465	2.20	N
9	314533	12/26/90	11:32:32.3	60.7601	28.6782	2.23	N
32	[illegible]820	4/25/91	10:42:59.8	60.7521	29.0299	2.07	N
93	[illegible]5902	4/24/92	11:24:35.6	60.6874	28.5146	2.00	N
96	329217	5/28/92	12:07:08.5	60.7775	28.8683	2.33	N
101	332004	6/30/92	10:31:48.3	60.2899	29.4760	2.06	N
113	340382	9/29/92	13:37:29.3	60.4335	29.3984	2.22	N
24	16794	4/2/91	14:14:25.9	60.6363	28.9503	2.13	O
38	24173	5/28/91	16:13:44.5	60.5304	29.2477	2.09	O
48	33208	8/1/91	14:33:17.6	60.5199	29.2327	2.33	O
23	16666	3/29/91	13:38:51.1	60.9737	28.8593	2.42	P
55	300380	10/17/91	14:14:40.5	60.9486	29.0505	2.35	P
65	303482	1/4/92	13:28:08.6	60.8264	29.1430	2.44	P
79	320007	3/5/92	13:25:59.6	60.7996	28.9934	2.30	P
97	329554	6/2/92	11:05:27.7	60.8772	28.9008	2.13	P

Table 131: Sorted events for area 41

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
105	335546	8/11/92	08:14:00.1	60.8114	28.9642	2.21	P
119	343302	11/12/92	13:01:18.7	60.8151	28.7838	2.08	P
40	25822	6/7/91	05:39:35.6	60.0576	29.5913	2.37	Q
44	27876	6/27/91	15:22:30.8	60.0954	29.6124	2.47	Q
45	27875	6/27/91	15:22:46.2	60.0848	29.9720	2.41	Q

Remarks:

- Most of the event locations are concentrated in a 50x50 km area in the center of the map (Figure 37).
- Several mines have been reported that are only a few kilometers apart. The Helsinki identification of the events does not always correspond to the event grouping probably because of the too small distances between mines.

Mine and event locations:

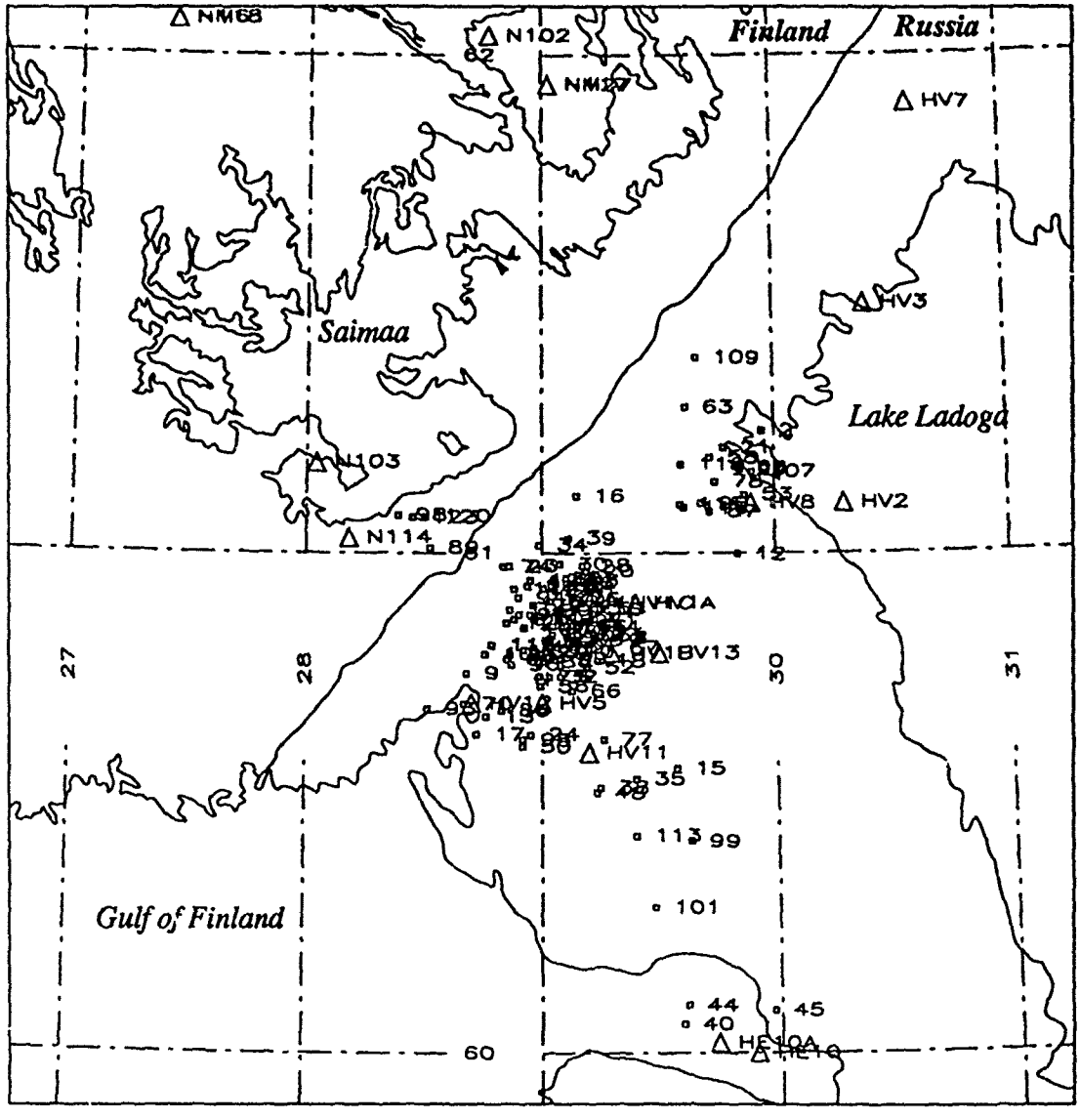

Figure 37: Mine and IMS event locations for area 41.

AREA 42

Latitude: 60 - 62°N
Longitude: 26 - 28°E
Local magnitude range: > 1.0
Number of events in IMS2: 382
Number of events within the magnitude range: 116
Number of processed events: 90
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 4 s. before *P*, 34 s. after *P*
Number of reference events: 16

Table 132: Reference events for area 42

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
59	325021	1233769	1954872	0.8	A
14	9000	596768	408971	0.89	B
48	322636	1227522	1858716	0.97	C
36	313097	1033121	1633348	0.88	D
61	325498	1235296	1975881	0.91	E
79	335261	1380331	2442667	0.88	F
69	331722	1323280	2207461	0.92	G
5	3271	533217	477550	0.93	H
32	300273	1000771	1301384	0.93	I
19	18604	738861	583537	0.92	J
66	329583	1287762	2128252	0.91	K
72	333426	1330530	2282458	0.95	L
71	332131	1324690	2227519	0.96	M
40	320890	1214300	1797630	0.95	N
51	322731	1227859	1852820	0.94	O
1	2003	524053	589666	0.87	P

Reported mine locations: None

Number of events found in the Helsinki bulletin: 23

Table X33: Events found in the Helsinki bulletin for area 42

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
15	9461	1/28/91	07:16:29.9	1.61	60.40	26.49	-	?
17	13756	3/11/91	14:31:56.4	1.75	61.76	26.46	-	?
20	18637	4/17/91	12:39:17.9	1.42	60.45	25.98	-	?
21	19854	4/25/91	13:30:55.1	1.08	60.46	25.92	LB	?
25	24170	5/28/91	14:31:39.4	1.17	60.60	27.05	-	?
29	36714	8/28/91	11:12:18.4	1.16	60.75	26.90	-	?
43	321411	3/19/92	15:04:52.2	1.47	62.03	26.59	-	?
44	324273	3/19/92	16:21:32.2	1.60	61.62	27.61	-	?
68	331364	6/23/92	08:55:25.5	1.06	60.51	26.04	-	?
60	325497	4/22/92	15:22:57.9	1.06	60.54	26.99	-	A
55	323427	4/2/92	08:56:28.8	1.49	61.62	27.62	-	C
37	313656	1/16/92	11:05:03.2	1.28	60.79	27.00	-	D
61	325498	4/22/92	15:26:39.2	1.35	60.57	26.92	-	E
74	333982	7/21/92	15:47:45.6	1.26	60.57	26.91	-	F
75	334446	7/27/92	13:51:41.5	1.19	60.55	26.97	-	F
67	330364	6/12/92	12:16:45.9	1.70	60.42	27.05	-	G
70	332127	7/1/92	14:37:22.0	1.34	60.56	27.04	-	G
32	300273	10/16/91	11:35:54.3	1.64	60.73	26.89	-	I
77	334776	7/31/92	08:07:32.0	1.41	60.59	26.95	-	I
82	336074	8/17/92	11:35:39.9	1.51	60.63	26.90	-	I
19	18604	4/16/91	12:54:52.2	2.19	HV5		EXP	J
83	336934	8/25/92	11:53:17.6	2.13	60.73	28.89	-	J
18	17302	4/8/91	09:52:30.0	1.87	61.02	26.63	-	K

Events with the most reliable classification:

Table 134: Sorted events for area 42

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
39	321655	3/6/92	11:30:59.0	60.1174	27.2437	1.01	A
59	325021	4/16/92	10:40:17.7	60.6011	26.9224	1.14	A
60	325497	4/22/92	15:22:57.9	60.1026	27.1291	1.06	A
14	9000	1/25/91	12:44:30.4	60.8105	26.9660	1.08	B
16	9380	1/29/91	12:29:10.2	60.7967	27.0460	1.05	B
48	322636	3/27/92	10:27:50.7	61.6304	27.4953	1.22	C
55	323427	4/2/92	08:56:28.8	61.5967	27.7043	1.49	C
36	313097	1/13/92	11:32:42.5	60.7615	26.9150	1.06	D
37	313656	1/16/92	11:05:03.2	60.7548	26.8707	1.28	D
61	325498	4/22/92	15:26:39.2	60.1854	27.3282	1.35	E
62	325907	4/24/92	12:06:51.9	60.5576	26.7975	1.04	E
49	323190	3/27/92	12:46:41.3	60.5563	26.9120	1.24	F
57	324004	4/7/92	12:48:00.2	60.5722	26.9350	1.08	F
63	326432	4/29/92	16:16:38.6	60.0943	27.2771	1.19	F
64	328593	5/21/92	17:33:03.4	60.5754	26.9238	1.29	F
74	333982	7/21/92	15:47:45.6	60.4991	27.0088	1.26	F
75	334446	7/27/92	13:51:41.5	60.5533	26.9838	1.19	F
79	335261	8/6/92	15:18:13.4	60.0741	27.2966	1.31	F
86	345158	12/8/92	12:42:29.3	60.6100	26.9247	1.12	F
26	25684	6/5/91	13:24:34.9	60.4722	27.0206	1.45	G
47	323583	3/24/92	16:10:45.9	60.1425	27.1262	1.17	G
65	329552	6/2/92	11:03:54.6	60.5549	26.8815	1.04	G
67	330364	6/12/92	12:16:45.9	60.6005	26.8882	1.70	G
69	331722	6/26/92	15:07:27.9	60.3460	27.1917	1.11	G
70	332127	7/1/92	14:37:22.0	60.5143	26.8538	1.34	G
3	2767	11/19/90	14:25:45.9	60.5323	26.9616	1.20	H
5	3271	11/22/90	14:13:45.1	60.5138	26.9226	1.07	H

Table 134: Sorted events for area 42

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
9	4654	12/19/90	14:13:29.6	60.1005	27.3443	1.25	H
10	5635	1/2/91	14:15:37.5	60.0920	27.4385	1.41	H
11	5857	1/3/91	14:21:03.2	60.4497	27.0367	1.16	H
12	6326	1/8/91	12:12:35.0	60.4643	27.0467	1.18	H
32	300273	10/16/91	11:35:54.3	60.6002	26.7768	1.64	I
33	301424	11/7/91	11:54:24.5	60.6156	26.8124	1.53	I
73	333522	7/16/92	10:56:30.6	60.4207	26.9298	1.48	I
77	334776	7/31/92	08:07:32.0	60.5721	26.8766	1.41	I
82	336074	8/17/92	11:35:39.9	60.7102	26.8294	1.51	I
19	18604	4/16/91	12:54:52.2	60.9441	27.9205	2.19	J
83	336934	8/25/92	11:53:17.6	60.8756	27.9251	2.13	J
18	17302	4/8/91	09:52:30.0	60.8701	26.8332	1.87	K
54	323135	3/31/92	07:20:09.7	60.8825	26.7110	1.40	K
56	323840	4/6/92	04:48:20.5	60.8939	26.7189	1.39	K
66	329583	6/2/92	14:47:38.1	60.9224	26.6657	1.16	K
72	333426	7/15/92	13:49:00.8	60.3459	26.9785	1.25	L
81	335670	8/12/92	13:42:45.9	60.4254	26.8914	1.37	L
71	332131	7/1/92	14:50:46.0	60.9870	26.5030	1.43	M
76	334650	7/29/92	15:34:13.7	60.8275	26.6246	1.22	M
40	320890	3/12/92	09:44:03.1	60.8998	27.1266	1.60	N
88	345720	12/17/92	12:28:33.4	61.1257	26.9861	1.87	N
51	322731	3/28/92	09:20:19.6	60.6595	27.1516	1.27	O
52	322734	3/28/92	10:46:32.6	60.6914	27.1531	1.16	O
1	2003	11/13/90	13:58:23.4	61.1691	26.0308	1.35	P
4	2848	11/20/90	13:12:51.6	61.1625	26.0266	1.04	P
8	3652	12/13/90	14:32:31.3	61.1689	26.0357	1.07	P

Remarks:

- Despite the large number of events located in this area, no mine locations are available. The Helsinki bulletin did not report any of these events as originating from a particular mine.
- A cluster of events is seen in the center of the map (Figure 38) on the coast of the Gulf of Finland. Several events are located off-shore.

Mine and event locations:

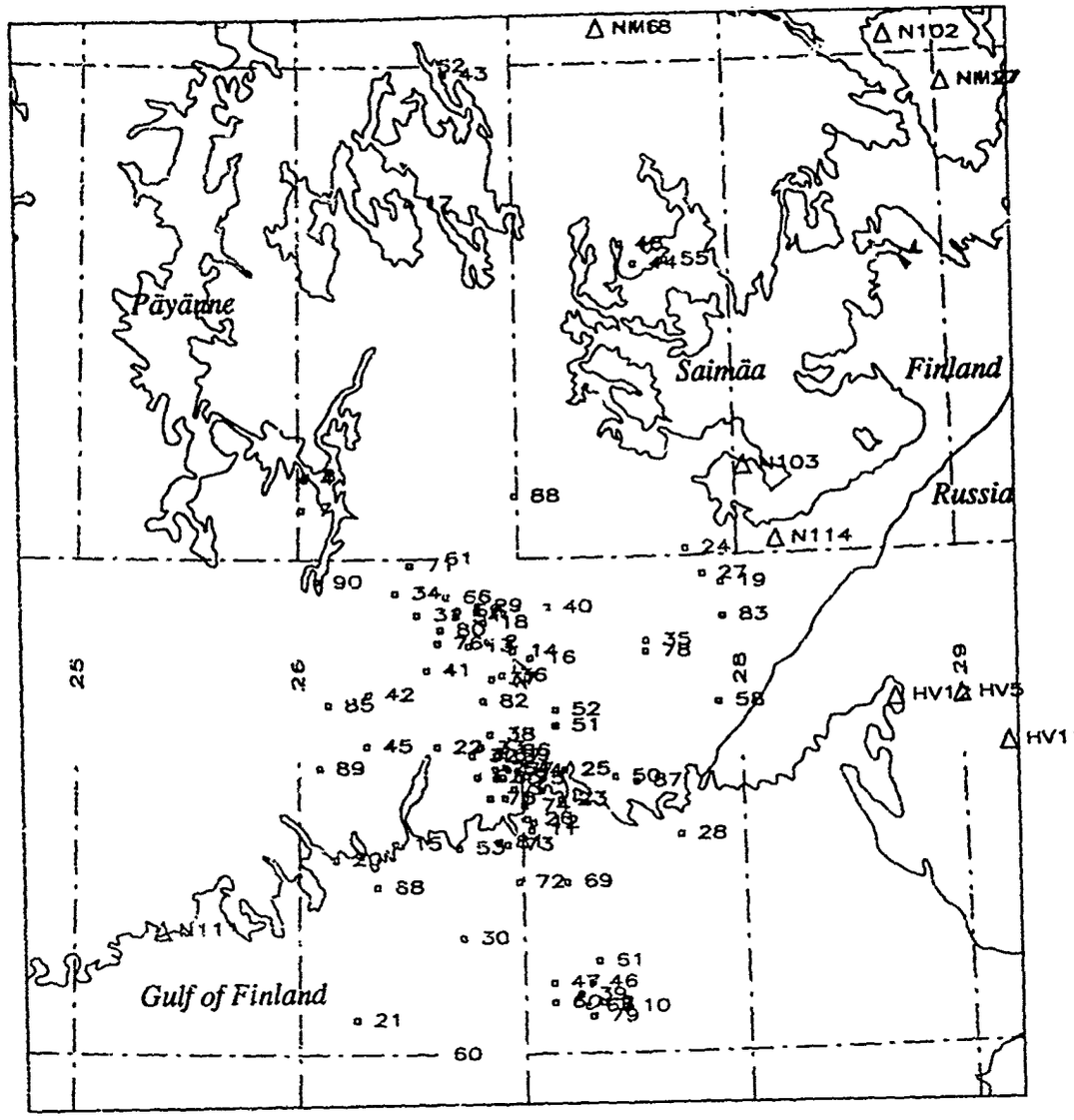

Figure 38: IMS event locations for area 42.

AREA 43

Latitude: 60 - 62°N
Longitude: 24 -26°E
Local magnitude range: > 1.3
Number of events in IMS2: 687
Number of events within the magnitude range: 109
Number of processed events: 79
Frequency range used to process the data: 1- 16 Hz
Processed signal length: 4 s. before *P*, 35 s. after *P*
Number of reference events: 13

Table 135: Reference events for area 43

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
72	338999	1430003	2659842	0.87	A
31	37026	915054	1151417	0.94	B
41	313363	1164134	1662375	0.85	C
60	329739	1288268	2136013	0.91	D
25	25868	806896	891348	0.90	E
12	14718	712919	506579	0.83	F
48	324077	1231370	1921566	0.92	G
49	324449	1232217	1936581	0.88	H
54	326614	1237739	2004240	0.90	I
7	13237	684240	430484	0.96	J
30	36898	903380	1147931	0.84	K
71	337770	1423011	2640477	0.95	L
24	25537	804627	882996	0.98	M

Reported mine locations:

Table 136: Mine locations for area 43

Label	Latitude	Longitude	Origin
N111	60.25	25.39	Norw
N112	60.27	24.07	Norw

Table 136: Mine locations for area 43

Label	Latitude	Longitude	Origin
HA5	61.6	24.2	old_Hels
old(HM26)	61.6	24.3	old_Hels
HM26	61.64	24.26	Hels

Number of events found in the Helsinki bulletin: 43

Table 137: Events found in the Helsinki bulletin for area 43

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
18	21770	5/7/91	07:25:54.1	1.34	60.11	24.27	-	?
20	22375	5/15/91	08:02:59.7	1.37	61.74	24.36	-	?
21	23957	5/23/91	19:24:54.7	1.39	61.52	24.97	EART	?
32	38193	9/5/91	13:44:37.5	1.49	60.31	25.01	-	?
38	301120	11/12/91	12:22:57.4	1.48	60.64	24.80	-	?
43	319323	2/18/92	14:04:24.4	1.66	60.33	24.93	-	?
44	317693	2/26/92	11:53:50.3	1.38	60.25	25.14	-	?
59	329558	6/2/92	11:41:22.0	1.64	60.12	25.08	-	?
65	332348	7/3/92	14:44:47.0	1.59	61.82	25.03	-	?
72	338999	9/10/92	14:09:15.3	1.39	60.23	24.55	-	A
29	34094	8/6/91	10:04:48.9	1.42	60.37	24.82	-	B
31	37026	8/29/91	10:43:09.9	1.36	60.37	24.83	-	B
39	301233	11/12/91	13:15:14.0	1.38	60.36	24.83	-	B
51	325782	4/14/92	15:08:01.7	1.38	60.33	25.02	-	C
60	329739	6/4/92	07:31:33.3	1.39	60.38	25.17	-	D
68	334441	7/27/92	12:14:25.9	1.34	60.30	25.17	-	D
70	336816	8/24/92	11:01:47.7	1.49	60.38	25.17	-	D
25	25868	6/7/91	10:34:22.1	1.49	60.09	24.48	-	E
61	329776	6/4/92	11:34:13.9	1.43	HM1		EXP	F
48	324077	4/8/92	10:36:21.2	1.32	60.32	25.01	-	G
50	324618	4/13/92	15:22:09.0	1.40	60.30	24.99	-	G

Table 137: Events found in the Helsinki bulletin for area 43

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
2	3315	11/23/90	10:44:00.9	1.67	60.33	24.95	-	H
6	12854	3/4/91	12:14:52.1	1.58	60.33	24.93	-	H
9	14362	3/13/91	09:21:37.6	1.66	60.33	24.98	-	H
13	15394	3/28/91	10:16:30.8	1.78	60.34	24.94	-	H
14	16163	4/4/91	11:10:24.3	1.64	60.32	24.94	-	H
15	18198	4/15/91	10:50:53.8	1.89	60.32	24.94	-	H
22	24852	5/31/91	11:27:37.4	1.43	60.33	24.97	-	H
40	302576	12/11/91	12:21:07.3	1.53	60.33	24.94	-	H
42	313532	1/30/92	13:47:23.8	1.69	60.33	24.93	-	H
49	324449	4/10/92	13:00:28.1	1.41	60.33	24.93	-	H
53	326417	4/29/92	14:43:59.6	1.64	60.33	24.94	-	H
56	327250	5/7/92	14:02:51.0	1.47	60.33	24.91	-	H
58	328931	5/25/92	14:05:45.5	1.30	60.33	24.93	-	H
64	331616	6/25/92	13:52:25.5	1.58	60.33	24.93	-	H
69	3355	8/10/92	15:39:25.6	1.63	60.32	24.95	-	H
54	326614	4/30/92	10:48:02.3	1.61	60.33	24.98	-	I
57	327528	5/11/92	15:01:27.2	1.55	60.30	24.88	-	I
11	15265	3/21/91	12:59:55.2	1.47	61.85	25.08	-	J
67	334094	7/22/92	16:26:41.9	1.58	61.84	25.09	-	J
30	36898	8/27/91	11:07:22.5	1.37	60.31	24.92	-	K
52	325878	4/24/92	09:34:15.5	1.44	60.32	24.99	-	K
63	331368	6/23/92	10:04:09.1	1.40	60.38	25.16	-	L
66	333313	7/14/92	11:00:03.0	1.32	60.39	25.16	-	L
71	337770	9/3/92	11:01:03.7	1.51	60.38	25.16	-	L
24	25537	6/5/91	11:26:55.4	1.65	61.64	24.75	-	M
27	32758	7/30/91	15:05:54.5	1.36	61.63	24.78	-	M

Events with the most reliable classification:

Table 138: Sorted events for area 43

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
72	338999	9/10/92	14:09:15.3	60.0367	24.0351	1.39	A
75	341264	10/13/92	13:18:36.1	60.3374	24.3400	1.52	A
29	34094	8/6/91	10:04:48.9	60.0033	24.9494	1.42	B
31	37026	8/29/91	10:43:09.9	60.3350	25.4804	1.36	B
39	301233	11/12/91	13:15:14.0	60.3414	25.3592	1.38	B
41	313363	1/27/92	11:08:14.0	60.1896	24.9601	1.34	C
51	325782	4/14/92	15:08:01.7	60.0224	24.6130	1.38	C
60	329739	6/4/92	07:31:33.3	60.3941	25.2957	1.39	D
68	334441	7/27/92	12:14:25.9	60.1580	25.3013	1.34	D
70	336816	8/24/92	11:01:47.7	60.2880	25.1368	1.49	D
78	342994	11/4/92	11:59:18.9	60.2721	25.1542	1.32	D
25	25868	6/7/91	10:34:22.1	60.1254	24.3199	1.49	E
28	32773	7/31/91	08:55:51.0	60.1240	24.1813	1.38	E
12	14718	3/22/91	11:53:52.0	60.0526	24.0030	1.36	F
61	329776	6/4/92	11:34:13.9	60.3903	24.1233	1.43	F
48	324077	4/8/92	10:36:21.2	60.1407	24.9870	1.32	G
50	324618	4/13/92	15:22:09.0	60.1411	24.9553	1.40	G
1	3127	11/20/90	11:51:05.0	60.1114	24.9959	2.00	H
2	3315	11/23/90	10:44:00.9	60.3430	25.0573	1.67	H
6	12854	3/4/91	12:14:52.1	60.3841	25.3892	1.58	H
9	14362	3/13/91	09:21:37.6	60.1310	25.0687	1.66	H
10	15215	3/21/91	10:46:18.1	60.1096	25.0099	1.87	H
13	15394	3/28/91	10:16:30.8	60.3850	25.4973	1.78	H
14	16163	4/4/91	11:10:24.3	60.4294	25.0043	1.64	H
15	18198	4/15/91	10:50:53.8	60.4296	24.8686	1.89	H
22	24852	5/31/91	11:27:37.4	60.0584	25.4733	1.43	H
23	25529	6/5/91	10:33:10.8	60.4680	25.2023	1.59	H

Table 138: Sorted events for area 43

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
26	31700	7/24/91	12:25:04.4	60.2558	25.1722	1.38	H
34	39737	9/12/91	08:57:40.8	60.0508	25.4912	1.58	H
36	41915	9/30/91	11:08:22.6	60.2473	25.2079	1.68	H
37	300250	10/17/91	10:49:08.9	60.0926	25.1425	1.48	H
40	302576	12/11/91	12:21:07.3	60.1173	25.1129	1.53	H
42	313532	1/30/92	13:47:23.8	60.0554	25.0711	1.69	H
49	324449	4/10/92	13:00:28.1	60.5134	25.2733	1.41	H
53	326417	4/29/92	14:43:59.6	60.4987	25.2569	1.64	H
56	327250	5/7/92	14:02:51.0	60.5142	25.3336	1.47	H
58	328931	5/25/92	14:05:45.5	60.5115	25.2142	1.30	H
62	330920	6/17/92	11:35:14.5	60.1098	25.2066	1.54	H
64	331616	6/25/92	13:52:25.5	60.1255	25.3830	1.58	H
69	335500	8/10/92	15:39:25.6	60.1453	25.0998	1.63	H
35	40431	9/18/91	11:03:07.5	60.1236	24.9986	1.44	I
54	326614	4/30/92	10:48:02.3	60.2174	24.8782	1.61	I
57	327528	5/11/92	15:01:27.2	60.1075	24.8365	1.55	I
3	6197	1/7/91	13:19:51.9	61.9692	25.0599	1.35	J
5	11052	2/4/91	13:03:27.7	61.9935	24.9959	1.66	J
7	13237	3/5/91	14:42:00.1	61.9273	25.0799	1.51	J
11	15265	3/21/91	12:59:55.2	61.9335	25.0229	1.47	J
16	20028	4/26/91	09:02:43.2	61.7986	25.2307	1.43	J
67	334094	7/22/92	16:26:41.9	61.9539	25.1418	1.58	J
30	36898	8/27/91	11:07:22.5	60.1988	24.8942	1.37	K
52	325878	4/24/92	09:34:15.5	60.7556	25.3583	1.44	K
63	331368	6/23/92	10:04:09.1	60.1837	25.2421	1.40	L
66	333313	7/14/92	11:00:03.0	60.2170	25.0983	1.32	L
71	337770	9/3/92	11:01:03.7	60.2647	25.2276	1.51	L
79	345640	12/16/92	09:30:49.0	60.2242	25.2755	1.41	L

Table 138: Sorted events for area 43

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
24	25537	6/5/91	11:26:55.4	61.6485	24.6609	1.65	M
27	32758	7/30/91	15:05:54.5	61.7724	24.8396	1.36	M

Remarks:

- The Helsinki bulletin reported only one mine in this area, and the only event with a manuai location did not originate from this mine.
- The automatic locations found in the Helsinki bulletin correspond to five well-defined spots. Each spot consists of one or several groups of events: group B; groups H, I and J; groups D and L; group M.
- Most of the events from group H were located off-shore by the IMS, about 30 km from their Helsinki locations.

Mine and event locations:

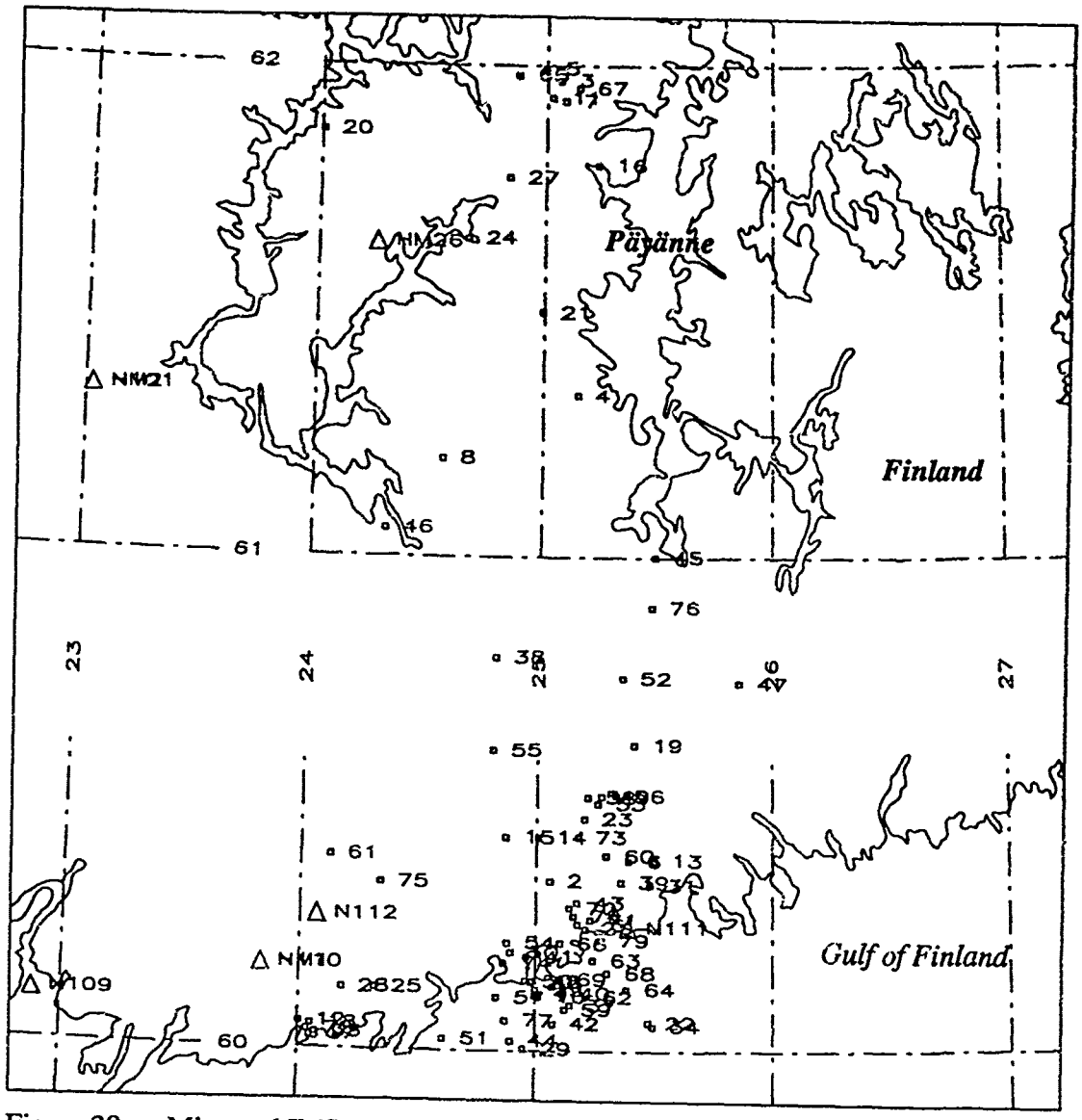

Figure 39: Mine and IMS event locations for area 43.

AREA 44

Latitude: 60 - 62°N
Longitude: 22 - 24°E
Local magnitude range: > 1.5
Number of events in IMS2: 855
Number of events within the magnitude range: 90
Number of processed events: 78
Frequency range used to process the data: 1 -16 Hz
Processed signal length: 5 s. before *P*, 45 s. after *P*
Number of reference events: 11

Table 139: Reference events for area 44

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
13	14251	709952	489306	0.83	A
60	330221	1289836	2156608	0.93	B
57	329491	1287484	2125255	0.83	C
37	31947	861346	1012556	0.94	D
49	312655	1140141	1653800	0.87	E
28	19813	754483	698561	0.86	F
3	2993	531581	595780	0.82	G
53	328298	1283627	2081293	0.84	H
21	18748	741111	612286	0.83	I
24	19419	750803	672733	0.84	J
59	330143	1289564	2152843	0.74	K

Reported mine locations:

Table 140: Mine locations for area 44

Label	Latitude	Longitude	Origin
N109	60.10	22.88	Norw
N121	60.14	22.59	Norw
HM1	60.17	23.84	Hels
N110	60.17	23.84	Norw

Table 140: Mine locations for area 44

Label	Latitude	Longitude	Origin
HA1	60.2	23.1	old_Hels
old(HM1)	60.2	23.8	old_Hels
HM3	60.30	22.29	Hels
N113	60.30	22.29	Norw
old(HM3)	60.3	22.3	old_Hels
HA2	60.4	22.4	old_Hels
N115	61.05	22.64	Norw
HM2	61.33	23.03	Hels
N101	61.33	23.03	Norw
HA3	61.4	22.8	old_Hels

Number of events found in the Helsinki bulletin: 40

Table 141: Events found in the Helsinki bulletin for area 44

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
6	9536	11/28/90	14:31:26.8	1.72	old(HM26)		EXP	?
9	7753	1/15/91	12:37:37.0	1.50	60.44	22.23	-	?
30	21856	5/3/91	06:12:28.1	1.52	60.31	24.22	-	?
38	34283	8/6/91	21:39:59.2	1.54	61.80	23.49	-	?
40	36694	8/28/91	09:20:51.2	1.60	59.74	22.84	-	?
58	329549	6/2/92	10:59:26.7	1.70	60.02	23.46	-	?
15	15940	3/25/91	11:46:34.6	1.52	old(HM3)		EXP	?
46	302634	12/2/91	12:08:37.4	1.53	old(HM26)		EXP	?
8	5592	1/4/91	11:54:13.1	1.51	old(HM1)		EXP	A
43	301862	11/20/91	11:33:07.9	1.75	61.67	21.68	-	B
55	328333	5/19/92	15:43:04.8	1.78	61.58	21.69	-	B
60	330221	6/11/92	11:25:07.5	1.77	61.67	21.65	-	B
48	315301	1/21/92	13:04:05.6	1.80	HM3		EXP	C
50	313700	1/17/92	11:46:17.5	2.00	HM3		EXP	C

Table 141: Events found in the Helsinki bulletin for area 44

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
57	329491	6/1/92	14:14:19.0	1.73	60.51	22.34	-	C
37	31947	7/25/91	13:38:04.6	1.67	60.42	22.30	-	D
12	14468	3/14/91	11:53:55.3	1.63	60.15	23.89	-	E
22	18180	4/18/91	10:54:08.6	1.58	old(HM1)		EXP	E
29	19822	4/25/91	10:57:04.4	1.58	59.86	25.20	LB	E
34	23207	5/21/91	10:55:42.6	1.51	60.14	23.88	-	E
44	302240	12/10/91	11:55:20.7	1.75	HM1		EXP	E
49	312655	1/23/92	11:56:17.6	1.67	60.19	23.94	-	E
65	335065	8/4/92	10:55:51.3	1.54	60.20	23.82	-	E
32	23403	5/20/91	10:24:23.2	1.58	61.36	22.64	-	F
3	2993	11/21/90	13:02:18.3	1.63	old(HM3)		EXP	G
53	328298	5/19/92	12:19:55.5	1.96	59.65	23.06	-	H
54	328329	5/19/92	14:47:44.0	2.09	59.63	22.94	-	H
18	18616	4/17/91	08:14:57.4	1.64	59.88	22.28	-	I
19	18744	4/18/91	05:23:41.0	1.84	59.86	22.22	-	I
20	18746	4/18/91	06:10:08.4	1.73	59.86	22.32	-	I
21	18748	4/18/91	06:28:38.5	1.70	59.88	22.27	-	I
23	19194	4/19/91	04:23:34.5	1.61	59.89	22.14	-	I
4	7790	11/22/90	14:25:43.0	1.93	60.49	21.94	-	J
17	17637	4/10/91	11:19:40.0	1.57	60.42	21.78	-	J
24	19419	4/22/91	09:13:05.3	1.87	60.37	21.95	-	J
33	23200	5/21/91	08:57:41.4	1.78	60.53	22.40	-	J
59	330143	6/10/92	13:09:46.7	1.98	61.50	22.00	-	K
61	330836	6/16/92	13:43:44.6	2.05	61.50	21.99	-	K
63	331369	6/23/92	09:33:20.3	1.78	61.49	21.99	-	K
66	336435	8/20/92	08:42:18.1	1.76	61.13	21.78	-	K

Events with the most reliable classification:

Table 142: Sorted events for area 44

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
8	5592	1/4/91	11:54:13.1	60.3461	23.7567	1.51	A
13	14251	3/19/91	11:55:03.5	60.2330	23.7518	1.58	A
14	14907	3/19/91	06:54:42.1	60.1397	23.5700	1.71	A
27	19787	4/25/91	04:13:41.5	60.0580	23.5643	1.56	A
39	34403	8/8/91	09:01:04.4	60.1089	23.3594	1.57	A
67	340570	10/1/92	11:55:19.1	60.2578	23.1831	1.54	A
43	301862	11/20/91	11:33:07.9	61.7510	22.0261	1.75	B
55	328333	5/19/92	15:43:04.8	61.6385	22.0265	1.78	B
56	328944	5/25/92	15:40:53.3	61.5880	22.0201	1.67	B
60	330221	6/11/92	11:25:07.5	61.6469	22.0175	1.77	B
69	343755	11/19/92	08:08:48.8	61.6504	22.0129	1.67	B
7	11148	12/14/90	11:47:59.6	60.6237	22.1226	1.59	C
48	315301	1/21/92	13:04:05.6	60.5834	22.0996	1.80	C
50	313700	1/17/92	11:46:17.5	60.7313	22.0290	2.00	C
57	329491	6/1/92	14:14:19.0	60.7179	22.1254	1.73	C
64	335005	8/3/92	13:17:57.4	60.5754	22.3127	1.56	C
70	345154	12/8/92	12:10:46.8	60.6304	22.2341	1.58	C
71	345642	12/16/92	09:41:44.5	60.5986	22.2788	1.52	C
37	31947	7/25/91	13:38:04.6	60.4826	22.5464	1.67	D
42	301185	11/5/91	13:21:40.6	60.6989	22.4193	1.89	D
10	8992	1/25/91	11:55:58.7	60.0862	23.4046	1.67	E
12	14468	3/14/91	11:53:55.3	60.2067	23.8817	1.63	E
22	18180	4/18/91	10:54:08.6	60.0100	23.6322	1.58	E
29	19822	4/25/91	10:57:04.4	60.1184	23.5926	1.58	E
34	23207	5/21/91	10:55:42.6	60.1398	23.6004	1.51	E
35	25733	6/6/91	10:54:54.8	60.1974	23.7456	1.54	E
44	302240	12/10/91	11:55:20.7	60.1886	23.3726	1.75	E

Table 142: Sorted events for area 44

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
47	302797	12/18/91	12:31:55.7	60.2237	23.4601	1.59	E
49	312655	1/23/92	11:56:17.6	60.1601	23.5356	1.67	E
65	335065	8/4/92	10:55:51.3	60.2705	23.6082	1.54	E
28	19813	4/25/91	08:49:18.3	61.1667	22.8352	1.58	F
32	23403	5/20/91	10:24:23.2	61.3564	22.8167	1.58	F
1	3128	11/20/90	11:52:31.7	60.2953	22.5724	1.53	G
2	2988	11/21/90	12:21:00.4	60.3575	22.2539	1.59	G
3	2993	11/21/90	13:02:18.3	60.3204	22.3685	1.63	G
25	19695	4/22/91	12:32:50.9	60.6299	22.0373	1.50	G
53	328298	5/19/92	12:19:55.5	60.0164	22.9480	1.96	H
54	328329	5/19/92	14:47:44.0	60.0236	22.8395	2.09	H
18	18616	4/17/91	08:14:57.4	60.2197	22.1515	1.64	I
19	18744	4/18/91	05:23:41.0	60.0984	22.2293	1.84	I
20	18746	4/18/91	06:10:08.4	60.0009	22.3071	1.73	I
21	18748	4/18/91	06:28:38.5	60.0822	22.2767	1.70	I
23	19194	4/19/91	04:23:34.5	60.0179	22.2991	1.61	I
4	7790	11/22/90	14:25:43.0	60.5870	22.1457	1.93	J
17	17637	4/10/91	11:19:40.0	60.4998	22.1798	1.57	J
24	19419	4/22/91	09:13:05.3	60.4157	22.0969	1.87	J
33	23200	5/21/91	08:57:41.4	60.5504	22.0794	1.78	J
36	28156	6/28/91	09:00:03.0	60.7067	22.1214	1.76	J
59	330143	6/10/92	13:09:46.7	61.7941	22.1473	1.98	K
61	330836	6/16/92	13:43:44.6	61.5957	22.0978	2.05	K
62	331008	6/18/92	12:13:07.5	60.3532	22.4506	2.07	K
63	331369	6/23/92	09:33:20.3	61.6915	22.2029	1.78	K
66	336435	8/20/92	08:42:18.1	60.9655	22.3378	1.76	K

Remarks:

- Events from groups B and K are located close to mine HM5 but none of them had

a manual location in the Helsinki bulletin. The Helsinki automatic locations given for the events from group B are close mine HM5 location.
- The other events are located along the Finnish coast or off-shore. According to the Helsinki bulletin, only the events from group I should be located off-shore.
- Events from group I occurred the same day within a couple of hours.

Mine and event locations:

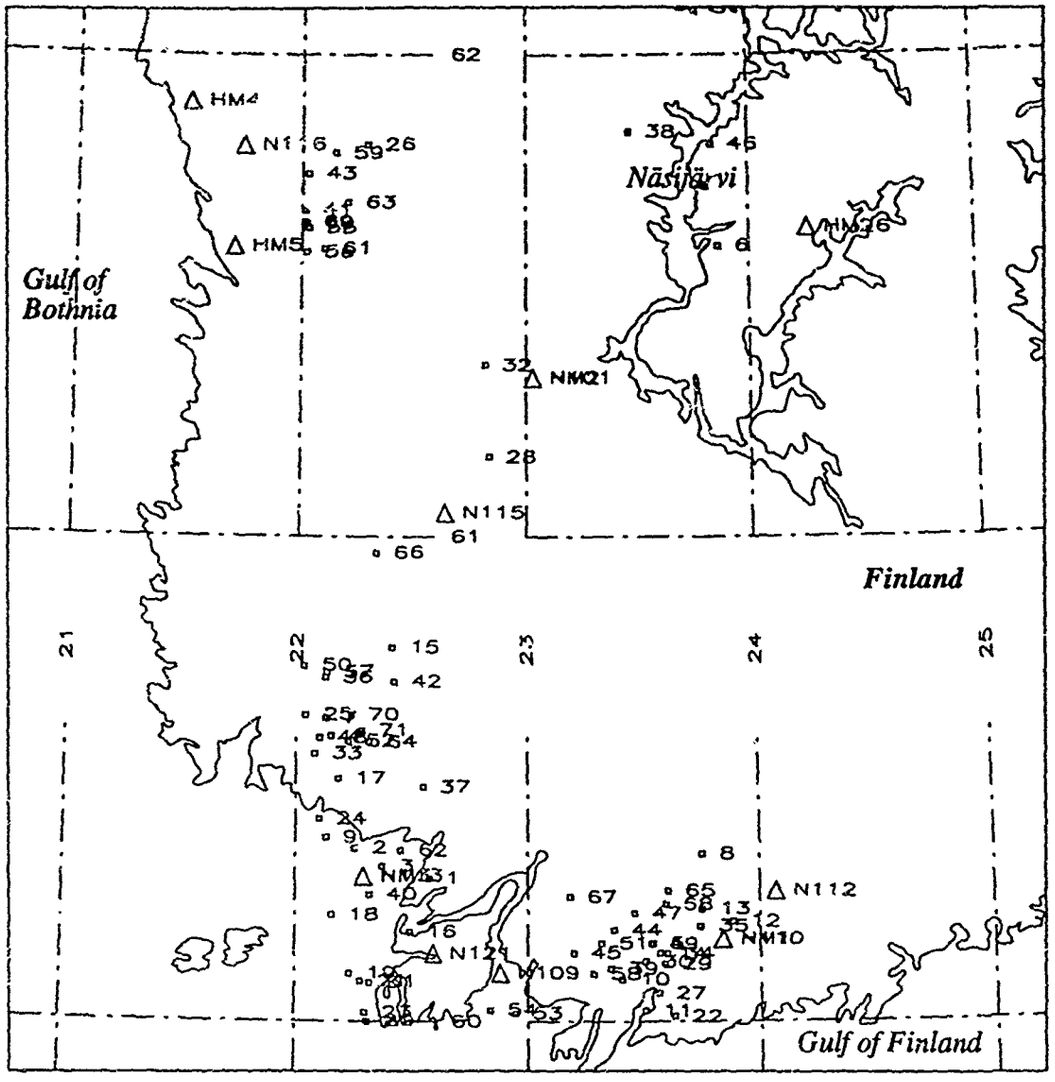

Figure 40: Mine and IMS event locations for area 44.

AREA 45

Latitude: 60 - 62°N
Longitude: 20 -22°E
Local magnitude range: > 1.0
Number of events in IMS2: 192
Number of events within the magnitude range: 105
Number of processed events: 78
Frequency range used to process the data: 1- 16 Hz
Processed signal length: 5 s. before *P*, 50 s. after *P*
Number of reference events: 14

Table 143: Reference events for area 45

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
67	336914	1412376	2605455	0.84	A
51	325787	1230249	1891875	0.79	B
39	34714	682286	1101797	0.82	C
1	2652	517537	632737	0.90	D
55	326266	1236918	1994814	0.81	E
16	13559	704159	481318	0.84	F
36	33013	871175	1070198	0.81	G
53	324786	1233351	1950678	0.82	H
2	2924	518354	633967	0.84	I
60	329142	1286222	2106400	0.93	J
22	17894	733086	576313	0.98	K
7	314238	554163	650152	0.88	L
24	20044	756143	707673	0.91	M
58	327532	1272309	2037615	0.86	N

Reported mine locations:

Table 144: Mine locations for area 45

Label	Latitude	Longitude	Origin
HA4	61.6	21.7	old_Hels
HM5	61.6	21.7	Hels
N116	61.81	21.74	Norw
HA6	61.9	21.5	old_Hels
HM4	61.9	21.5	Hels

Number of events found in the Helsinki bulletin: 27

Table 145: Events found in the Helsinki bulletin for area 45

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
62	329651	6/3/92	11:20:11.9	1.48	61.60	21.72	-	?
64	330691	6/16/92	07:34:52.8	2.09	61.19	20.65	-	?
70	336918	8/25/92	10:51:45.2	1.64	60.70	20.42	-	?
67	336914	8/25/92	10:23:44.5	1.54	60.74	20.44	-	A
68	336911	8/25/92	10:25:37.9	1.99	60.75	20.35	-	A
47	325741	4/3/92	10:54:37.6	2.22	60.79	20.09	-	B
48	325771	4/3/92	14:29:20.0	2.65	60.94	20.44	-	B
49	325773	4/3/92	14:45:22.0	2.57	60.80	19.96	-	B
50	325779	4/3/92	15:00:58.5	2.17	60.77	20.00	-	B
51	325787	4/3/92	15:24:53.4	2.49	60.77	20.11	-	B
52	325790	4/3/92	15:48:53.2	2.47	60.77	20.10	-	B
37	34285	8/6/91	22:19:59.5	1.47	60.70	21.12	-	C
38	34319	8/7/91	22:19:58.8	1.39	60.68	21.16	-	C
39	34714	8/8/91	22:19:59.0	1.87	60.65	21.06	-	C
40	33904	8/9/91	22:19:57.4	1.50	60.59	21.03	-	C
1	2652	11/4/90	10:08:32.5	1.45	60.74	21.41	-	D
55	326266	4/28/92	07:42:11.8	2.33	61.10	20.30	-	E
56	326263	4/28/92	07:50:08.1	2.31	61.09	20.31	-	E

Table 145: Events found in the Helsinki bulletin for area 45

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
63	330655	6/16/92	07:30:13.5	2.13	61.22	20.60	-	E
60	329142	5/27/92	14:39:54.6	1.56	61.24	21.74	-	J
66	333880	7/20/92	14:51:01.5	1.51	61.17	21.57	-	J
22	17894	4/12/91	10:23:32.0	2.05	61.47	21.97	-	K
59	329016	5/26/92	11:56:25.7	1.94	61.49	21.96	-	K
24	20044	4/26/91	11:54:40.2	1.69	61.72	21.53	-	M
30	23227	5/21/91	14:15:38.3	1.68	61.67	21.50	-	M
45	302729	12/5/91	10:49:05.9	1.74	61.65	21.66	-	N
58	327532	5/11/92	16:09:08.9	1.70	61.54	21.83	-	N

Events with the most reliable classification:

Table 146: Sorted events for area 45

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
67	336914	8/25/92	10:23:44.5	60.9062	20.7076	1.54	A
68	336911	8/25/92	10:25:37.9	60.9856	20.4262	1.99	A
47	325741	4/3/92	10:54:37.6	60.9075	20.4956	2.22	B
48	325771	4/3/92	14:29:20.0	60.8150	20.4409	2.65	B
49	325773	4/3/92	14:45:22.0	60.9408	20.4728	2.57	B
50	325779	4/3/92	15:00:58.5	60.9440	20.4163	2.17	B
51	325787	4/3/92	15:24:53.4	60.8998	20.3631	2.49	B
52	325790	4/3/92	15:48:53.2	60.9208	20.3089	2.47	B
37	34285	8/6/91	22:19:59.5	60.6354	21.1479	1.47	C
38	34319	8/7/91	22:19:58.8	60.5222	21.2842	1.39	C
39	34714	8/8/91	22:19:59.0	60.6723	21.1598	1.87	C
40	33904	8/9/91	22:19:57.4	60.5173	21.2724	1.50	C
1	2652	11/4/90	10:08:32.5	60.7652	21.6026	1.45	D
3	2932	11/5/90	20:21:43.0	60.6983	21.4102	1.49	D
55	326266	4/28/92	07:42:11.8	61.1954	20.3486	2.33	E

Table 146: Sorted events for area 45

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
56	326263	4/28/92	07:50:08.1	61.2005	20.7810	2.31	E
63	330655	6/16/92	07:30:13.5	61.1196	20.7541	2.13	E
74	343679	11/18/92	12:35:48.0	61.1258	20.3453	2.32	E
75	343705	11/18/92	12:55:46.0	61.0786	20.3447	2.16	E
16	13559	3/13/91	09:12:18.7	61.6967	21.9493	1.18	F
34	25312	6/6/91	14:58:46.8	61.7380	21.4994	1.41	F
71	339222	9/18/92	12:39:12.2	61.6256	21.7710	1.14	F
36	33013	8/1/91	09:00:07.5	61.1774	21.2351	1.15	G
77	344931	12/4/92	12:45:36.6	61.4710	21.6665	1.17	G
10	5692	1/5/91	10:59:30.3	60.7760	21.7659	1.01	H
11	6848	1/15/91	09:43:07.7	60.8292	21.9743	1.22	H
19	14280	3/19/91	13:58:36.4	61.9810	21.7924	1.15	H
25	19998	4/30/91	10:04:23.5	61.9538	21.9305	1.32	H
53	324786	4/15/92	09:23:07.7	61.7551	21.8575	1.04	H
2	2924	11/5/90	14:51:49.2	60.6415	21.8626	1.30	I
5	2622	11/26/90	14:34:45.5	60.6609	21.8190	1.28	I
60	329142	5/27/92	14:39:54.6	61.2679	21.8548	1.56	J
66	333880	7/20/92	14:51:01.5	61.0803	21.8565	1.51	J
22	17894	4/12/91	10:23:32.0	61.5190	21.9407	2.05	K
59	329016	5/26/92	11:56:25.7	61.7637	20.8546	1.94	K
7	314238	12/14/90	11:19:10.4	60.8755	21.9519	1.87	L
33	25541	6/5/91	11:29:29.2	60.6722	21.8888	1.79	L
20	15753	3/27/91	17:26:04.3	61.0967	21.8250	1.50	M
24	20044	4/26/91	11:54:40.2	61.7218	21.7247	1.69	M
30	23227	5/21/91	14:15:38.3	61.6967	21.6477	1.68	M
43	40982	9/26/91	10:52:51.3	61.6926	21.9944	1.64	N
45	302729	12/5/91	10:49:05.9	61.7252	21.9204	1.74	N

Table 146: Sorted events for area 45

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
57	327032	5/5/92	14:28:17.0	61.6162	21.9940	1.75	N
58	327532	5/11/92	16:09:08.9	61.6401	21.9815	1.70	N

Remarks:

- Two mines are reported in the Helsinki bulletin for this area, but none of the events was identified as originating from one or the other. All events had automatic locations.

Mine and event locations:

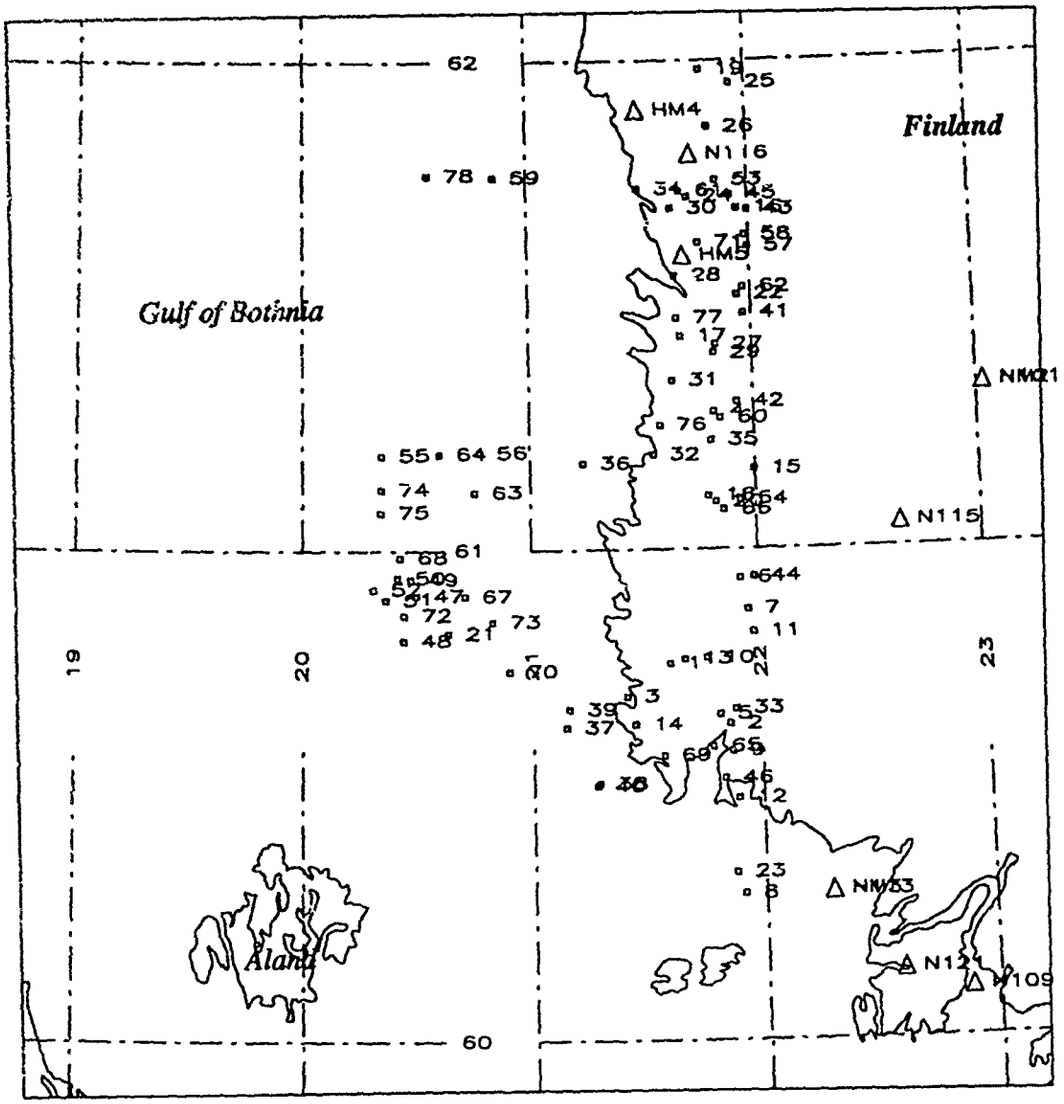

Figure 41: Mine and IMS event locations for area 45.

AREA 54

Latitude: 58 - 60°N
Longitude: 20 - 24°E
Local magnitude range: > 1.0
Number of events in IMS2: 157
Number of events within the magnitude range: > 1.0
Number of processed events: 116
Frequency range used to process the data: 74
Processed signal length: 5 s. before *P*, 50 s. after *P*
Number of reference events: 7

Table 147: Reference events for area 54

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
1	5232	524531	496205	0.83	A
50	328317	1283695	2081437	0.87	B
58	328426	1284080	2082220	0.83	C
14	16174	726716	538352	0.85	D
21	18745	741071	612250	0.83	E
43	325725	1233081	1946442	0.84	F
17	17751	738545	580918	0.87	G

Reported mine locations: None
Number of events found in the Helsinki bulletin: 40

Table 148: Events found in the Helsinki bulletin for area 54

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
3	5241	11/14/90	10:18:28.0	1.97	59.78	23.79	-	?
4	5243	11/14/90	10:56:21.3	1.99	59.79	23.87	-	?
5	5247	11/14/90	11:19:38.6	2.08	59.83	24.11	-	?
7	7378	11/21/90	08:57:34.4	2.02	59.69	22.44	-	?
8	7379	11/21/90	09:17:12.1	2.09	59.60	22.43	-	?
9	10243	12/3/90	13:28:07.0	1.35	59.60	22.43	-	?
10	8305	1/21/91	11:42:27.4	1.96	59.72	22.70	-	?

Table 148: Events found in the Helsinki bulletin for area 54

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
19	18609	4/16/91	14:52:17.2	1.89	59.88	22.30	-	?
25	28119	6/26/91	10:36:28.7	1.59	59.77	23.94	-	?
27	38298	9/6/91	10:54:44.1	1.26	HM1		EXP	?
28	41018	9/19/91	16:31:28.3	1.57	59.74	22.51	-	?
29	41036	9/19/91	16:38:00.3	1.91	59.74	22.35	-	?
30	41038	9/19/91	16:55:01.1	2.03	59.79	22.30	-	?
31	41039	9/19/91	17:00:56.7	1.64	59.80	22.30	-	?
35	312984	1/22/92	08:55:30.6	2.62	59.72	24.09	-	?
36	313026	1/23/92	09:44:46.2	2.60	59.73	24.03	-	?
42	325657	4/14/92	10:32:16.7	1.33	59.77	22.44	-	?
49	328302	5/19/92	12:28:04.8	1.73	59.63	23.08	-	?
51	328323	5/19/92	14:24:06.8	2.64	59.74	22.94	-	?
52	328327	5/19/92	14:36:30.1	1.78	59.63	22.96	-	?
53	328372	5/20/92	08:05:55.2	1.47	59.62	23.13	-	?
54	328373	5/20/92	08:14:27.1	1.98	59.60	23.00	-	?
57	328423	5/20/92	13:00:40.0	1.73	59.59	23.00	-	?
60	328431	5/20/92	14:03:47.9	1.84	59.73	22.87	-	?
61	335809	8/14/92	07:39:52.0	2.14	59.67	22.34	-	?
62	337775	9/3/92	11:24:44.9	1.73	59.30	24.40	-	?
1	5232	11/14/90	09:53:56.3	1.57	59.91	23.88	-	A
2	5237	11/14/90	09:57:04.9	2.06	59.71	23.72	-	A
50	328317	5/19/92	13:26:35.1	2.04	59.69	23.01	-	B
56	328424	5/20/92	12:56:25.1	1.92	59.57	22.93	-	B
59	328432	5/20/92	14:00:14.2	1.81	59.57	22.70	-	C
40	324438	4/10/92	11:20:54.0	1.70	HE1		EXP	D
20	17851	4/16/91	15:18:33.8	1.84	59.91	22.20	-	E
21	18745	4/18/91	05:47:11.6	1.71	59.89	22.24	-	E
41	325653	4/14/92	09:55:00.3	1.60	59.86	22.39	-	E

Table 148: Events found in the Helsinki bulletin for area 54

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
45	324764	4/15/92	05:00:58.9	1.41	59.83	22.40	-	E
43	325725	4/14/92	11:26:04.1	1.35	59.80	22.34	-	F
44	325728	4/14/92	11:43:15.6	1.46	59.81	22.38	-	F
15	18588	4/16/91	05:12:38.8	1.60	59.88	22.24	-	G
16	17746	4/16/91	05:38:49.1	1.61	59.90	22.26	-	G

Events with the most reliable classification:

Table 149: Sorted events for area 54

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
1	5232	11/14/90	09:53:56.3	59.8344	23.4839	1.57	A
2	5237	11/14/90	09:57:04.9	59.8134	23.6982	2.06	A
50	328317	5/19/92	13:26:35.1	59.8865	22.7625	2.04	B
56	328424	5/20/92	12:56:25.1	59.9419	22.8446	1.92	B
58	328426	5/20/92	13:20:05.7	59.8186	22.7422	1.95	C
59	328432	5/20/92	14:00:14.2	59.7897	23.0032	1.81	C
14	16174	4/4/91	12:16:09.3	59.5700	23.8913	1.55	D
40	324438	4/10/92	11:20:54.0	59.5063	23.8482	1.70	D
64	339887	9/24/92	10:21:05.1	59.5261	23.9013	1.45	D
20	17851	4/16/91	15:18:33.8	59.9889	22.2905	1.84	E
21	18745	4/18/91	05:47:11.6	59.8271	22.4197	1.71	E
41	325653	4/14/92	09:55:00.3	59.8112	22.2844	1.60	E
45	324764	4/15/92	05:00:58.9	59.5271	22.4442	1.41	E
43	325725	4/14/92	11:26:04.1	59.7931	22.5120	1.35	F
44	325728	4/14/92	11:43:15.6	59.7001	22.6074	1.46	F
15	18588	4/16/91	05:12:38.8	59.9080	22.4961	1.60	G
16	17746	4/16/91	05:38:49.1	59.8669	22.5720	1.61	G
17	17751	4/16/91	06:06:19.9	59.8804	22.4627	1.65	G

Remarks:

- Despite the large number of events, no mine has been reported in the Helsinki bulletin. But, most of these events were located off-shore of the Finnish coast by the IMS.

Mine and event locations:

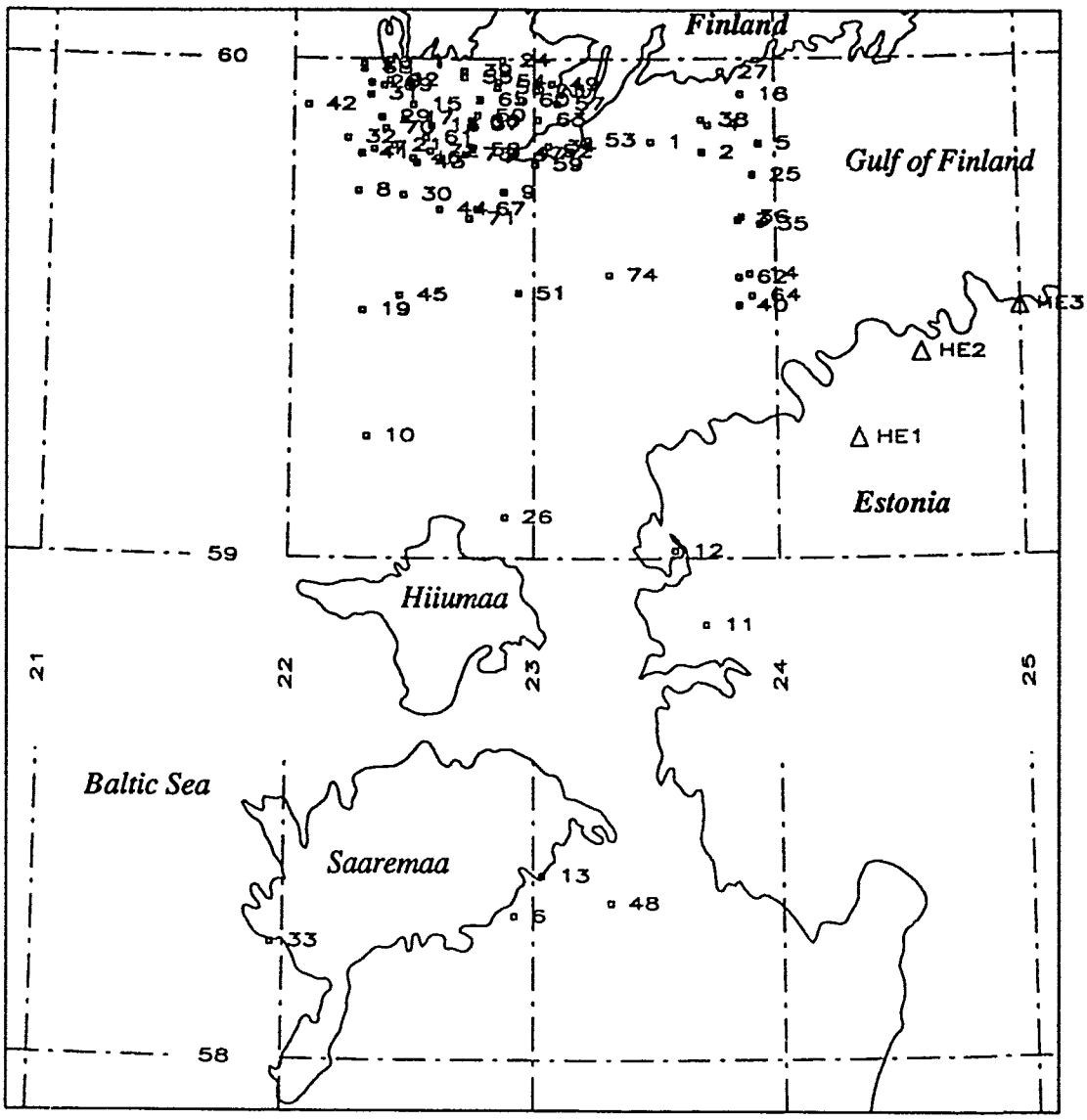

Figure 42: IMS event locations for area 54.

AREA 55

Latitude: 58 - 60°N
Longitude: 24 - 26°E
Local magnitude range: > 1.5
Number of events in IMS2: 409
Number of events within the magnitude range: 144
Number of processed events: 117
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 5 s. before *P*, 45 s. after *P*
Number of reference events: 14

Table 150: Reference events for area 55

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
37	19259	743626	618727	0.84	A
53	31944	861191	1012268	0.82	B
78	302430	1008806	1469680	0.89	C
63	38341	932985	1223791	0.81	D
83	302640	1010323	1491835	0.85	E
64	39874	942516	1236940	0.85	F
100	328457	1284174	2082364	0.98	G
112	340384	1458818	2725236	0.88	H
20	314426	560939	658213	0.86	I
73	301143	1004983	1396189	0.85	J
105	330351	1290235	2160724	0.87	K
107	332481	1325792	2245966	0.92	L
68	41777	957254	1283681	0.86	M
11	2501	533888	479197	0.80	N

Reported mine locations:

Table 151: Mine locations for area 55

Label	Latitude	Longitude	Origin
SB8	59.230	24.235	SPOT
HE1	59.24	24.33	Hels
SB1	59.242	24.329	SPOT
HB1	59.3	24.4	old_Hels
HB2	59.4	24.6	old_Hels
SB2	59.407	24.591	SPOT
HE2	59.41	24.59	Hels
HB3	59.5	25.0	old_Hels
HE3	59.5	25.0	Hels

Number of events found in the Helsinki bulletin: 84

Table 152: Events found in the Helsinki bulletin for area 55

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
18	314203	12/13/90	14:00:38.0	1.99	HB2		EXP	?
26	13232	3/6/91	13:45:05.7	1.78	60.30	24.93	-	?
30	14636	3/15/91	11:18:14.6	2.00	HE3		EXP	?
34	17642	4/10/91	11:29:51.9	1.81	HB1		EXP	?
36	18995	4/18/91	11:32:28.4	1.61	60.11	24.35	-	?
39	19479	4/26/91	13:01:55.5	1.65	59.47	24.67	QB	?
40	20350	5/2/91	09:27:34.7	1.53	59.28	27 11	-	?
41	21818	5/7/91	11:25:56.4	1.99	59.48	25.12	-	?
45	24580	5/30/91	14:00:53.6	1.63	59.42	24.63	-	?
47	24863	5/31/91	12:17:21.3	1.95	59.46	24.95	-	?
49	25718	6/6/91	06:50:28.8	1.83	59.83	24.32	-	?
51	25745	6/6/91	12:33:23.6	1.96	59.76	24.21	-	?
81	302238	12/10/91	11:07:02.6	2.02	59.80	24.09	-	?
87	313024	1/23/92	08:45:45.7	2.45	59.73	24.07	-	?

Table 152: Events found in the Helsinki bulletin for area 55

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
103	329549	6/3/92	10:29:34.7	2.04	59.81	24.25	-	?
109	338778	9/14/92	10:16:07.1	2.18	59.47	25.07	-	?
111	340157	9/25/92	12:38:12.5	1.78	59.51	24.98	-	?
56	34147	8/7/91	13:12:05.1	1.91	HE2		EXP	?
58	35875	8/22/91	13:28:45.6	1.72	HE2		EXP	?
69	300097	10/1/91	13:03:16.5	2.18	HE3		EXP	?
75	301244	11/12/91	14:17:46.7	1.52	HE2		EXP	?
77	302227	11/25/91	12:52:06.8	1.56	HE2		EXP	?
84	302813	12/6/91	13:51:02.9	1.99	HE3		EXP	?
85	302622	12/7/91	13:42:15.9	1.58	HE3		EXP	?
86	303100	12/19/91	12:50:43.4	1.90	HE1		EXP	?
89	315268	1/20/92	14:06:59.6	2.05	HE2		EXP	?
90	315434	1/29/92	12:57:17.6	1.91	HE2		EXP	?
91	317805	2/20/92	09:47:13.6	1.57	HE4		EXP	?
96	325639	4/2/92	14:05:50.0	2.06	HE2		EXP	?
3	5266	11/14/90	13:20:03.0	1.79	HB1		EXP	A
12	8312	11/26/90	13:57:23.9	2.32	HB1		EXP	A
29	14648	3/15/91	12:49:40.8	1.91	HB1		EXP	A
32	15416	3/28/91	12:34:18.4	1.67	HB1		EXP	A
37	19259	4/19/91	11:29:37.8	1.74	HB1		EXP	A
50	25744	6/6/91	12:19:58.8	1.75	HE1		EXP	A
67	41773	9/27/91	11:46:53.2	1.90	HE1		EXP	A
46	24862	5/31/91	12:03:30.4	2.03	59.47	25.03	-	B
53	31944	7/25/91	12:57:21.4	1.64	HE3		EXP	B
76	301879	11/20/91	13:32:51.3	2.15	HE3		EXP	B
80	302357	12/10/91	09:14:59.6	2.59	59.82	24.05	-	B
94	320378	3/12/92	12:38:46.7	2.13	HE2		EXP	B
97	324804	4/15/92	11:39:54.8	2.04	HE3		EXP	B

Table 152: Events found in the Helsinki bulletin for area 55

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
98	326312	4/28/92	12:10:09.9	2.26	HE3		EXP	B
101	328571	5/21/92	12:13:29.4	1.57	HE2		EXP	B
106	331009	6/18/92	12:46:24.7	1.58	HE3		EXP	B
78	302430	11/29/91	13:19:15.7	1.56	HE2		EXP	C
93	319810	3/5/92	12:16:41.3	1.67	HE2		EXP	C
60	35942	8/26/91	13:20:43.4	1.54	HE3		EXP	D
63	38341	9/10/91	12:08:56.4	1.59	HE3		EXP	D
66	40448	9/18/91	12:43:01.1	1.98	HE3		EXP	D
10	3270	11/22/90	14:05:03.4	2.03	HE3		EXP	E
17	42312	12/10/90	13:53:54.5	1.61	HE3		EXP	E
33	16654	3/29/91	11:06:54.8	2.02	HE3		EXP	E
82	302637	12/2/91	13:05:55.8	2.59	59.71	24.08	-	E
83	302640	12/2/91	17:10:20.0	2.52	59.71	24.08	-	E
9	7533	11/21/90	14:26:39.4	2.12	HE3		EXP	E
55	32903	7/31/91	11:46:59.0	2.16	HE3		EXP	F
64	39874	9/16/91	11:23:39.5	1.86	HE3		EXP	F
65	40443	9/18/91	12:01:30.7	2.08	HE3		EXP	F
102	329093	5/27/92	08:57:49.6	1.64	60.38	25.17	-	G
112	340384	9/29/92	14:21:05.4	1.67	60.23	24.50	-	H
52	28304	6/26/91	12:38:34.4	1.89	HE1		EXP	I
15	42140	12/4/90	12:42:42.2	2.25	HE3		EXP	J
23	6195	1/7/91	12:45:25.2	2.35	HE3		EXP	J
24	6333	1/8/91	13:41:43.4	2.04	HE3		EXP	J
70	300209	10/15/91	12:19:13.1	2.28	HE3		EXP	J
73	301143	11/8/91	12:14:36.1	2.29	HE3		EXP	J
79	302344	12/3/91	08:52:49.2	2.66	59.70	24.04	-	J
2	2920	11/5/90	13:54:46.7	1.91	HB1		EXP	K
6	2668	11/16/90	14:46:12.5	1.95	HB1		EXP	K

Table 152: Events found in the Helsinki bulletin for area 55

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
31	14599	3/21/91	14:11:43.1	1.81	HB1		EXP	K
38	19826	4/25/91	11:09:05.8	1.67	59.26	24.28	QB	K
42	22471	5/9/91	12:13:55.1	1.70	HB1		EXP	K
57	34652	8/8/91	13:46:56.3	1.68	HE1		EXP	K
59	35617	8/23/91	12:35:39.3	1.54	HE1		EXP	K
92	321698	3/6/92	13:58:34.8	1.78	HE1		EXP	K
104	329839	6/5/92	12:00:05.7	1.65	HE1		EXP	K
105	330351	6/12/92	11:06:57.0	1.56	HE1		EXP	K
107	332481	7/6/92	11:28:57.4	1.60	HE2		EXP	L
108	337968	8/26/92	12:11:39.0	1.68	59.53	24.92	-	L
68	41777	9/27/91	12:04:49.2	1.58	HE3		EXP	M
72	300468	10/21/91	14:27:23.5	1.58	HE2		EXP	M
13	8468	11/27/90	11:58:25.7	1.90	HB5		EXP	N
54	32756	7/30/91	14:14:11.8	1.64	HE3		EXP	N

Events with the most reliable classification:

Table 153: Sorted events for area 55

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
3	5266	11/14/90	13:20:03.0	59.5353	24.0717	1.79	A
12	8312	11/26/90	13:57:23.9	59.3791	24.0988	2.32	A
29	14648	3/15/91	12:49:40.8	59.4200	24.1194	1.91	A
32	15416	3/28/91	12:34:18.4	59.4249	24.2212	1.67	A
37	19259	4/19/91	11:29:37.8	59.4877	24.1788	1.74	A
50	25744	6/6/91	12:19:58.8	59.3667	24.2156	1.75	A
67	41773	9/27/91	11:46:53.2	59.3915	24.2022	1.90	A
46	24862	5/31/91	12:03:30.4	59.4487	25.2029	2.03	B
53	31944	7/25/91	12:57:21.4	59.4339	24.8226	1.64	B
80	302357	12/10/91	09:14:59.6	59.4760	24.1442	2.59	B

Table 153: Sorted events for area 55

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
94	320378	3/12/92	12:38:46.7	59.5118	25.1450	2.13	B
97	324804	4/15/92	11:39:54.8	59.5558	25.0023	2.04	B
98	326312	4/28/92	12:10:09.9	59.5602	25.3231	2.26	B
101	328571	5/21/92	12:13:29.4	59.5629	25.2674	1.57	B
106	331009	6/18/92	12:46:24.7	59.6074	24.8961	1.58	B
78	302430	11/29/91	13:19:15.7	59.5647	24.5086	1.56	C
93	319810	3/5/92	12:16:41.3	59.5660	24.6658	1.67	C
35	18042	4/17/91	12:34:02.5	59.5045	25.3960	1.62	D
60	35942	8/26/91	13:20:43.4	59.4636	25.0837	1.54	D
63	38341	9/10/91	12:08:56.4	59.5573	25.2521	1.59	D
66	40448	9/18/91	12:43:01.1	59.4869	24.9974	1.98	D
95	325637	4/2/92	13:31:33.5	59.4201	24.9798	1.53	D
9	7533	11/21/90	14:26:39.4	59.8214	24.4552	2.12	E
10	3270	11/22/90	14:05:03.4	59.4873	25.5651	2.03	E
17	42312	12/10/90	13:53:54.5	59.2010	25.2785	1.61	E
33	16654	3/29/91	11:06:54.8	59.5291	25.1617	2.02	E
82	302637	12/2/91	13:05:55.8	59.4664	24.2286	2.59	E
83	302640	12/2/91	17:10:20.0	59.5719	24.0197	2.52	E
55	32903	7/31/91	11:46:59.0	59.5039	25.1904	2.16	F
62	38300	9/6/91	11:27:53.2	59.3709	25.1164	2.22	F
64	39874	9/16/91	11:23:39.5	59.5489	24.9466	1.86	F
65	40443	9/18/91	12:01:30.7	59.4379	25.0090	2.08	F
100	328457	5/20/92	19:17:16.9	59.9892	25.2440	1.60	G
102	329093	5/27/92	08:57:49.6	59.8987	25.1113	1.64	G
112	340384	9/29/92	14:21:05.4	59.8142	24.3078	1.67	H
115	342331	10/28/92	14:05:13.2	59.9637	24.3501	1.57	H
16	313963	12/7/90	13:53:41.1	59.4068	24.2184	1.75	I
20	314426	12/21/90	13:24:39.9	59.3557	24.1233	1.81	I

Table 153: Sorted events for area 55

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
52	28304	6/26/91	12:38:34.4	59.4133	24.2419	1.89	I
15	42140	12/4/90	12:42:42.2	59.4175	25.0994	2.25	J
23	6195	1/7/91	12:45:25.2	59.4452	25.1402	2.35	J
24	6333	1/8/91	13:41:43.4	59.3466	25.1930	2.04	J
70	300209	10/15/91	12:19:13.1	59.4442	25.3173	2.28	J
73	301143	11/8/91	12:14:36.1	59.5892	25.0339	2.29	J
79	302344	12/3/91	08:52:49.2	59.5604	24.0286	2.66	J
117	346182	12/23/92	12:22:07.9	59.5099	25.3750	2.11	J
2	2920	11/5/90	13:54:46.7	59.4746	24.1254	1.91	K
6	2668	11/16/90	14:46:12.5	59.3879	24.3612	1.95	K
22	6730	12/30/90	11:50:59.9	59.3132	24.2707	1.67	K
31	14599	3/21/91	14:11:43.1	59.4346	24.4814	1.81	K
38	19826	4/25/91	11:09:05.8	59.3898	24.2314	1.67	K
42	22471	5/9/91	12:13:55.1	59.4843	24.1855	1.70	K
44	23404	5/20/91	10:51:35.9	59.4218	24.2114	1.68	K
57	34652	8/8/91	13:46:56.3	59.3392	24.7585	1.68	K
59	35617	8/23/91	12:35:39.3	59.3338	24.8436	1.54	K
74	301236	11/12/91	13:28:45.9	59.2230	24.8188	1.63	K
92	321698	3/6/92	13:58:34.8	59.4460	24.1680	1.78	K
99	327340	5/8/92	11:24:36.6	59.4378	24.3092	1.52	K
104	329839	6/5/92	12:00:05.7	59.3640	24.6954	1.65	K
105	330351	6/12/92	11:06:57.0	59.5122	24.4259	1.56	K
107	332481	7/6/92	11:28:57.4	59.5211	24.8507	1.60	L
108	337968	8/26/92	12:11:39.0	59.4209	24.8198	1.68	L
68	41777	9/27/91	12:04:49.2	59.5300	24.8749	1.58	M
72	300468	10/21/91	14:27:23.5	59.5149	24.9024	1.58	M
1	1473	11/5/90	12:12:45.8	59.4680	25.2030	1.60	N
4	2578	11/16/90	10:10:40.1	59.5052	25.2728	1.55	N

Table 153: Sorted events for area 55

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
5	2168	11/16/90	10:38:17.5	59.4302	25.4726	1.54	N
7	2218	11/17/90	10:09:46.2	59.4981	25.2997	1.56	N
8	2339	11/20/90	13:36:40.2	59.4673	25.3308	1.69	N
11	2501	11/23/90	12:13:42.8	59.5060	24.9906	1.52	N
13	8468	11/27/90	11:58:25.7	59.4530	25.5845	1.90	N
14	2740	11/29/90	13:19:23.3	59.5060	25.4563	1.64	N
19	4348	12/19/90	11:31:48.0	59.41[illegible]9	25.4211	1.56	N
21	7233	12/27/90	12:57:29.0	59.5129	25.1270	1.56	N
25	7481	1/14/91	11:50:54.5	59.4470	25.3286	1.51	N
54	32756	7/30/91	14:14:11.8	59.3457	25.0813	1.64	N

Remarks:

- The area shows an important mining activity. Most of the events are located on the coast of Estonia.
- According to the identification found in the Helsinki bulletin, events from groups A, I and K originate from mine HE1; events from group L originate from mine HE2; events from groups E, F, J and N originate from mine HE3. Events from groups B and M showed locations either at mine HE2 or at mine HE3.

Mine and event locations:

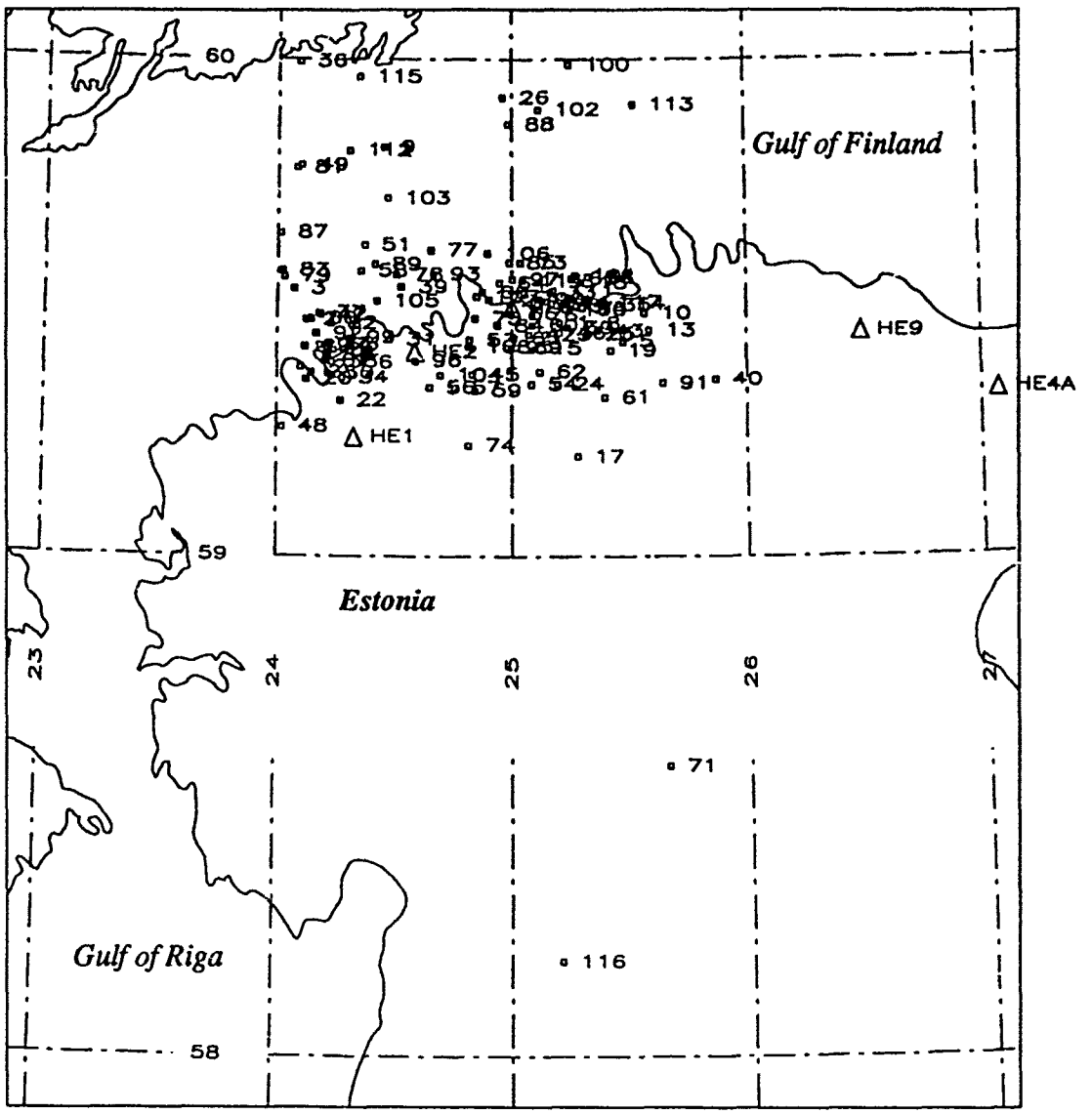

Figure 43: Mine and IMS event locations for area 55.

AREA 56

Latitude: 58 - 60°N
Longitude: 26 - 28°E
Local magnitude range: > 2.2
Number of events in IMS2: 2805
Number of events within the magnitude range: 149
Number of processed events: 117
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 6 s. before *P*, 56 s. after *P*
Number of reference events: 12

Table 154: Reference events for area 56

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
100	335075	1379737	2435380	0.82	A
97	334525	1370102	2351758	0.80	B
70	325624	1229589	1885659	0.84	C
64	323153	1228763	1874178	0.85	D
6	4245	556740	653191	0.84	E
17	12924	621109	399167	0.88	F
33	20309	760277	731037	0.88	G
108	341044	1459918	2741280	0.88	H
51	313191	1163628	1664772	0.89	I
99	335056	1379673	2434768	0.80	J
25	17292	729272	561982	0.84	K
82	327003	1269767	2017515	0.83	L

Reported mine locations:

Table 155: Mine locations for area 56

Label	Latitude	Longitude	Origin
HB9	59.2	27.6	old_Hels
HE5A	59.24	27.83	Hels
SB11	59.243	27.833	SPOT

Table 155: Mine locations for area 56

Label	Latitude	Longitude	Origin
SB9	59.269	27.732	SPOT
HE5	59.27	27.73	Hels
HB10	59.3	27.6	old_Hels
HB6	59.3	27.2	old_Hels
HE6A	59.3	27.5	Hels
SB10	59.306	27.626	SPOT
HE6	59.31	27.63	Hels
SB7	59.325	27.272	SPOT
SB6	59.327	27.070	SPOT
HE4	59.33	27.27	Hels
HE4A	59.33	27.07	Hels
SB5	59.446	26.486	SPOT
HE9	59.45	26.49	Hels
HB5	59.5	26.5	old_Hels

Number of events found in the Helsinki bulletin: 95

Table 156: Events found in the Helsinki bulletin for area 56

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
31	19819	4/25/91	10:42:12.2	2.20	59.26	27.62	QB	?
3	26217	11/27/90	12:56:41.3	2.34	HB5		EXP	?
8	4253	12/19/90	12:06:06.5	2.23	HB12		EXP	?
14	6315	1/8/91	10:41:31.7	2.21	HB6		EXP	?
37	25340	6/4/91	10:26:36.6	2.54	HE6		EXP	?
54	315689	2/4/92	12:59:17.0	2.21	HE4A		EXP	?
55	319415	2/21/92	11:46:30.1	2.34	HE6A		EXP	?
59	319308	2/18/92	12:42:01.9	2.61	HE4		EXP	?
76	324586	4/13/92	10:29:01.2	2.20	HE5		EXP	?
47	301933	11/27/91	12:05:40.7	2.28	HE9		EXP	A

Table 156: Events found in the Helsinki bulletin for area 56

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
49	302419	11/29/91	12:52:52.0	2.21	HE9		EXP	A
62	320966	3/16/92	12:49:23.8	2.33	HE9		EXP	A
100	335075	8/4/92	12:17:08.6	2.33	HE9		EXP	A
2	3347	11/23/90	12:20:24.3	2.30	HB6		EXP	B
9	9617	12/21/90	12:54:51.2	2.48	HB6		EXP	B
15	9379	1/29/91	12:12:45.9	2.22	HB6		EXP	B
16	10929	2/4/91	11:21:11.8	2.20	HB6		EXP	B
18	13676	3/8/91	11:21:25.2	2.42	HB6		EXP	B
19	13732	3/11/91	11:31:58.2	2.44	HB6		EXP	B
20	142	3/12/91	13:48:08.4	2.42	HB6		EXP	B
21	14375	3/13/91	12:04:17.9	2.47	HB6		EXP	B
22	14467	3/14/91	11:21:16.7	2.31	HB6		EXP	B
23	15262	3/21/91	12:43:30.5	2.50	HB6		EXP	B
24	16608	4/2/91	10:06:34.3	2.29	HB6		EXP	B
26	17427	4/9/91	09:06:34.6	2.23	HB6		EXP	B
27	18195	4/15/91	10:08:16.0	2.45	HB6		EXP	B
28	19447	4/22/91	11:54:37.9	2.42	59.26	27.13	QB	B
29	22454	4/23/91	09:24:30.7	2.28	59.23	27.14	QB	B
32	20035	4/26/91	10:12:37.9	2.29	59.27	27.12	QB	B
36	23210	5/21/91	11:02:52.4	2.22	59.28	27.19	-	B
38	25862	6/7/91	08:52:55.5	2.41	HE4		EXP	B
39	28175	6/28/91	12:09:54.2	2.23	HE4		EXP	B
41	32159	7/26/91	11:40:22.7	2.25	HE4		EXP	B
43	39875	9/16/91	11:42:47.1	2.23	HE4		EXP	B
44	41775	9/27/91	11:47:47.5	2.43	HE4		EXP	B
46	301855	11/20/91	10:45:57.3	2.21	HE4		EXP	B
48	301898	11/28/91	12:45:23.1	2.55	HE4		EXP	B
56	320699	2/27/92	10:08:30.2	2.38	HE4A		EXP	B

Table 156: Events found in the Helsinki bulletin for area 56

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
57	320933	2/28/92	11:27:10.6	2.44	HE4A		EXP	B
63	323149	3/31/92	11:09:49.6	2.41	HE4		EXP	B
67	324891	4/1/92	12:16:28.8	2.37	HE4		EXP	B
68	325182	4/2/92	09:45:17.9	2.39	HE4		EXP	B
71	325748	4/3/92	11:08:59.2	2.51	HE4		EXP	B
72	326497	4/8/92	10:58:02.6	2.36	HE4A		EXP	B
73	326806	4/9/92	11:32:59.6	2.25	HE4		EXP	B
75	324444	4/10/92	12:28:48.7	2.37	HE4A		EXP	B
77	324587	4/13/92	10:53:34.2	2.41	HE4A		EXP	B
80	326490	4/20/92	12:47:59.3	2.34	HE4		EXP	B
84	327512	5/11/92	11:26:58.8	2.64	HE4		EXP	B
89	331005	6/18/92	11:08:43.0	2.31	HE4		EXP	B
90	331072	6/19/92	11:21:54.6	2.25	HE4		EXP	B
91	3317	6/26/92	11:58:41.2	2.21	HE4A		EXP	B
92	333061	7/3/92	11:13:30.8	2.22	HE4A		EXP	B
94	334458	7/15/92	10:37:33.3	2.27	HE4		EXP	B
95	333839	7/20/92	09:23:08.8	2.27	HE4		EXP	B
97	334525	7/28/92	11:34:09.8	2.27	HE4A		EXP	B
102	336561	8/21/92	10:25:46.4	2.21	59.27	27.19	-	B
103	337468	8/31/92	10:29:35.6	2.23	59.35	27.05	-	B
104	339526	9/22/92	09:34:59.5	2.41	59.37	27.09	-	B
105	340513	9/23/92	10:57:57.1	2.33	59.40	27.17	-	B
106	340121	9/25/92	09:03:40.1	2.31	59.26	27.18	-	B
107	340311	9/28/92	12:28:52.8	2.51	59.26	27.24	-	B
12	6819	12/29/90	11:32:34.1	2.24	HB9		EXP	C
70	325624	4/2/92	12:57:31.5	2.24	HE6		EXP	C
81	326398	4/29/92	11:45:55.2	2.41	HE6		EXP	C
7	4327	12/18/90	09:48:31.1	2.52	59.29	27.54	-	D

Table 156: Events found in the Helsinki bulletin for area 56

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
30	19729	4/24/91	12:24:44.4	2.31	59.3	27.63	LB	D
52	315352	1/31/92	09:30:05.4	2.43	HE6		EXP	D
58	320936	2/28/92	11:33:26.1	2.30	HE6A		EXP	D
60	319811	3/5/92	12:19:08.1	2.40	HE6		EXP	D
64	323153	3/31/92	12:01:37.7	2.29	HE6A		EXP	D
74	324431	4/10/92	11:38:30.9	2.22	HE6		EXP	D
79	325014	4/16/92	10:37:44.0	2.26	HE6A		EXP	D
86	328286	5/19/92	11:25:43.7	2.21	HE6A		EXP	D
96	334070	7/22/92	12:30:05.3	2.21	HE6A		EXP	D
98	334785	7/31/92	09:37:42.9	2.20	HE6A		EXP	D
6	4245	12/17/90	11:10:06.6	2.38	HB9		EXP	E
34	20313	4/30/91	10:13:09.9	2.24	59.32	27.71	-	E
66	324861	4/1/92	11:03:03.3	2.43	HE6		EXP	E
17	12924	2/6/91	10:41:12.6	2.23	HB9		EXP	F
87	329122	5/27/92	11:13:37.9	2.22	HE5		EXP	F
33	20309	4/30/91	09:19:19.4	2.38	59.32	27.39	P.QB	G
50	313660	1/16/92	12:18:36.9	2.23	HE5		EXP	H
61	320964	3/16/92	11:56:13.3	2.27	HE5		EXP	H
83	327327	5/8/92	10:57:30.0	2.49	HE5		EXP	H
51	313191	1/28/92	11:09:05.0	2.26	59.35	27.64	-	I
99	335056	8/4/92	10:10:42.9	2.44	HE4		EXP	J
101	335149	8/5/92	11:00:04.2	2.39	HE4		EXP	J
4	10040	11/29/90	12:12:58.2	2.24	HB6		EXP	K
10	314557	12/27/90	11:45:36.3	2.20	HB6		EXP	K
25	17292	4/8/91	08:45:28.0	2.21	HB6		EXP	K
78	324801	4/15/92	10:58:45.5	2.39	HE4		EXP	K
42	36904	8/27/91	12:41:14.5	2.35	HE4		EXP	L

Table 156: Events found in the Helsinki bulletin for area 56

Event #	IMS orid	IMS origin time		IMS ml	HEL location	HEL label	Group
82	327003	5/5/92	11:12:27.1	2.20	HE4A	EXP	L
85	328271	5/19/92	10:23:16.0	2.27	HE4	EXP	L

Events with the most reliable classification:

Table 157: Sorted events for area 56

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
47	301933	11/27/91	12:05:40.7	59.3894	26.2496	2.28	A
49	302419	11/29/91	12:52:52.0	59.4707	26.4447	2.21	A
62	320966	3/16/92	12:49:23.8	59.5156	26.3601	2.33	A
100	335075	8/4/92	12:17:08.6	59.3681	26.6952	2.33	A
114	341852	10/22/92	13:28:28.2	59.5219	26.4925	2.35	A
2	3347	11/23/90	12:20:24.3	59.2021	27.0459	2.30	B
9	9617	12/21/90	12:54:51.2	59.2592	27.0414	2.48	B
15	9379	1/29/91	12:12:45.9	59.1936	27.2855	2.22	B
16	10929	2/4/91	11:21:11.8	59.2766	27.0500	2.20	B
18	13676	3/8/91	11:21:25.2	59.1745	27.1718	2.42	B
19	13732	3/11/91	11:31:58.2	59.3298	27.0021	2.44	B
20	14200	3/12/91	13:48:08.4	59.1969	27.1446	2.42	B
21	14375	3/13/91	12:04:17.9	59.1951	27.1483	2.47	B
22	14467	3/14/91	11:21:16.7	59.2377	27.0553	2.31	B
23	15262	3/21/91	12:43:30.5	59.3794	27.2065	2.50	B
24	16608	4/2/91	10:06:34.3	59.2136	27.1976	2.29	B
26	17427	4/9/91	09:06:34.6	59.2049	27.5368	2.23	B
27	18195	4/15/91	10:08:16.0	59.3141	27.0124	2.45	B
28	19447	4/22/91	11:54:37.9	59.2866	27.0900	2.42	B
29	22454	4/23/91	09:24:30.7	59.2707	26.9892	2.28	B
32	20035	4/26/91	10:12:37.9	59.3224	27.0340	2.29	B
36	23210	5/21/91	11:02:52.4	59.3732	27.2519	2.22	B

Table 157: Sorted events for area 56

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
38	25862	6/7/91	08:52:55.5	59.3678	27.0244	2.41	B
39	28175	6/28/91	12:09:54.2	59.2987	27.1047	2.23	B
41	32159	7/26/91	11:40:22.7	59.2373	26.9424	2.25	B
43	39875	9/16/91	11:42:47.1	59.3024	27.1204	2.23	B
44	41775	9/27/91	11:47:47.5	59.3380	26.9646	2.43	B
46	301855	11/20/91	10:45:57.3	59.3141	27.0416	2.21	B
48	301898	11/28/91	12:45:23.1	59.3779	27.2237	2.55	B
56	320699	2/27/92	10:08:30.2	59.3276	26.9491	2.38	B
57	320933	2/28/92	11:27:10.6	59.4233	27.1842	2.44	B
63	323149	3/31/92	11:09:49.6	59.3580	26.9079	2.41	B
67	324891	4/1/92	12:16:28.8	59.3622	27.0035	2.37	B
68	325182	4/2/92	09:45:17.9	59.3521	27.0082	2.39	B
71	325748	4/3/92	11:08:59.2	59.3402	27.0450	2.51	B
72	326497	4/8/92	10:58:02.6	59.1850	27.1454	2.36	B
73	326806	4/9/92	11:32:59.6	59.3348	26.9497	2.25	B
75	324444	4/10/92	12:28:48.7	59.3277	26.9577	2.37	B
77	324587	4/13/92	10:53:34.2	59.3326	27.0214	2.41	B
80	326490	4/20/92	12:47:59.3	59.3065	26.9254	2.34	B
84	327512	5/11/92	11:26:58.8	59.3855	27.3022	2.64	B
88	330913	6/17/92	11:31:52.4	59.3540	27.2066	2.41	B
89	331005	6/18/92	11:08:43.0	59.3907	27.0590	2.31	B
90	331072	6/19/92	11:21:54.6	59.3527	27.0287	2.25	B
91	331700	6/26/92	11:58:41.2	59.3628	26.8502	2.21	B
92	333061	7/3/92	11:13:30.8	59.2343	27.1041	2.22	B
93	333300	7/14/92	10:01:53.5	59.3588	27.0840	2.31	B
94	334458	7/15/92	10:37:33.3	59.3434	27.1561	2.27	B
95	333839	7/20/92	09:23:08.8	59.3442	27.0237	2.27	B
97	334525	7/28/92	11:34:09.8	59.3568	27.0704	2.27	B

Table 157: Sorted events for area 56

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
102	336561	8/21/92	10:25:46.4	58.6741	27.3505	2.21	B
103	337468	8/31/92	10:29:35.6	59.3693	27.0796	2.23	B
104	339526	9/22/92	09:34:59.5	59.3876	27.2665	2.41	B
105	340513	9/23/92	10:57:57.1	59.2948	27.0157	2.33	B
106	340121	9/25/92	09:03:40.1	58.7574	27.3314	2.31	B
107	340311	9/28/92	12:28:52.8	59.2406	27.3756	2.51	B
109	340923	10/7/92	10:51:14.2	59.3749	26.9316	2.21	B
110	341027	10/9/92	10:47:06.7	59.4415	27.3429	2.26	B
111	341248	10/13/92	11:28:54.4	59.3839	26.9641	2.26	B
117	347436	1/8/93	12:33:25.2	59.4539	27.2012	2.23	B
12	6819	12/29/90	11:32:34.1	59.2565	27.4446	2.24	C
65	323183	3/31/92	12:42:54.3	59.2947	27.5058	2.41	C
70	325624	4/2/92	12:57:31.5	59.2695	27.7815	2.24	C
81	326398	4/29/92	11:45:55.2	59.1410	27.8101	2.41	C
7	4327	12/18/90	09:48:31.1	59.1852	27.7200	2.52	D
11	7018	12/28/90	10:06:17.2	59.2550	27.6595	2.22	D
30	19729	4/24/91	12:24:44.4	59.3493	27.4795	2.31	D
52	315352	1/31/92	09:30:05.4	59.2726	27.6778	2.43	D
58	320936	2/28/92	11:33:26.1	59.1504	27.5863	2.30	D
60	319811	3/5/92	12:19:08.1	59.2467	27.6004	2.40	D
64	323153	3/31/92	12:01:37.7	59.2772	27.6020	2.29	D
69	325619	4/2/92	12:14:05.1	59.3400	27.6370	2.32	D
74	324431	4/10/92	11:38:30.9	59.2520	27.1311	2.22	D
79	325014	4/16/92	10:37:44.0	59.2154	27.6069	2.26	D
86	328286	5/19/92	11:25:43.7	59.9926	27.2049	2.21	D
96	334070	7/22/92	12:30:05.3	59.0312	27.7967	2.21	D
98	334785	7/31/92	09:37:42.9	59.3053	27.6824	2.20	D
6	4245	12/17/90	11:10:06.6	59.1959	27.7027	2.38	E

Table 157: Sorted events for area 56

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
34	20313	4/30/91	10:13:09.9	59.3138	27.6136	2.24	E
66	324861	4/1/92	11:03:03.3	59.2513	27.4739	2.43	E
17	12924	2/6/91	10:41:12.6	59.3176	27.7736	2.23	F
87	329122	5/27/92	11:13:37.9	59.3031	27.6217	2.22	F
33	20309	4/30/91	09:19:19.4	59.1735	27.4995	2.38	G
112	341408	10/15/92	10:31:15.7	59.5879	27.7401	2.22	G
50	313660	1/16/92	12:18:36.9	59.2697	27.5855	2.23	H
61	320964	3/16/92	11:56:13.3	59.3953	27.5578	2.27	H
83	327327	5/8/92	10:57:30.0	58.9911	27.8396	2.49	H
108	341044	10/5/92	09:26:03.0	59.2290	27.7198	2.22	H
51	313191	1/28/92	11:09:05.0	59.3068	27.6108	2.26	I
115	342223	10/26/92	11:48:50.8	59.4642	27.2549	2.22	I
99	335056	8/4/92	10:10:42.9	59.3432	26.9877	2.44	J
101	335149	8/5/92	11:00:04.2	59.2884	26.9169	2.39	J
113	341834	10/22/92	11:23:15.1	59.1806	27.0452	2.37	J
4	10040	11/29/90	12:12:58.2	59.2736	27.0922	2.24	K
10	314557	12/27/90	11:45:36.3	59.1658	27.0988	2.20	K
25	17292	4/8/91	08:45:28.0	59.3370	27.1269	2.21	K
78	324801	4/15/92	10:58:45.5	59.3440	26.9071	2.39	K
35	20314	4/30/91	10:16:08.4	59.2033	27.0870	2.33	L
42	36904	8/27/91	12:41:14.5	59.3616	26.8391	2.35	L
82	327003	5/5/92	11:12:27.1	59.3487	26.8881	2.20	L
85	328271	5/19/92	10:23:16.0	59.3887	27.1242	2.27	L
116	342397	10/29/92	10:58:23.8	59.3865	27.0316	2.31	L

Remarks:

- This area shows an important mining activity.
- According to the Helsinki bulletin identification, events from group A originate from mine HE9; events from groups F and H originate from mine HE5; events from groups J and K originate from mine HE4.

- Events from groups B and L shows locations either at mine HE4 or from at mine HE4A. These two mines are only 11 km apart.
- Events from group D are located either at mine HE6 or at mine HE6A. These mines are 7.5 km apart.

Mine and event locations:

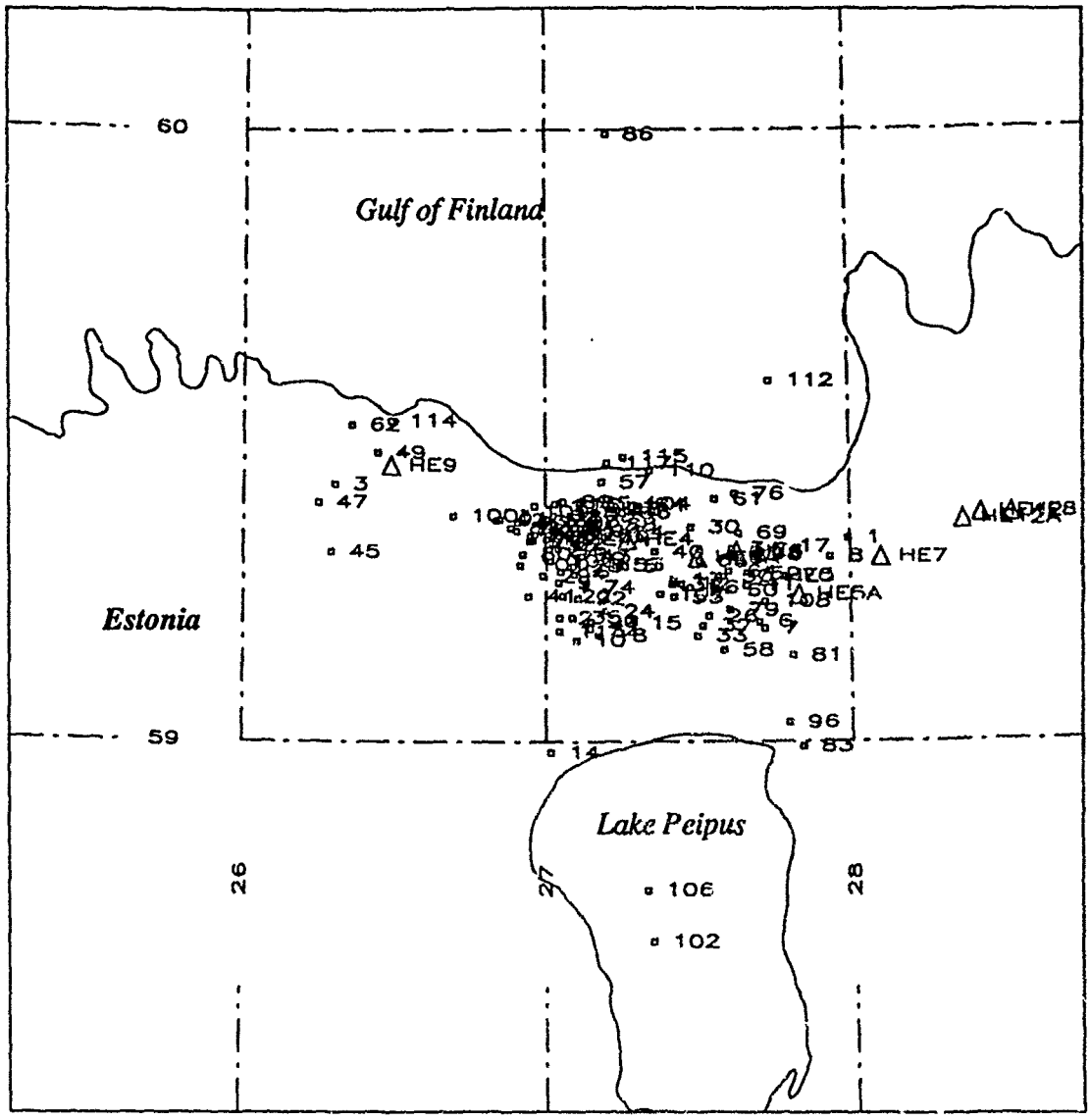

Figure 44: Mine and IMS event locations for area 56.

AREA 57

Latitude: 58 - 60°N
Longitude: 28 - 29°E
Local magnitude range: > 2.0
Number of events in IMS2: 384
Number of events within the magnitude range: 114
Number of processed events: 89
Frequency range used to process the data: 1 - 16 Hz
Processed signal length: 6 s. before *P*, 56 s. after *P*
Number of reference events: 11

Table 158: Reference events for area 57

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
78	332106	1324635	2226904	0.82	A
89	345332	1528393	2884820	0.82	B
14	17933	734193	578800	0.84	C
21	23989	793027	804921	0.85	D
64	321016	1215872	1821588	0.85	E
81	332780	1326675	2258518	0.83	F
53	313122	1033136	1633420	0.81	G
4	314512	563794	671767	0.83	H
22	24158	796601	808083	0.86	I
69	327925	1276466	2078628	0.84	J
88	340648	1459490	2736186	0.82	K

Reported mine locations:

Table 159: Mine locations for area 57

Label	Latitude	Longitude	Origin
HB11	59.3	28.1	old_Hels
HE7	59.3	28.1	Hels
HE12A	59.36	28.37	Hels
SB12	59.364	28.365	SPOT

Table 159: Mine locations for area 57

Label	Latitude	Longitude	Origin
SB14	59.369	28.527	SPOT
HE12	59.37	28.43	Hels
HE8	59.37	28.53	Hels
SB13	59.370	28.428	SPOT
HB12	59.4	28.4	old_Hels
HB13	59.4	28.5	old_Hels

Number of events found in the Helsinki bulletin: 82

Table 160: Events found in the Helsinki bulletttin for area 57

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
6	6019	1/5/91	12:00:13.6	2.21	HB13		EXP	?
16	19265	4/19/91	12:00:52.1	2.49	HB12		EXP	?
34	300377	10/17/91	13:01:36.8	2.31	HE8		EXP	?
36	301137	11/5/91	10:35:56.7	2.08	HE5		EXP	?
37	301641	11/14/91	13:05:41.4	2.13	HE8		EXP	?
46	303404	12/23/91	11:57:37.0	2.05	HE8		EXP	?
50	303463	1/8/92	13:43:03.2	2.08	HE8		EXP	?
62	319748	3/4/92	12:03:11.5	2.06	HE8		EXP	?
63	320315	3/11/92	12:01:36.0	2.08	HE8		EXP	?
66	324591	4/13/92	10:46:40.0	2.06	HE6A		EXP	?
75	329829	6/5/92	10:59:40.9	2.01	HE8		EXP	?
2	2645	11/16/90	12:01:03.8	2.12	HB13		EXP	A
13	17613	4/11/91	12:07:56.0	2.12	HB13		EXP	A
17	19885	4/23/91	12:00:28.3	2.15	59.44	28.56	QB	A
25	25683	6/5/91	12:51:34.9	2.04	HE8		EXP	A
43	302633	12/2/91	12:02:16.0	2.23	HE8		EXP	A
47	303515	12/24/91	12:03:52.2	2.16	59.35	28.69	-	A
51	303582	1/14/92	12:01:39.7	2.31	HE8		EXP	A

Table 160: Events found in the Helsinki bulletttin for area 57

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
73	329293	5/29/92	11:05:53.6	2.04	HE8		EXP	A
74	329657	6/3/92	11:23:39.4	2.00	59.26	28.55	-	A
78	332106	7/1/92	11:01:47.2	2.16	HE8		EXP	A
85	336813	8/24/92	10:54:01.3	2.07	59.40	28.72	-	A
86	337146	8/27/92	11:03:46.8	2.04	59.36	28.56	-	A
87	338781	9/14/92	11:00:58.2	2.00	59.41	28.61	-	A
23	24257	5/29/91	12:00:56.4	2.63	59.42	28.30	-	B
30	41712	9/26/91	12:02:44.2	2.01	HE8		EXP	B
31	41780	9/27/91	12:23:00.8	2.29	HE8		EXP	B
57	315410	1/27/92	11:30:12.0	2.23	HE7		EXP	B
58	315357	1/31/92	11:25:23.1	2.24	HE8		EXP	B
59	315376	1/31/92	12:39:16.7	2.02	HE8		EXP	B
61	319809	3/5/92	12:01:31.3	2.21	HE7		EXP	B
3	314049	12/10/90	13:40:41.2	2.42	HB13		EXP	C
8	7710	1/15/91	12:01:37.6	2.14	HB12		EXP	C
14	17933	4/13/91	09:27:37.5	2.45	HB13		EXP	C
20	21682	4/30/91	12:13:59.0	2.15	59.42	28.55	QB	C
29	41643	9/25/91	12:02:17.5	2.02	HE8		EXP	C
38	301934	11/21/91	13:13:35.8	2.11	HE12A		EXP	C
42	302438	11/29/91	13:35:37.0	2.09	HE8		EXP	C
44	302826	12/11/91	12:27:31.7	2.21	HE12A		EXP	C
68	328079	5/14/92	10:30:09.2	2.26	HE8		EXP	C
70	328284	5/19/92	11:04:39.2	2.13	HE7		EXP	C
5	7225	12/27/90	12:06:45.9	2.04	HB13		EXP	D
18	19469	4/26/91	12:00:54.4	2.18	59.19	28.32	QB	D
21	23989	5/24/91	12:00:38.4	2.41	59.48	28.54	-	D
40	301902	11/28/91	13:04:25.8	2.12	HE8		EXP	D
64	321016	3/18/92	12:01:18.0	2.05	HE8		EXP	E

Table 160: Events found in the Helsinki bulletttin for area 57

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
32	300216	10/15/91	13:00:56.6	2.27	HE8		EXP	F
54	315318	1/24/92	09:46:16.2	2.01	HE8		EXP	F
65	325991	4/6/92	07:00:21.9	2.13	HE8		EXP	F
77	330998	6/18/92	11:00:57.2	2.10	HE8		EXP	F
79	332201	7/2/92	10:59:01.3	2.12	HE8		EXP	F
81	332780	7/9/92	11:01:09.3	2.28	HE8		EXP	F
82	332882	7/10/92	10:59:38.6	2.09	59.37	28.43	-	F
1	5252	11/14/90	11:58:36.6	2.16	HE7		EXP	G
9	8997	1/25/91	12:03:16.1	2.06	HB13		EXP	G
53	313122	1/13/92	12:03:19.7	2.05	HE8		EXP	G
60	321215	3/2/92	12:00:03.7	2.05	HE8		EXP	G
4	314512	12/25/90	12:04:38.4	2.42	HE7		EXP	H
15	18633	4/17/91	12:00:16.8	2.48	HE7		EXP	H
19	21681	4/30/91	12:10:42.6	2.28	59.30	28.07	-QB	H
24	25371	6/4/91	13:12:53.5	2.11	HE8		EXP	H
35	301027	11/1/91	12:52:40.9	2.41	HE8		EXP	H
48	303095	12/28/91	12:04:44.2	2.56	HE8		EXP	H
52	312770	12/26/91	12:58:44.1	2.17	HE8		EXP	H
55	312833	12/27/91	12:02:40.0	2.10	HE8		EXP	H
72	328555	5/21/92	11:03:34.9	2.34	HE8		EXP	H
7	7484	1/14/91	11:59:43.9	2.14	HB13		EXP	I
22	24158	5/28/91	12:03:20.3	2.48	59.40	28.49	-	I
56	313227	1/30/92	11:21:38.4	2.15	HE8		EXP	I
80	332562	7/7/92	11:00:04.6	2.18	HE8		EXP	I
83	333171	7/13/92	11:02:29.3	2.14	HE8		EXP	I
10	9354	1/28/91	12:03:04.5	2.28	HB13		EXP	J
11	16782	4/2/91	12:00:50.3	2.15	HE7		EXP	J
12	17446	4/9/91	12:01:59.4	2.26	HE7		EXP	J

Table 160: Events found in the Helsinki bulletttin for area 57

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
27	40661	9/20/91	12:00:44.9	2.22	HE12		EXP	J
39	301989	11/22/91	13:03:52.1	2.16	HE8		EXP	J
41	302253	11/25/91	13:00:13.3	2.25	HE8		EXP	J
67	327123	5/6/92	11:38:33.3	2.16	HE12A		EXP	J
69	327925	5/15/92	11:16:40.1	2.23	HE12		EXP	J
84	336067	8/17/92	11:01:51.3	2.18	59.33	28.31	-	J
33	300289	10/16/91	13:00:28.5	2.02	HE8		EXP	K
71	328394	5/20/92	11:01:43.9	2.05	HE8		EXP	K

Events with the most reliable classification:

Table 161: Sorted events for area 57

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
2	2645	11/16/90	12:01:03.8	59.4395	28.0827	2.12	A
13	17613	4/11/91	12:07:56.0	59.3921	28.3805	2.12	A
17	19885	4/23/91	12:00:28.3	59.2431	28.1996	2.15	A
25	25683	6/5/91	12:51:34.9	59.4077	28.3799	2.04	A
43	302633	12/2/91	12:02:16.0	59.3986	28.4219	2.23	A
47	303515	12/24/91	12:03:52.2	59.2583	28.5875	2.16	A
51	303582	1/14/92	12:01:39.7	59.3516	28.0746	2.31	A
73	329293	5/29/92	11:05:53.6	59.5492	28.0573	2.04	A
74	329657	6/3/92	11:23:39.4	59.4617	28.1482	2.00	A
78	332106	7/1/92	11:01:47.2	58.9892	28.3761	2.16	A
85	336813	8/24/92	10:54:01.3	59.4310	28.3635	2.07	A
86	337146	8/27/92	11:03:46.8	59.3348	28.2032	2.04	A
87	338781	9/14/92	11:00:58.2	59.3878	28.2035	2.00	A
23	24257	5/29/91	12:00:56.4	59.5083	28.1686	2.63	B
30	41712	9/26/91	12:02:44.2	59.3300	28.3945	2.01	B
31	41780	9/27/91	12:23:00.8	59.4935	28.1633	2.29	B

Table 161: Sorted events for area 57

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
57	315410	1/27/92	11:30:12.0	59.2801	28.5051	2.23	B
58	315357	1/31/92	11:25:23.1	59.3236	28.1465	2.24	B
59	315376	1/31/92	12:39:16.7	59.3997	28.1151	2.02	B
61	319809	3/5/92	12:01:31.3	59.2845	28.3806	2.21	B
89	345332	12/11/92	08:25:47.3	59.5652	28.0141	2.08	B
3	314049	12/10/90	13:40:41.2	59.4663	28.1736	2.42	C
8	7710	1/15/91	12:01:37.6	59.3296	28.2510	2.14	C
14	17933	4/13/91	09:27:37.5	59.4560	28.2665	2.45	C
20	21682	4/30/91	12:13:59.0	59.4410	28.1265	2.15	C
29	41643	9/25/91	12:02:17.5	59.2721	28.2675	2.02	C
38	301934	11/21/91	13:13:35.8	59.3575	28.3111	2.11	C
42	302438	11/29/91	13:35:37.0	59.3292	28.3243	2.09	C
44	302826	12/11/91	12:27:31.7	59.2793	28.1240	2.21	C
68	328079	5/14/92	10:30:09.2	59.2540	28.0519	2.26	C
70	328284	5/19/92	11:04:39.2	59.2208	28.3226	2.13	C
5	7225	12/27/90	12:06:45.9	59.3147	28.4385	2.04	D
18	19469	4/26/91	12:00:54.4	59.4346	28.1442	2.18	D
21	23989	5/24/91	12:00:38.4	59.4195	28.2461	2.41	D
40	301902	11/28/91	13:04:25.8	59.3708	28.2558	2.12	D
26	41014	9/19/91	14:05:25.4	59.2102	28.2880	2.04	E
28	40662	9/20/91	12:02:18.1	59.1550	28.2544	2.04	E
64	321016	3/18/92	12:01:18.0	59.3273	28.3586	2.05	E
32	300216	10/15/91	13:00:56.6	59.3020	28.2754	2.27	F
54	315318	1/24/92	09:46:16.2	59.3580	28.2926	2.01	F
65	325991	4/6/92	07:00:21.9	59.4180	28.3311	2.13	F
76	330676	6/16/92	11:00:37.8	59.0050	28.3673	2.06	F
77	330998	6/18/92	11:00:57.2	58.9598	28.2370	2.10	F
79	332201	7/2/92	10:59:01.3	59.4999	28.2604	2.12	F

Table 161: Sorted events for area 57

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
81	332780	7/9/92	11:01:09.3	59.2470	28.3928	2.28	F
82	332882	7/10/92	10:59:38.6	59.5634	28.1656	2.09	F
1	5252	11/14/90	11:58:36.6	59.3296	28.1699	2.16	G
9	8997	1/25/91	12:03:16.1	59.3852	28.3801	2.06	G
53	313122	1/13/92	12:03:19.7	59.3316	28.2736	2.05	G
60	321215	3/2/92	12:00:03.7	59.3325	28.2411	2.05	G
4	314512	12/25/90	12:04:38.4	59.2974	28.2139	2.42	H
15	18633	4/17/91	12:00:16.8	59.3676	28.2724	2.48	H
19	21681	4/30/91	12:10:42.6	59.3457	28.1572	2.28	H
24	25371	6/4/91	13:12:53.5	59.5319	28.0894	2.11	H
35	301027	11/1/91	12:52:40.9	59.2294	28.0643	2.41	H
48	303095	12/28/91	12:04:44.2	59.3870	28.3033	2.56	H
52	312770	12/26/91	12:58:44.1	59.2808	28.3808	2.17	H
55	312833	12/27/91	12:02:40.0	59.3741	28.3197	2.10	H
72	328555	5/21/92	11:03:34.9	59.3098	28.3733	2.34	H
7	7484	1/14/91	11:59:43.9	59.3174	28.2812	2.14	I
22	24158	5/28/91	12:03:20.3	59.5002	28.5226	2.48	I
56	313227	1/30/92	11:21:38.4	59.3983	28.2433	2.15	I
80	332562	7/7/92	11:00:04.6	59.0939	28.3357	2.18	I
83	333171	7/13/92	11:02:29.3	59.4015	28.4998	2.14	I
10	9354	1/28/91	12:03:04.5	59.4637	28.1004	2.28	J
11	16782	4/2/91	12:00:50.3	59.2999	28.2573	2.15	J
12	17446	4/9/91	12:01:59.4	59.5502	28.0291	2.26	J
27	40661	9/20/91	12:00:44.9	59.2880	28.2168	2.22	J
39	301989	11/22/91	13:03:52.1	59.4692	28.0023	2.16	J
41	302253	11/25/91	13:00:13.3	59.2953	28.0951	2.25	J
67	327123	5/6/92	11:38:33.3	59.5202	28.0235	2.16	J
69	327925	5/15/92	11:16:40.1	59.6317	28.1194	2.23	J

Table 161: Sorted events for area 57

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
84	336067	8/17/92	11:01:51.3	59.2988	28.1929	2.18	J
33	300289	10/16/91	13:00:28.5	59.2948	28.2969	2.02	K
71	328394	5/20/92	11:01:43.9	59.3435	28.0354	2.05	K
88	340648	10/2/92	12:00:15.3	59.2175	28.4387	2.10	K

Remarks:

- According to the Helsinki bulletin identification, events from groups A, D, E, F, I and K originate from mine HE8;
- Events from the other groups show locations from several mines (HE7, HE8 and HE12A) within the same group.

Mine and event locations:

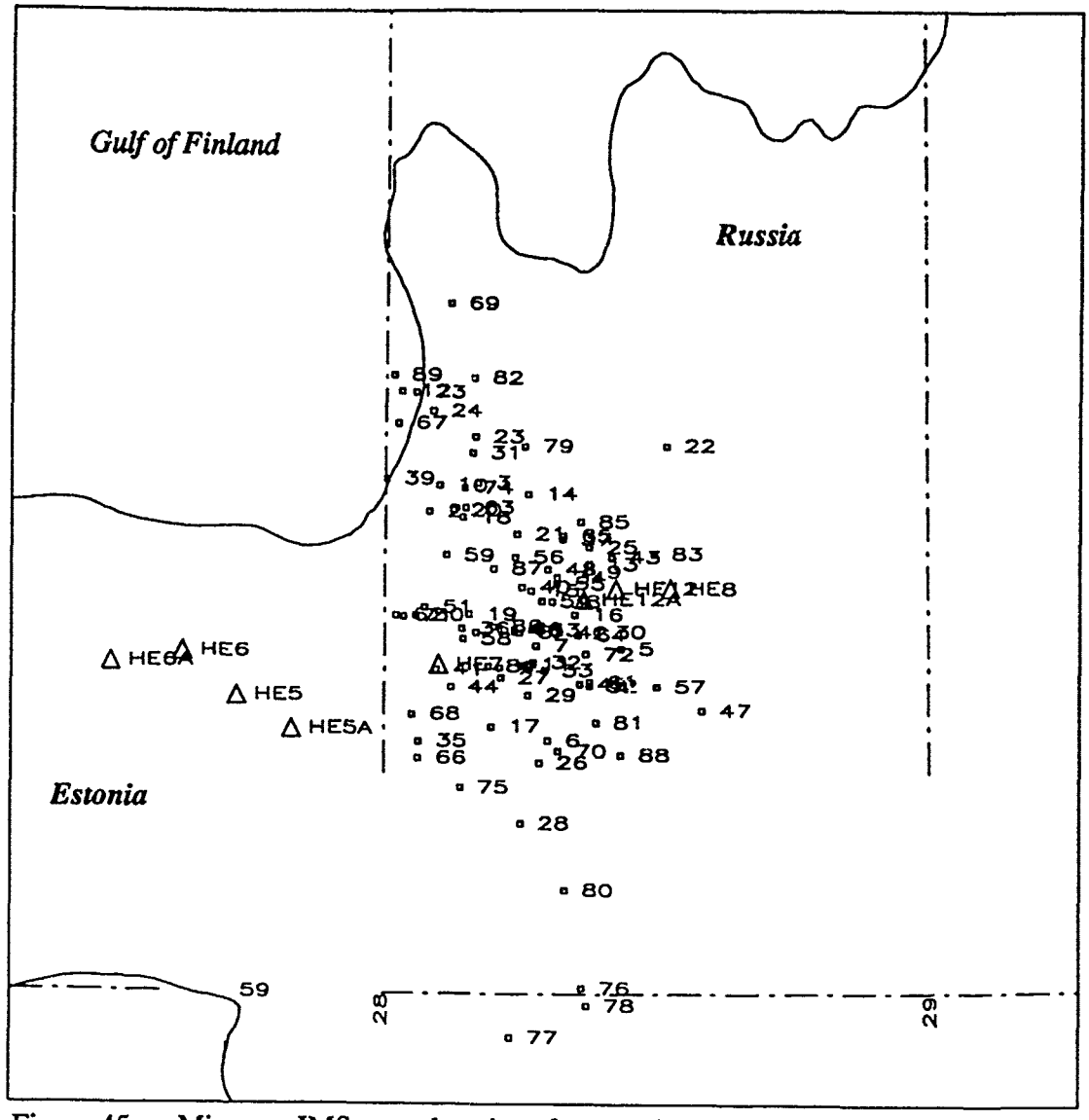

Figure 45: Mine ans IMS event locations for area 57.

AREA 58

Latitude: 58 -60°N
Longitude: 29 - 30°E
Local magnitude range: > 1.5
Number of events in IMS2: 64
Number of events within the magnitude range: 35
Number of processed events: 26
Frequency range used to process the data: 1- 16 Hz
Processed signal length: 6 s. before *P*, 56 s. after *P*
Number of reference events: 3

Table 162: Reference events for area 58

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
5	31266	860207	999965	0.77	A
23	331061	1292075	2183827	0.78	B
24	332018	1324347	2222776	0.93	C

Reported mine locations:

Table 163: Mine locations for area 58

Label	Latitude	Longitude	Origin
SB16	59.482	29.930	SPOT
HB16	59.6	30.0	old_Hels
HE11	59.6	30.0	Hels
HB15	60.0	29.9	old_Hels
HE10	60.0	29.9	Hels

Number of events found in the Helsinki bulletin: 12

Table 164: Events found in the Helsinki bulletin for area 58

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
15	319348	2/19/92	11:00:21.1	1.70	HE11		EXP	?
16	318343	2/24/92	12:50:51.2	1.91	HE11		EXP	?
10	41785	9/27/91	13:01:25.7	1.98	59.36	30.95	-	A

Table 164: Events found in the Helsinki bulletin for area 58

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
11	303517	12/24/91	12:27:57.0	1.70	HE11		EXP	A
12	312775	12/26/91	14:56:37.8	2.01	HE11		EXP	A
20	325809	4/20/92	09:41:38.8	1.60	HE11		EXP	A
21	328205	5/18/92	12:43:49.3	1.69	HE11		EXP	A
22	330039	6/9/92	10:40:13.4	1.57	HE11		EXP	A
23	331061	6/19/92	10:14:32.9	2.27	HE10		EXP	B
25	332079	7/1/92	07:11:49.1	2.56	HE10		EXP	B
24	332018	6/30/92	12:07:06.2	1.75	HV11		EXP	C
26	336431	8/20/92	10:09:31.1	2.10	60.59	29.05	-	C

Events with the most reliable classification:

Table 165: Sorted events for area 58

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
1	3192	11/20/90	13:01:32.2	59.5846	29.6680	1.98	A
2	9510	11/28/90	12:53:27.6	59.5807	29.8216	1.77	A
4	15967	3/28/91	11:48:14.0	59.7221	29.5065	1.51	A
5	31266	7/22/91	13:49:23.1	59.8984	29.7972	1.75	A
7	32749	7/30/91	12:39:35.8	59.5421	29.7011	1.53	A
8	36906	8/27/91	13:56:45.1	59.5375	29.5294	1.53	A
9	40897	9/19/91	10:06:52.4	59.3510	29.8820	1.86	A
10	41785	9/27/91	13:01:25.7	59.3934	29.8425	1.98	A
11	303517	12/24/91	12:27:57.0	59.4173	29.6493	1.70	A
12	312775	12/26/91	14:56:37.8	59.5200	29.7998	2.01	A
14	313197	1/28/92	11:52:56.6	59.4895	29.8046	1.77	A
17	319740	3/4/92	11:38:54.3	59.5171	29.8976	1.60	A
18	320963	3/16/92	11:51:45.2	59.4502	29.3829	1.66	A
19	323187	3/27/92	12:35:40.7	59.4133	29.4759	1.76	A
20	325809	4/20/92	09:41:38.8	59.4831	29.5424	1.60	A

Table 165: Sorted events for area 58

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
21	328205	5/18/92	12:43:49.3	59.3942	29.3945	1.69	A
22	330039	6/9/92	10:40:13.4	59.4802	29.4785	1.57	A
23	331061	6/19/92	10:14:32.9	59.9791	29.6340	2.27	B
25	332079	7/1/92	07:11:49.1	59.9810	29.8692	2.56	B
24	332018	6/30/92	12:07:06.2	59.8649	29.9498	1.75	C
26	336431	8/20/92	10:09:31.1	59.8949	29.9606	2.10	C

Remarks:

- According to the identification found in the Helsinki bulletin, events from group A originate from mine HE11 and events from group B originate from mine HE10.
- The IMS located events from group C on the southern shore of the Gulf of Finland while for the same events, the Helsinki bulletin gave locations on the other side of the Gulf of Finland.

Mine and event locations:

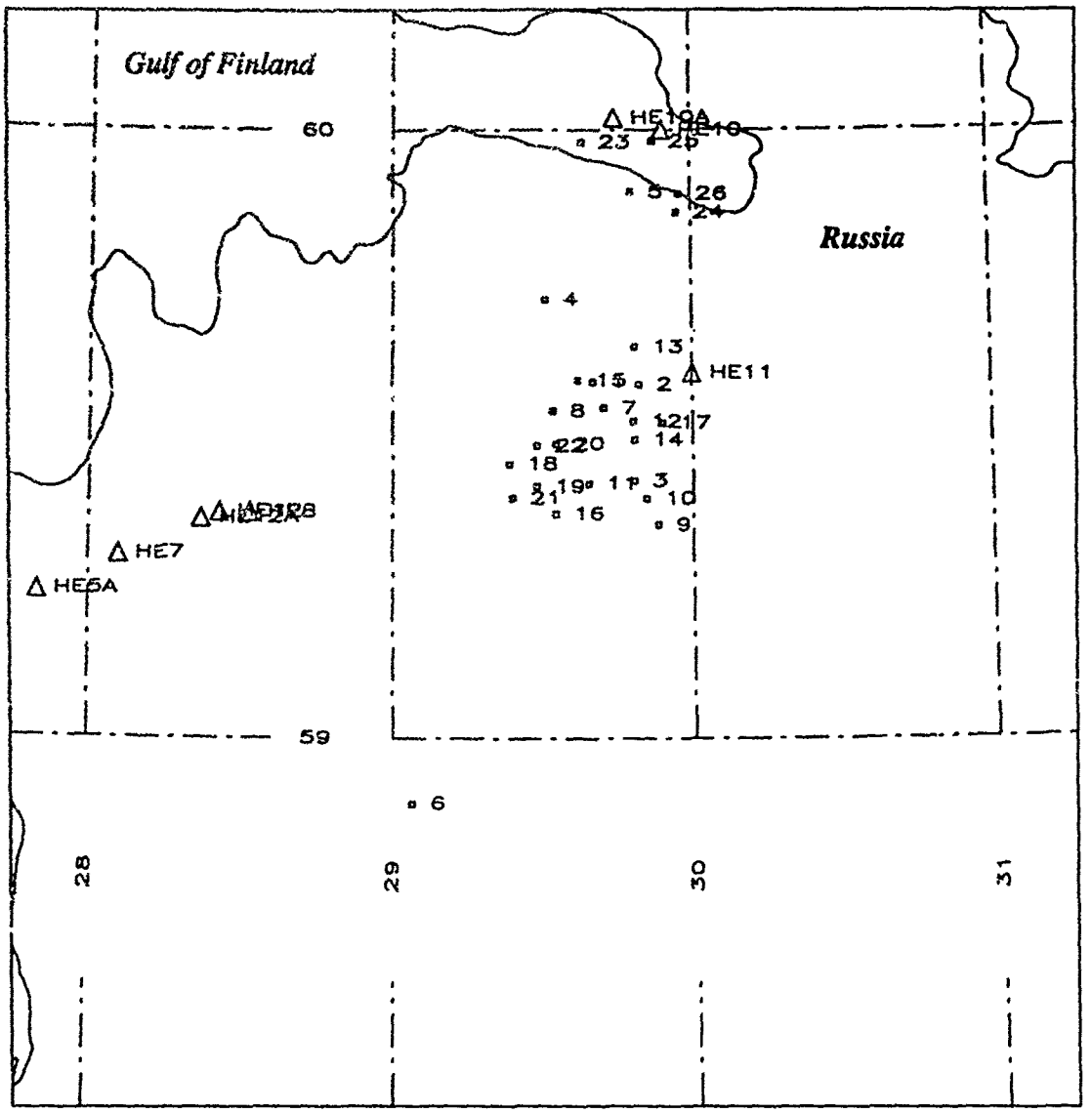

Figure 46: Mine and IMS event locations for area 58.

AREA 59

Latitude: 58 - 60°N
Longitude: 30 -36°E
Local magnitude range: > 1.5
Number of events in IMS2: 185
Number of events within the magnitude range: 157
Number of processed events: 121
Frequency range used to process the data: 2 - 16 Hz
Processed signal length: 10 s. before *P*, 90 s. after *P*
Number of reference events: 5

Table 166: Reference events for area 59

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
75	320309	1214005	1793676	0.81	A
1	5780	526235	627895	0.80	B
90	328179	1277251	2080176	0.80	C
97	331975	1324205	2221294	0.74	D
12	7476	588248	434834	0.85	E

Reported mine locations: None
Number of events found in the Helsinki bulletin: 2

Table 167: Events found in the Helsinki bulletin for area 59

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
103	336328	8/19/92	12:14:53.1	1.67	60.53	29.10	-	?
101	336151	8/18/92	11:33:30.3	1.96	59.52	33.99	-	D

Events with the most reliable classification:

Table 168: Sorted events for area 59

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
4	314046	12/10/90	12:11:58.3	59.5061	34.0647	1.57	A
6	4104	12/15/90	08:54:25.8	59.6309	34.2211	1.92	A
7	4247	12/17/90	11:48:15.9	59.6076	34.0714	1.94	A

Table 168: Sorted events for area 59

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
8	314487	12/24/90	11:00:54.9	59.4384	34.1109	1.75	A
13	10928	2/4/91	11:04:00.2	59.5988	33.8354	1.82	A
14	13217	3/6/91	12:30:29.2	59.6423	34.3260	2.02	A
16	14371	3/13/91	11:03:49.6	59.5040	34.0542	1.95	A
20	15000	3/16/91	08:44:10.0	59.4896	33.9862	1.81	A
21	15236	3/18/91	11:11:12.2	59.6517	34.4161	2.03	A
22	15116	3/20/91	12:18:56.3	59.4478	34.2216	1.87	A
24	16292	4/1/91	12:13:14.9	59.6108	34.2792	1.73	A
25	16786	4/2/91	12:08:05.1	59.8585	34.2863	1.77	A
28	19266	4/19/91	12:06:03.9	59.2011	34.1379	1.83	A
33	22167	5/13/91	11:49:51.1	59.7986	34.2036	2.04	A
36	23215	5/21/91	12:12:53.3	59.9341	34.2948	1.88	A
40	24928	6/1/91	08:27:01.3	59.7354	34.3174	1.93	A
43	31695	7/24/91	11:47:56.3	59.7013	34.3866	2.00	A
45	32931	7/31/91	12:48:09.3	59.6333	34.3382	1.97	A
46	34554	8/8/91	11:43:34.6	59.4565	34.2134	1.89	A
49	301497	11/10/91	13:12:51.2	59.6113	34.2332	1.89	A
54	302701	12/12/91	12:46:46.0	59.5289	34.2675	1.79	A
66	320290	2/26/92	11:13:56.5	59.7123	34.2680	1.89	A
67	320926	2/28/92	11:15:38.2	59.5260	34.2462	1.89	A
71	321667	3/6/92	11:52:27.4	59.6743	34.2941	1.83	A
73	320039	3/9/92	11:59:43.9	59.5156	34.1212	1.72	A
75	320309	3/11/92	11:56:31.7	59.5131	34.0504	2.11	A
91	329011	5/26/92	11:50:27.1	59.2985	34.5302	1.86	A
93	330022	6/9/92	08:33:37.2	59.8118	34.3222	1.74	A
95	331080	6/19/92	12:04:18.8	59.5799	34.2136	1.98	A
107	344276	11/25/92	11:31:25.4	59.7950	34.2208	1.83	A
108	344518	11/27/92	11:06:14.2	[illegible]	34.2838	1.91	A

Table 168: Sorted events for area 59

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
109	344769	12/2/92	09:33:58.5	59.6961	34.3594	1.82	A
1	5780	11/15/90	12:21:13.5	59.5188	34.3494	1.98	B
5	314063	12/11/90	11:15:15.0	59.6295	34.3655	1.82	B
29	18764	4/22/91	10:46:57.2	59.6340	34.3463	1.87	B
31	19710	4/24/91	11:10:29.7	59.1977	34.4492	1.86	B
59	315418	1/29/92	12:11:02.2	59.5451	33.9832	2.05	B
68	321210	3/2/92	11:04:57.4	59.4707	34.1426	1.88	B
70	319545	3/5/92	11:15:10.6	59.5501	34.1751	1.76	B
72	321688	3/6/92	12:32:15.1	59.4708	34.4838	1.90	B
74	322255	3/10/92	11:38:44.6	59.6460	33.9246	1.79	B
76	321541	3/12/92	11:27:06.0	59.4174	34.1796	2.09	B
80	321514	3/17/92	10:14:19.6	59.3937	33.8682	1.88	B
82	322208	3/21/92	13:15:23.1	59.5575	34.2561	1.90	B
83	323101	3/25/92	08:45:49.9	59.3971	34.0139	1.98	B
89	325011	4/16/92	10:03:32.3	59.3934	34.2327	1.69	B
114	346279	12/24/92	08:47:31.1	59.6229	34.2427	1.91	B
115	346351	12/25/92	10:01:57.2	59.3889	33.9167	1.53	B
117	346738	12/30/92	10:15:04.7	59.5764	34.3288	1.80	B
118	346849	12/31/92	10:49:11.5	59.5555	34.1543	1.66	B
120	347160	1/5/93	09:48:15.0	59.6094	34.2583	1.81	B
121	347390	1/8/93	08:09:19.7	59.1964	34.0126	1.70	B
42	25885	6/7/91	12:47:52.3	59.5736	34.2584	2.02	C
87	323976	4/7/92	09:59:15.5	59.8041	34.3418	1.85	C
90	328179	5/18/92	09:36:39.9	59.8258	34.3004	1.68	C
9	314511	12/25/90	11:55:06.7	59.6501	34.4628	1.64	D
10	315828	1/2/91	11:45:34.5	59.9017	33.1204	1.86	D
32	19807	4/25/91	08:00:18.4	59.7824	35.7733	2.09	D
39	24573	5/30/91	12:31:33.5	59.8532	34.0800	1.95	D

Table 168: Sorted events for area 59

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
41	25747	6/6/91	12:40:25.4	59.0118	34.1586	2.11	D
77	320391	3/12/92	13:25:45.4	59.8179	32.6178	1.60	D
97	331975	6/30/92	07:27:25.1	59.6690	34.3197	1.95	D
101	336151	8/18/92	11:33:30.3	59.6634	34.2650	1.96	D
105	338083	9/7/92	10:13:32.2	59.4930	34.3913	1.74	D
106	338672	9/10/92	10:48:59.6	59.2455	34.0290	1.66	D
110	344926	12/4/92	12:33:10.0	59.5852	34.2285	1.62	D
111	345494	12/9/92	11:05:16.2	59.6758	34.2546	1.84	D
12	7476	1/14/91	11:09:09.1	59.4781	34.1205	1.80	E
88	326801	4/9/92	10:51:02.1	59.5507	34.2476	1.65	E

Remarks:

- A cluster of events is clearly seen on the map (Figure 47), despite the fact that no mines have been reported in this area.

Mine and event locations:

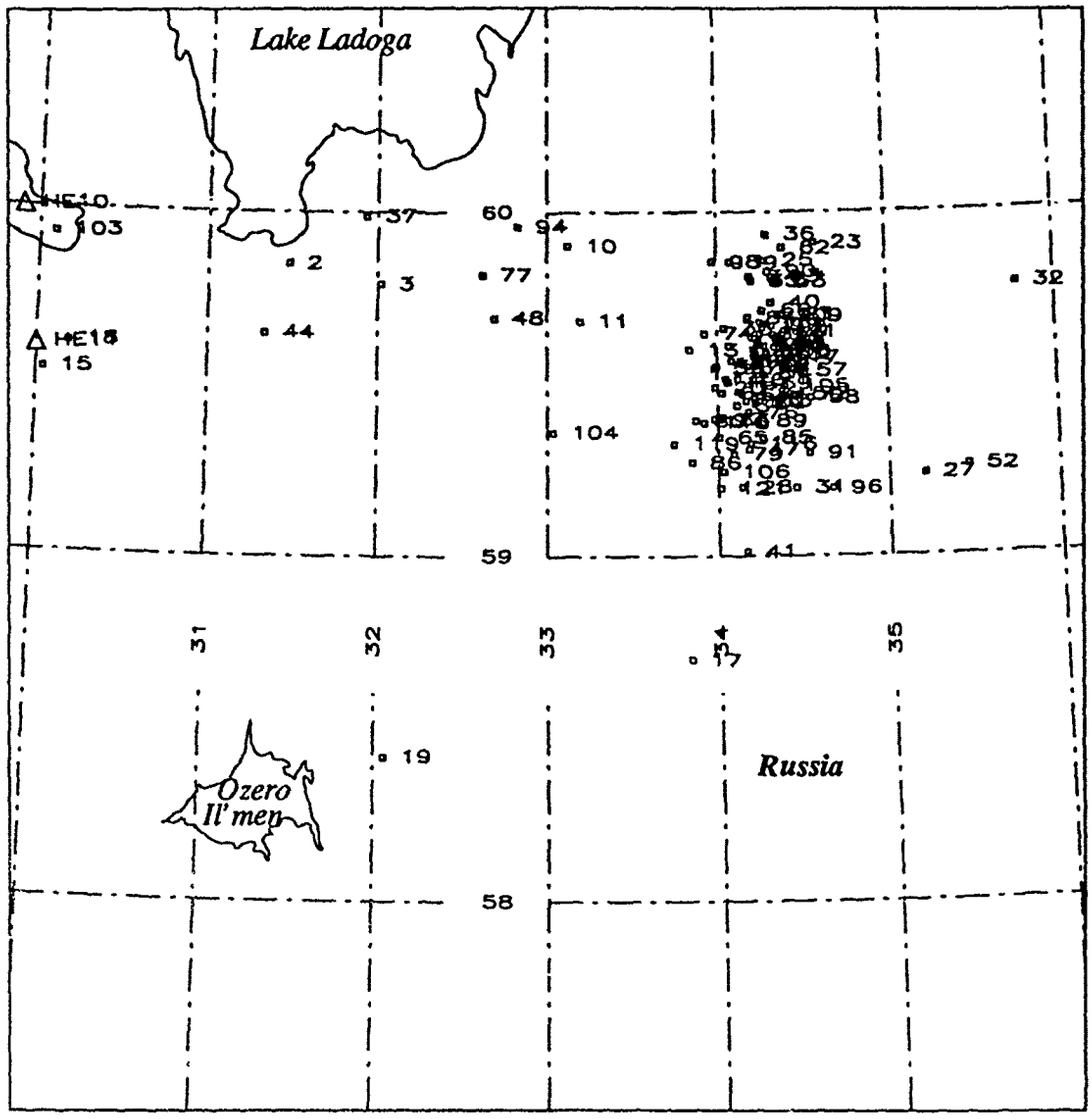

Figure 47: IMS event locations for area 59.

AREA 60

Latitude: 56 -58°N
Longitude: 30 -36 °E
Local magnitude range: -
Number of events in IMS2: 27
Number of events within the magnitude range: 27
Number of processed events: 16
Frequency range used to process the data: 3 - 16 Hz
Processed signal length: 12 s. before *P*, 112 s. after *P*
Number of reference events: None
Reported mine locations: None
Number of events found in the Helsinki bulletin: None
Events with the most reliable classification: None
Remarks:

- Small set of events with too low signal-to-noise ratios.

Mine and event locations:

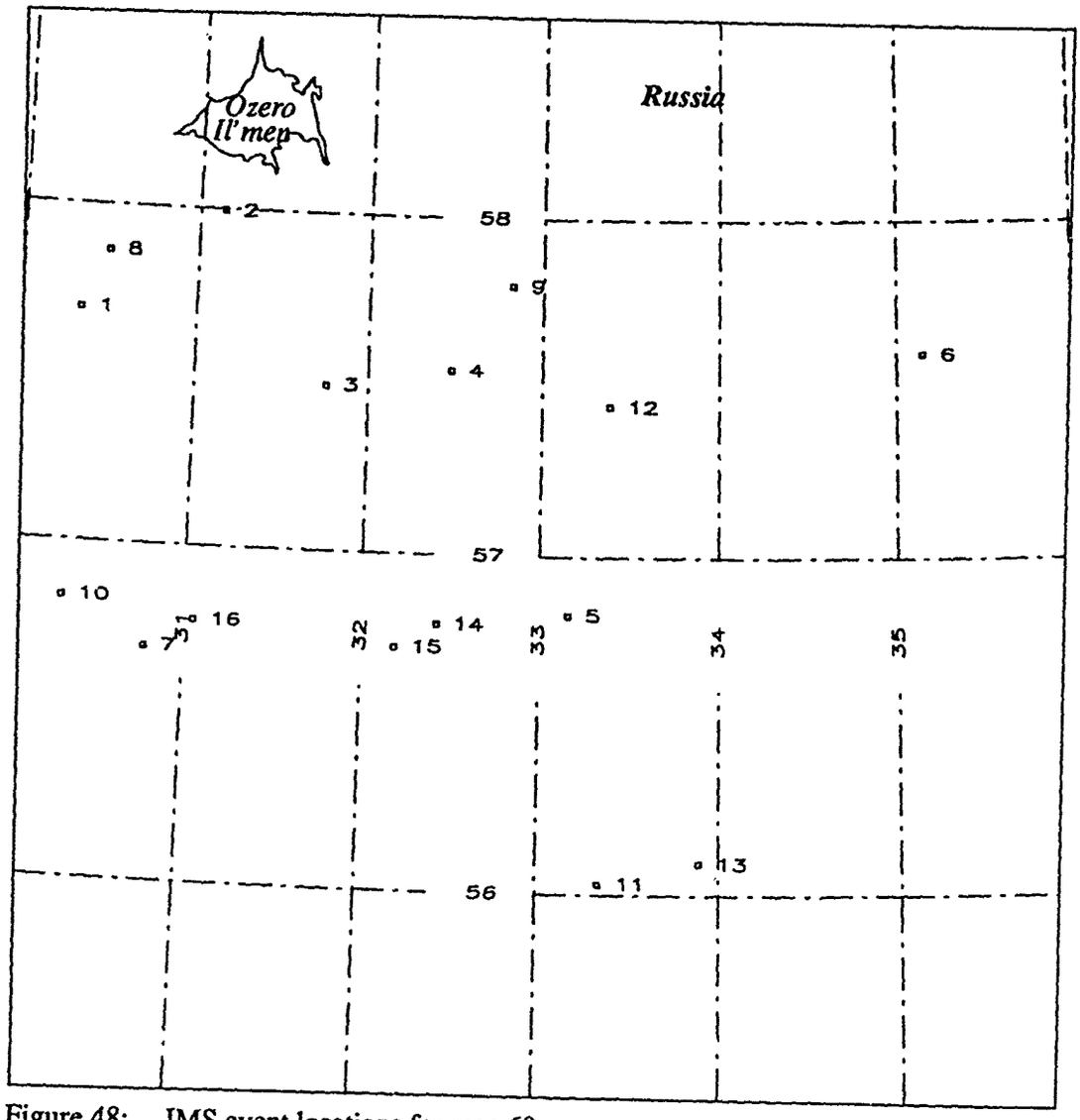

Figure 48: IMS event locations for area 60.

AREA 61

Latitude: 56 -58°N
Longitude: 24 - 30 E
Local magnitude range: -
Number of events in IMS2: 128
Number of events within the magnitude range: 128
Number of processed events: 80
Frequency range used to process the data: 3 -16 Hz
Processed signal length: 12 s. before *P*, 107 s. after *P*
Number of reference events: 8

Table 169: Reference events for area 61

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
20	16584	724530	549370	0.81	A
18	15942	715403	528479	0.85	B
59	322826	1216171	1817148	0.83	C
7	314334	558118	654565	0.86	D
8	6992	566212	452420	0.82	E
47	302990	1011949	1531989	0.84	F
6	10021	538512	621817	0.89	G
66	333609	1355180	2305990	0.95	H

Reported mine locations: None
Number of events found in the Helsinki bulletin: 3

Table 170: Events found in the Helsinki bulletin for area 61

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
45	301247	11/12/91	14:41:29.7	1.84	57.40	26.92	-	B
38	36722	8/28/91	12:58:21.0	2.02	56.61	27.23	-	C
66	333609	7/17/92	10:56:11.4	2.16	58.12	28.48	-	H

Events with the most reliable classification:

Table 171: Sorted events for area 61

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
20	16584	4/2/91	07:29:04.7	57.3632	26.2503	1.59	A
27	18721	4/15/91	14:40:01.1	57.4370	26.9942	1.87	A
35	31945	7/25/91	13:02:08.2	56.1381	27.0552	2.15	A
37	35873	8/22/91	13:04:02.3	57.3698	25.7312	1.50	A
5	8423	11/27/90	10:12:47.2	57.3489	26.9453	1.83	B
15	14122	3/12/91	12:23:28.5	57.4144	26.5094	1.87	B
18	15942	3/25/91	12:37:06.1	57.5562	26.6645	1.82	B
45	301247	11/12/91	14:41:29.7	57.4468	26.2818	1.84	B
46	302689	12/11/91	08:08:01.2	57.4982	26.5350	1.76	B
38	36722	8/28/91	12:58:21.0	56.4931	25.9810	2.02	C
57	320311	2/26/92	13:02:18.0	56.5862	25.8517	2.12	C
59	322826	3/17/92	13:21:54.4	57.8231	25.7155	-	C
63	327118	5/6/92	12:17:21.9	57.8541	24.4177	1.66	C
7	314334	12/19/90	11:39:59.1	57.0299	24.4762	2.24	D
49	303454	12/24/91	10:44:51.3	57.0037	24.4546	1.84	D
8	6992	12/28/90	09:19:58.4	56.6228	25.3981	1.93	E
21	16836	4/3/91	09:21:41.5	56.3905	26.3120	1.83	E
39	38207	9/6/91	09:49:13.0	56.7956	24.3215	1.79	E
47	302990	12/18/91	12:54:27.9	56.6850	25.6473	2.07	F
65	333532	7/16/92	12:49:15.1	56.7134	25.8610	2.07	F
6	10021	11/29/90	10:37:25.3	56.6106	25.3951	2.09	G
12	6427	1/9/91	10:42:08.9	56.4984	25.6545	1.92	G
66	333609	7/17/92	10:56:11.4	57.7214	28.3311	2.16	H
79	344910	12/4/92	11:27:42.2	57.7317	28.1129	2.06	H

Remarks:

- No mines have been reported in this area. The Helsinki bulletin reported only three events with automatic locations.

- Several cluster of events consisting in three or four events could be determined.

Mine and event locations:

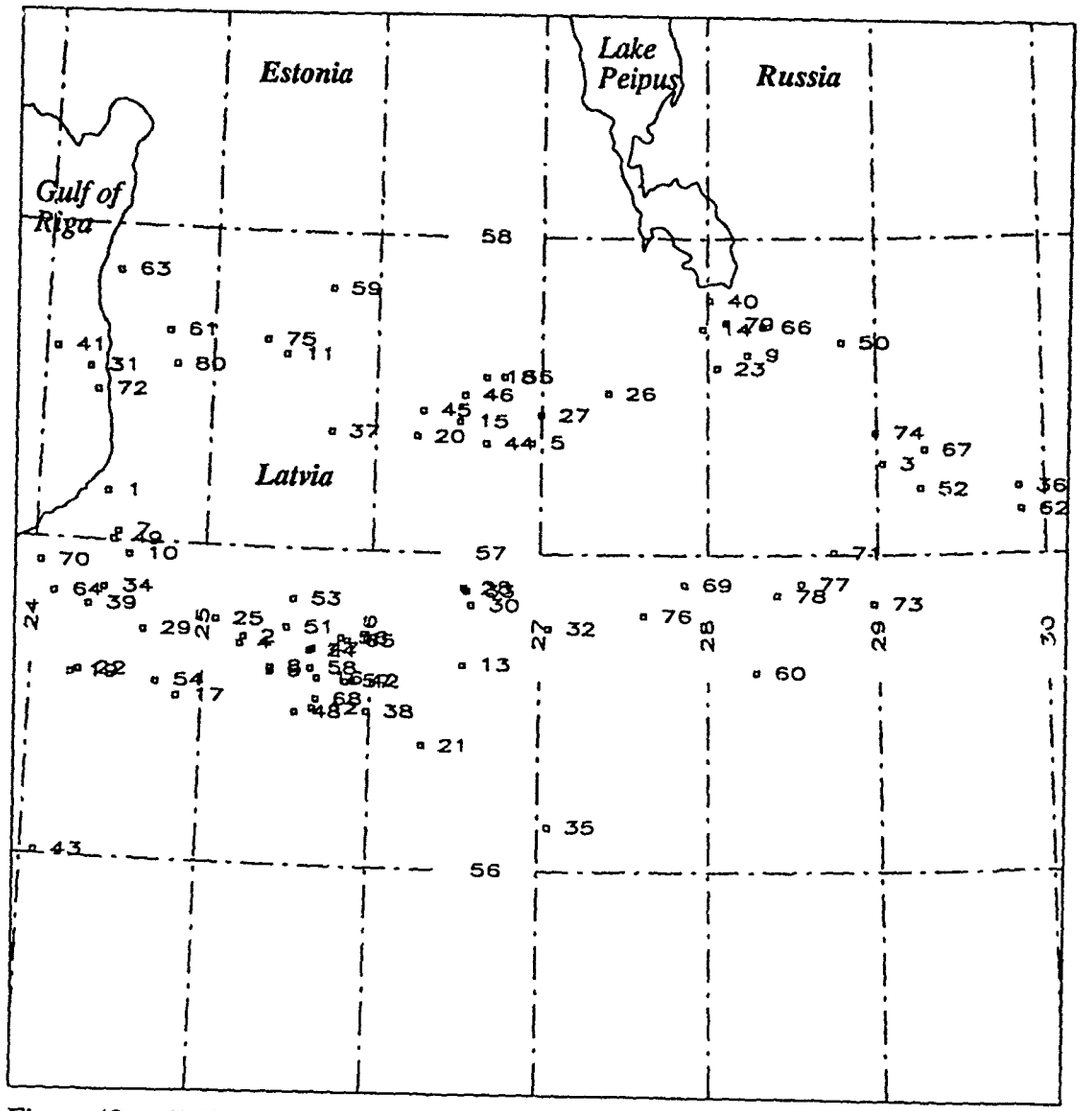

Figure 49: IMS events locations for area 61. Borders between Estonia, Latvia and Russia are missing.

AREA 62

Latitude: 56 -58 N
Longitude: 18 - 24 E
Local magnitude range: -
Number of events in IMS2: 117
Number of events within the magnitude range: 117
Number of processed events: 80
Frequency range used to process the data: 3 - 16 Hz
Processed signal length: 12 s. before *P*, 112 s. after *P*
Number of reference events: 8

Table 172: Reference events for area 62

Event #	IMS orid	IMS arid	IMS wfid	Threshold	Group
52	320015	1206683	1773588	0.82	A
14	13717	699443	463214	0.91	B
69	335507	1363064	2337637	0.81	C
63	331394	1292935	2195044	0.81	D
54	321515	1216100	1816986	0.82	E
10	5206	561855	670474	0.81	F
13	9356	608141	411911	0.80	G
18	15462	712928	506453	0.81	H

Reported mine locations: None
Number of events found in the Helsinki bulletin: 7

Table 173: Events found in the Helsinki bulletin for area 62

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
3	26213	11/27/90	12:52:09.0	2.56	58.15	18.06	-	?
34	39886	9/16/91	13:14:33.8	2.40	58.02	18.47	-	?
35	39889	9/16/91	13:17:23.4	2.65	58.28	18.52	-	?
63	331394	6/23/92	12:17:52.8	2.56	58.50	18.68	-	D
64	331387	6/23/92	12:36:11.2	2.60	58.40	18.69	-	D

Table 173: Events found in the Helsinki bulletin for area 62

Event #	IMS orid	IMS origin time		IMS ml	HEL location		HEL label	Group
65	331388	6/23/92	12:40:29.5	2.51	58.23	19.38	-	D
77	339112	9/17/92	13:24:36.4	-	57.40	17.86	-	D

Events with the most reliable classification:

Table 174: Sorted events for area 62

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
8	4329	12/18/90	14:29:22.0	56.8619	23.6099	1.85	A
41	303416	12/23/91	13:15:24.1	56.9182	23.4905	2.03	A
52	320015	3/5/92	14:15:52.0	57.2368	23.2869	1.93	A
56	324344	4/9/92	13:20:57.8	57.5432	23.7878	1.59	A
70	335515	7/24/92	13:49:55.2	56.9806	23.7871	-	A
14	13717	3/8/91	14:38:17.3	56.9736	23.5002	1.93	B
21	16777	4/2/91	11:37:44.5	56.8348	23.7904	2.02	B
22	18265	4/15/91	13:02:45.9	56.7922	23.5560	2.27	B
29	25978	6/8/91	10:40:40.8	56.7553	23.2241	1.84	C
58	325087	4/17/92	08:40:53.9	56.3405	23.2217	1.98	C
59	327513	5/11/92	11:57:41.4	56.4263	22.8702	2.04	C
67	333234	7/13/92	12:31:12.6	56.5218	22.2679	1.95	C
69	335507	7/23/92	08:47:55.4	56.3573	22.9189	2.05	C
63	331394	6/23/92	12:17:52.8	57.8428	19.5130	2.56	D
64	331387	6/23/92	12:36:11.2	57.5209	19.2025	2.60	D
65	331388	6/23/92	12:40:29.5	57.7262	18.9908	2.51	D
77	339112	9/17/92	13:24:36.4	56.9403	19.3141	-	D
32	32581	7/29/91	10:43:02.9	56.2648	23.8012	1.73	E
39	302360	12/10/91	11:15:15.8	56.4133	22.6274	2.06	E
43	315279	1/21/92	10:32:20.6	56.2661	22.8384	2.27	E
54	321515	3/17/92	10:22:52.9	56.3481	23.0686	2.16	E
5[illegible]	324778	4/15/92	08:24:39.1	56.4992	22.7366	1.98	E

Table 174: Sorted events for area 62

Event #	IMS orid	IMS origin time		IMS lat.	IMS lon.	IMS ml	Group
60	328909	5/25/92	09:56:27.8	56.2688	23.7246	1.92	E
68	334456	7/15/92	09:41:55.9	56.2497	23.2470	2.11	E
73	337636	9/2/92	09:23:00.7	56.2969	22.9074	1.99	E
80	344440	11/24/92	11:03:18.5	56.3828	22.9369	1.83	E
5	11143	12/14/90	10:55:27.5	56.5868	22.2438	2.08	F
9	4347	12/19/90	11:25:25.8	56.4821	22.3512	1.99	F
10	5206	12/22/90	10:35:41.0	56.4900	22.2748	1.98	F
11	5837	1/3/91	11:38:33.8	56.3977	22.5111	1.92	F
15	14638	3/15/91	11:48:58.0	56.1591	23.1517	1.95	F
4	42224	12/5/90	13:36:53.9	56.7197	22.6259	1.38	G
13	9356	1/28/91	12:12:37.6	56.6294	22.7689	2.00	G
16	15278	3/18/91	16:41:55.0	56.4886	22.4183	1.78	G
30	31402	7/23/91	09:07:43.2	56.5432	22.1624	1.71	G
17	14912	3/19/91	10:50:47.6	56.4460	22.5936	1.81	H
18	15462	3/22/91	11:12:25.8	56.4424	22.9295	1.84	H
20	16290	4/1/91	11:40:18.3	56.3961	22.5396	1.58	H

Remarks:

- No mines have been reported despite the number of events occurring in this area.
- The events reported in the Helsinki bulletin are located on the Gotland Island and correspond to events from group D.

Mine and event locations:

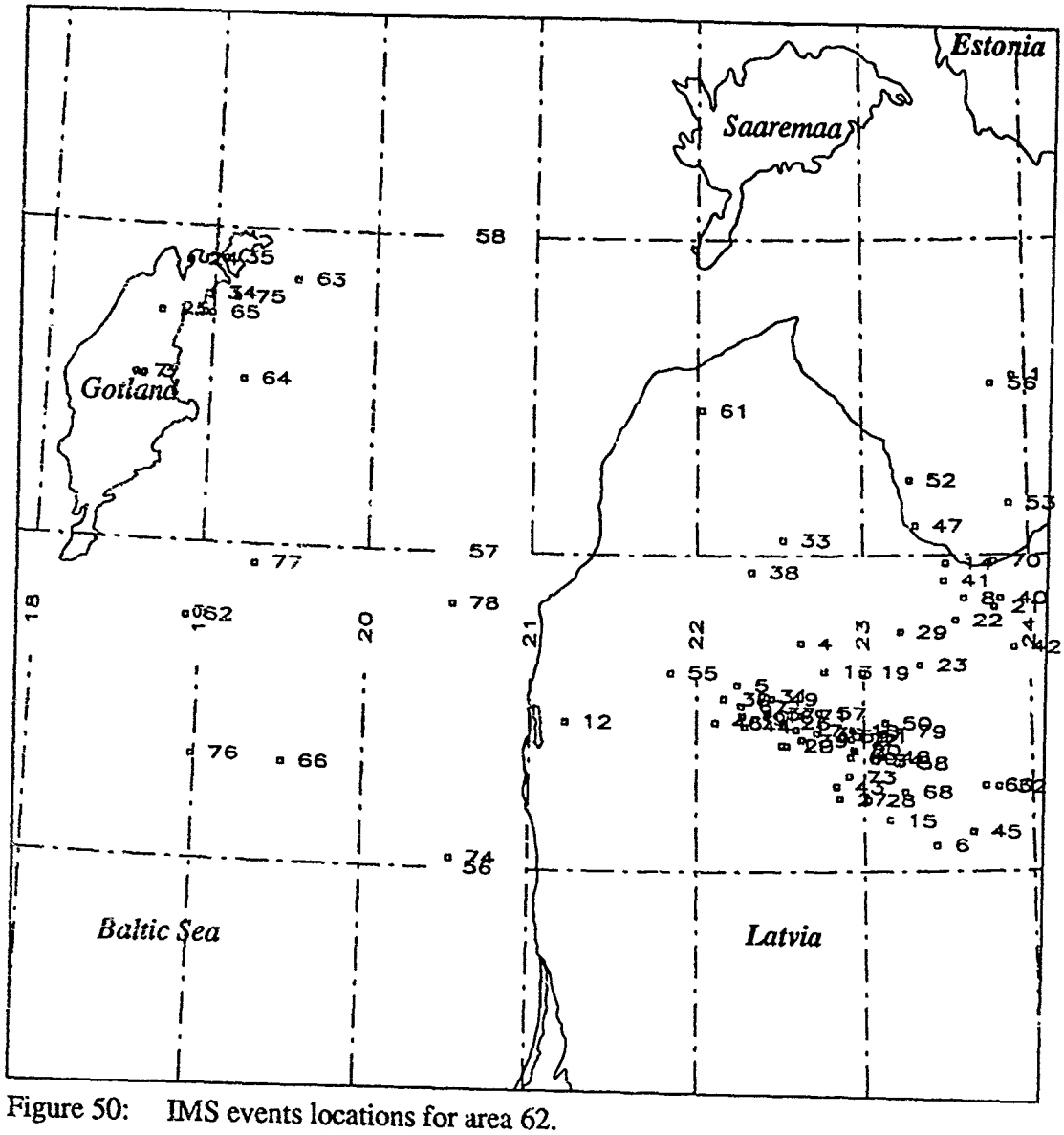

Figure 50: IMS events locations for area 62.

APPENDIX 2

The following table gives the list of the processing parameters used to perform the wavefom comparison for each area. Lat1, Lat2, Lon1, and Lon2 give the limits of each area. Lfc and Hfc give the low frequency and the high frequency corner in Hz, respectively, used in the filtering. Sbf and Saf give, in seconds, the time before the first arrival and the time after the first arrival, respectively, defining the signal length.

Table 175: Processing parameters for FINESA data

Area	Lat1	Lat2	Lon1	Lon2	Lfc	Hfc	Sbf	Saf
28	64	66	24	26	2.0	16.0	9	84
29	64	66	26	30	2.0	16.0	10	90
30	64	66	30	36	1.0	16.0	14	124
34	62	64	18	24	2.0	16.0	7	67
35	62	64	24	26	2.0	16.0	7	67
36	62	64	26	28	2.0	16.0	6	56
37	62	64	28	32	2.0	16.0	7	67
38	62	64	32	38	2.0	16.0	11	96
39	60	62	34	38	2.0	16.0	11	96
40	60	62	30	34	1.0	16.0	6	56
41	60	62	28	30	1.0	16.0	5	45
42	60	62	26	28	1.0	16.0	4	34
43	60	62	24	26	1.0	16.0	4	35
44	60	62	22	24	1.0	16.0	5	45
45	60	62	20	22	1.0	16.0	5	50
54	58	60	20	24	1.0	16.0	5	50
55	58	60	24	26	1.0	16.0	5	45
56	58	60	26	28	1.0	16.0	6	56
57	58	60	28	29	1.0	16.0	6	56
58	58	60	29	30	1.0	16.0	6	56
59	58	60	30	36	2.0	16.0	10	90
60	56	58	30	36	3.0	16.0	12	112
61	56	58	24	30	3.0	16.0	12	107
62	56	58	18	24	3.0	16.0	12	112

APPENDIX 3

The mine locations provided in this appendix cover more than the studied area. Distance 1 defines the distance to the ARCESS array in degrees and Distance 2, in kilometers. Mines are ordered by increasing longitude.

Table 176: SPOT mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
SB8	59.230	24.235	10.36	1238.710	2.49
SB1	59.242	24.329	10.35	1237.03	2.30
SB11	59.243	27.833	10.38	1241.14	355.45
SB9	59.269	27.732	10.35	1237.55	355.64
SB10	59.306	27.626	10.31	1232.64	355.83
SB7	59.325	27.272	10.28	1228.91	356.52
SB6	59.327	27.070	10.27	1227.97	356.91
SB12	59.364	28.365	10.29	1229.58	354.36
SB14	59.369	28.527	10.29	1229.98	354.04
SB13	59.370	28.428	10.28	1229.24	354.24
SB2	59.407	24.591	10.18	1216.68	1.82
SB5	59.446	26.486	10.14	1212.13	358.04
SB16	59.482	29.930	10.27	1227.52	351.25
SB15	60.019	29.742	9.72	1162.13	351.15
SC3b	60.581	29.064	9.11	1089.55	352.08
SC3a	60.599	29.073	9.10	1087.48	352.04
SC2	60.699	29.178	9.01	1076.48	351.73
SC1a	60.747	28.836	8.93	1068.01	352.44
SC1c	60.749	28.854	8.93	1067.91	352.40
SC1b	60.753	28.846	8.93	1067.37	352.41
SC0	60.816	28.711	8.86	1058.85	352.66
SC4c	60.843	28.989	8.85	1057.81	352.02
SC4b	60.849	28.979	8.84	1057.02	352.03
SC4a	60.851	28.991	8.84	1056.88	352.00
SC19	60.852	30.096	8.93	1067.13	349.55

Table 176: SPOT mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
SC6	60.951	29.175	8.75	1046.55	351.50
SC7	60.961	29.312	8.75	1046.56	351.18
SC8	60.969	28.880	8.72	1041.96	352.15
SC9	60.974	29.054	8.72	1042.79	351.75
SC10	60.985	29.275	8.73	1043.39	351.24
SC5b	60.999	29.026	8.70	1039.59	351.79
SC5c	61.005	29.043	8.69	1039.02	351.74
SC5a	61.008	29.016	8.69	1038.43	351.80
SC11c	61.120	29.902	8.65	1033.47	349.67
SC11b	61.132	29.823	8.63	1031.23	349.83
SC11a	61.133	29.845	8.63	1031.34	349.78
SC12d	61.199	29.727	8.55	1022.34	349.97
SC12c	61.201	29.731	8.55	1022.15	349.96
SC12b	61.204	29.727	8.55	1021.75	349.97
SC12a	61.208	29.727	8.54	1021.28	349.96
SC13	61.270	29.804	8.49	1014.74	349.71
SC14	61.604	31.283	8.31	993.565	345.82
SC17	61.664	31.654	8.30	991.958	344.87
SC15b	61.666	31.144	8.24	984.421	346.04
SC15a	61.672	31.139	8.23	983.653	346.04
SC16	61.691	31.274	8.23	983.321	345.70
SC18b	61.946	30.606	7.90	944.600	346.85
SC18a	61.952	30.575	7.89	943.502	346.92
SD44	67.607	33.486	3.51	419.675	307.12
SD43	67.645	32.912	3.31	396.102	308.34
SD42	67.759	32.824	3.22	384.554	307.03
SD41	67.803	32.781	3.18	379.824	306.53
SD49	67.889	34.566	3.69	441.618	300.73

Table 176: SPOT mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
SD40	67.893	33.029	3.20	382.702	304.46
SD50	67.895	34.615	3.71	443.158	300.55
SD47	67.916	34.385	3.62	432.924	300.75
SD48	67.926	34.486	3.65	436.243	300.40
SD46	68.006	34.697	3.68	439.762	298.89
SD45	68.019	34.349	3.56	425.319	299.39
SD39	68.040	33.229	3.18	380.626	301.68
SD38	68.082	33.219	3.16	377.616	301.06
SD37	68.112	32.986	3.07	366.807	301.20
SD35	68.120	33.400	3.20	382.288	300.01
SD36	68.133	33.162	3.11	372.289	300.40
SD34	68.251	33.267	3.09	369.437	298.24
SD33	68.268	33.403	3.13	373.830	297.65
SD32	68.700	33.125	2.86	341.371	290.61
SD31	68.791	33.146	2.83	338.543	288.84
SD30	68.792	33.133	2.83	337.969	288.84
SD29	68.872	33.025	2.76	330.521	287.43
SD28	68.930	33.096	2.77	331.448	286.18
SD18	68.932	34.938	3.41	408.182	284.60
SD27	68.943	32.965	2.72	325.576	286.08
SD26	68.997	32.871	2.68	319.927	285.07
SD25	68.999	32.910	2.69	321.488	284.99
SD23	69.012	33.641	2.94	351.583	284.07
SD24	69.013	32.939	2.70	322.265	284.67
SD22	69.034	33.506	2.89	345.307	283.75
SD21	69.060	33.484	2.87	343.658	283.26
SD17	69.064	35.008	3.41	407.414	282.40
SD16	69.070	35.008	3.41	407.260	282.30

Table 176: SPOT mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
SD20	69.093	33.482	2.87	342.686	282.62
SD19	69.111	33.594	2.90	346.913	282.20
SD15	69.223	33.168	2.73	326.429	280.16
SD14	69.256	33.106	2.70	323.149	279.49
SD12	69.276	32.811	2.60	310.367	279.16
SD13	69.286	32.903	2.63	314.044	278.91
SD11	69.299	32.721	2.56	306.157	278.68
SD4	69.329	30.019	1.61	192.217	279.50
SD2	69.367	30.093	1.63	194.620	278.09
SD3	69.368	30.134	1.64	196.324	278.02
SD7	69.398	30.614	1.81	216.018	276.75
SD8	69.401	30.847	1.89	225.767	276.58
SD9	69.409	30.953	1.93	230.115	276.31
SD10	69.410	32.135	2.34	279.794	276.17
SD6	69.432	30.527	1.77	211.918	275.69
SD5	69.435	30.531	1.77	212.051	275.59
SD1	69.597	30.049	1.60	190.838	269.89

Two tables are provided for the Helsinki mine locations. The locations shown in Table 177 started to be used at the beginning of June 1991. A mapping between the new Helsinki locations and the old Helsinki locations is proposed in this table. Certain mines can have up to four different locations reported in the Helsinki bulletin; only the most frequent are listed. Locations given with one decimal were obtain by averaging seismic locations; locations with two decimals were obtain from the SPOT imagery.

Tab'e 177: Helsinki mine locations

Label	Old label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HE1	HB1	59.24	24.33	10.35	1237.270	2.30
HE5A	HB9	59.24	27.83	10.39	1241.480	355.46
HE5	HB9	59.27	27.73	10.35	1237.420	355.64

Table 177: Helsinki mine locations

Label	Old label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HE6A	HB10	59.3	27.5	10.31	1232.810	356.08
HE7	HB11	59.3	28.1	10.34	1235.700	354.91
HE6	HB10	59.31	27.63	10.31	1232.180	355.82
HE4	HB6	59.33	27.27	10.28	1228.310	356.52
HE4A	HB6	59.33	27.07	10.27	1227.610	356.91
HE12A	HB12	59.36	28.37	10.29	1230.080	354.35
HE12	HB12	59.37	28.43	10.28	1229.260	354.23
HE8	HB13	59.37	28.53	10.29	1229.880	354.04
HE2	HB2	59.41	24.59	10.18	1216.320	1.82
HE9	HB5	59.45	26.49	10.14	1211.660	358.03
HE3	HB3	59.5	25.0	10.08	1204.910	1.02
HE11	HB16	59.6	30.0	10.16	1214.190	351.01
HE10	HB15	60.0	29.9	9.75	1165.860	350.85
HE10A	HB15	60.02	29.74	9.72	1161.990	351.15
HM1	HA1	60.17	23.84	9.43	1127.390	3.58
HM3	HA2	60.30	22.29	9.37	1120.340	6.96
HV11	HC3	60.6	29.2	9.11	1088.420	351.77
HV12	HC1	60.7	28.7	8.97	1072.570	352.78
HV5	HC2	60.7	29.0	8.99	1074.890	352.12
HV13	HC7	60.8	29.5	8.93	1067.350	350.92
HV1B	HC4	60.8	29.3	8.91	1065.550	351.36
HV1A	HC6	60.9	29.4	8.82	1054.590	351.04
HV1C	HC5	60.9	29.3	8.81	1053.690	351.26
HV2	HC11	61.1	30.3	8.70	1040.140	348.80
HV8	HC11	61.1	29.9	8.66	1035.800	349.70
HM2	HA3	61.33	23.03	8.30	992.660	6.04
HV4	HC14	61.4	31.6	8.55	1021.780	345.45
HV6	HC15	61.4	34.3	8.94	1068.340	339.75

Table 177: Helsinki mine locations

Label	Old label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HV3	HC12	61.5	30.4	8.32	994.286	348.03
HM5	HA4	61.6	21.7	8.12	970.875	9.51
HM26	HA5	61.64	24.26	7.95	949.899	3.17
HM4	HA6	61.9	21.5	7.84	937.384	10.37
HV7	HC13	61.9	30.6	7.95	949.899	346.94
HM27	-	61.94	29.03	7.76	928.021	350.79
HM6	HA7	62.07	27.41	7.54	901.123	354.89
HV9	HC16	62.2	34.3	8.19	978.847	337.82
HM15	HA8	62.5	30.1	7.31	873.457	347.20
HM21	HA9	62.6	23.6	7.01	837.805	5.50
HM20	HA10	62.7	23.2	6.93	828.226	6.74
HM14	HA11	62.8	22.9	6.85	818.395	7.71
HM12	HA12	62.83	29.25	6.90	825.018	348.98
HM18	HA14	63.0	26.8	6.59	787.184	356.03
HM19	HA13	63.02	29.23	6.71	802.434	348.73
HM7	HA15	63.12	27.74	6.51	777.713	353.05
HM17	HA16	63.16	27.99	6.48	774.690	352.24
HM23	HA18	63.3	29.3	6.44	770.283	348.03
HM16	HA17	63.4	27.3	6.20	741.663	354.15
HM13	HA19	63.66	26.05	5.91	705.992	358.14
HM24	HA20	63.85	25.05	5.71	683.054	1.61
HM10	HA22	64.1	27.1	5.50	656.995	354.14
HM9	HA21	64.1	24.7	5.47	653.804	2.97
HM8	HA23	64.12	28.06	5.53	661.291	350.64
HM11	HA24	64.41	25.15	5.15	615.717	1.39
HV10	HC17	64.68	30.66	5.27	630.425	339.89
HM22	HA25	65.78	24.70	3.79	452.502	4.30
HM25	HA26	65.8	28.10	3.88	463.898	346.40

Table 177: Helsinki mine locations

Label	Old label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HR3	HE1	67.12	20.90	2.97	354.734	33.06
HR1	HE1	67.18	20.67	2.97	354.764	34.94
HK8	HD1	67.56	30.44	2.69	321.321	319.83
HK5	HD10	67.6	34.2	3.74	446.567	305.31
HK1A	HD8/HD9	67.63	33.84	3.61	431.064	305.85
HK2	HD8/HD9	67.64	34.02	3.66	437.065	305.26
HK2A	HD8/HD9	67.64	33.88	3.61	431.848	305.62
HR2	HE2	67.65	21.00	2.51	300.478	39.05
HK1	HD8	67.67	33.74	3.55	424.547	305.59
HK7	HD3	67.7	31.4	2.84	339.396	313.18
HM28	-	67.79	24.43	1.80	214.830	12.16
HR4	HE2	67.8	20.2	2.61	311.740	45.63
HK4	HD6	68.16	33.18	3.11	371.356	299.93
HK11	HD5	68.87	33.03	2.77	330.799	287.46
HK10	HD12	69.2	34.7	3.27	391.275	280.18
HK12	HD7	69.23	33.17	2.73	326.366	280.01
HK9	HD11	69.3	34.4	3.15	376.717	278.44
HK3	HD2	69.4	30.8	1.87	223.806	276.63
HK6	HD4	69.6	32.3	2.39	285.180	271.61
HN1	HF1	69.6	29.9	1.54	184.594	269.63

Table 178: Old Helsinki mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HB9	59.2	27.6	10.417	1158.32	355.924
HB1	59.3	24.4	10.289	1144.09	2.178
HB10	59.3	27.6	10.317	1147.2	355.884
HB11	59.3	28.1	10.337	1149.43	354.910
HB6	59.3	27.2	10.303	1145.65	356.667

Table 178: Old Helsinki mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HB12	59.4	28.4	10.252	1139.98	354.273
HB13	59.4	28.5	10.257	1140.53	354.078
HB2	59.4	24.6	10.185	1132.53	1.802
HB3	59.5	25.0	10.080	1120.85	1.016
HB5	59.5	26.5	10.086	1121.52	358.003
HB16	59.6	30.0	10.157	1129.41	351.009
HB15	60.0	29.9	9.753	1084.49	350.847
HA1	60.2	23.1	9.429	1048.46	5.170
HA2	60.4	22.4	9.266	1030.34	6.797
HC3	60.6	29.2	9.105	1012.43	351.767
HC1	60.7	28.7	8.972	997.645	352.781
HC2	60.7	29.0	8.992	999.869	352.117
HC4	60.8	29.3	8.914	991.196	351.361
HC7	60.8	29.5	8.929	992.864	350.918
HC5	60.9	29.3	8.815	980.187	351.264
HC6	60.9	29.4	8.822	980.966	351.040
HC10[a]	61.1	39.9	10.351	1150.98	330.883
HC11	61.1	30.2	8.692	966.51	349.020
HA3	61.4	22.8	8.246	916.917	6.647
HC14	61.4	31.6	8.548	950.498	345.450
HC15	61.4	34.3	8.937	993.753	339.749
HC12	61.5	30.4	8.318	924.923	348.028
HA4	61.6	21.7	8.122	903.129	9.511
HA5	61.6	24.2	7.988	888.229	3.306
HA6	61.9	21.5	7.842	871.994	10.375
HC13	61.9	30.6	7.946	883.559	346.944
HA7	62.1	27.4	7.508	834.855	354.895
HC16	62.2	34.3	8.188	910.468	337.819

Table 178: Old Helsinki mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HA8	62.5	30.1	7.307	812.505	347.203
HA9	62.6	23.6	7.009	779.369	5.501
HA10	62.7	23.2	6.928	770.362	6.736
HA11	62.8	22.9	6.846	761.244	7.709
HA12	62.8	29.3	6.936	771.251	348.887
HA13	62.9	28.7	6.787	754.683	350.455
HA14	63.0	26.8	6.585	732.222	356.028
HA15	63.2	27.8	6.430	714.986	352.777
HA16	63.2	28.1	6.448	716.988	351.850
HA17	63.4	27.3	6.204	689.856	354.152
HA18	63.5	29.6	6.277	697.974	346.723
HA19	63.7	26.0	5.865	652.161	358.299
HA20	63.8	25.1	5.764	640.93	1.421
HA21	64.1	24.7	5.469	608.128	2.975
HA22	64.1	27.1	5.496	611.13	354.136
HA23	64.2	28.0	5.448	605.793	350.723
HA24	64.4	25.2	5.160	573.768	1.196
HC17	64.7	30.7	5.261	584.999	339.680
HA25	65.8	24.7	3.765	418.651	4.319
HA26	65.8	28.1	3.881	431.549	346.396
HE1	67.1	20.6	3.049	339.035	34.430
HD1	67.6	30.5	2.672	297.114	318.953
HD10	67.6	34.2	3.736	415.426	305.315
HD9	67.6	34.0	3.673	408.421	305.819
HD3	67.7	31.4	2.839	315.684	313.183
HD8	67.7	33.7	3.522	391.63	305.303
HE2	67.7	21.0	2.475	275.209	39.783
HD6	68.1	33.2	3.143	349.487	300.827

Table 178: Old Helsinki mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
HD5	68.8	33.0	2.779	309.012	288.881
HD12	69.2	34.7	3.273	363.943	280.184
HD7	69.2	33.3	2.781	309.234	280.580
HD11	69.3	34.4	3.151	350.377	278.445
HD2	69.4	30.8	1.872	208.158	276.626
HD4	69.6	32.3	2.386	265.312	271.612
HF1	69.6	29.9	1.544	171.686	269.630

a. This mine does not have a corresponding new location.

Table 179: Norwegian mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
N15	58.300	6.400	13.96	1669.200	28.49
N205	58.800	15.100	11.67	1394.550	18.31
N206	59.300	15.400	11.14	1331.810	18.63
N209	59.700	14.100	10.99	1313.850	21.40
N16	59.750	10.770	11.63	1390.170	26.35
N14	59.900	10.500	11.56	1381.420	27.04
N208	60.000	14.800	10.58	1265.070	20.84
N109	60.100	22.880	9.54	1140.350	5.58
N207	60.100	15.000	10.45	1249.600	20.70
N202	60.120	17.520	10.03	1199.380	16.29
N121	60.140	22.590	9.51	1137.360	6.21
N110	60.170	23.840	9.43	1127.390	3.58
N204	60.185	16.115	10.18	1217.390	18.94
N203	60.200	16.130	10.17	1215.390	18.94
N111	60.250	25.390	9.32	1114.700	0.25
N112	60.270	24.070	9.32	1114.610	3.12

Table 179: Norwegian mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
N113	60.300	22.290	9.37	1120.340	6.96
N203	60.620	15.100	9.95	1189.280	21.57
N210	60.700	15.900	9.73	1163.470	20.31
N13	60.740	11.020	10.69	1277.820	28.31
N114	61.030	28.180	8.61	1029.680	353.71
N115	61.050	22.640	8.60	1028.560	6.75
N103	61.180	28.040	8.46	1010.910	353.93
N101	61.330	23.030	8.30	992.660	6.04
N116	61.810	21.740	7.91	945.651	9.66
N6	61.930	5.450	11.18	1335.950	38.48
N117	61.940	29.030	7.76	928.021	350.79
N1	62.040	5.523	11.07	1323.060	38.76
N102	62.040	28.770	7.65	913.888	351.34
N118	62.070	27.410	7.54	901.123	354.89
N122	62.820	29.250	6.91	826.196	349.00
N123	63.020	29.230	6.71	802.434	348.73
N124	63.120	27.740	6.51	777.713	353.05
N119	63.150	24.020	6.44	770.017	4.66
N125	63.160	27.990	6.48	774.690	352.24
N104	63.660	26.050	5.91	705.992	358.14
N105	63.850	25.050	5.71	683.054	1.61
N218	63.867	20.217	6.07	725.049	17.87
N215	63.917	20.100	5.93	721.264	18.37
N219	63.917	20.300	6.01	717.987	17.76
N217	63.933	20.067	6.02	719.931	18.53
N270	64.050	20.717	5.82	696.179	16.82
N9	64.070	11.200	7.85	938.973	39.49
N216	64.100	19.583	5.94	709.582	20.54

Table 179: Norwegian mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
N126	64.120	28.060	5.53	661.291	350.64
N214	64.133	18.567	6.07	725.969	23.68
N106	64.410	25.150	5.15	615.717	1.39
N7	64.870	12.880	6.50	776.824	38.77
N107	65.780	24.700	3.79	452.502	4.30
N120	65.900	24.470	3.67	439.132	5.69
N8	65.930	13.880	5.71	682.252	45.46
N213	66.133	17.183	4.65	555.392	38.94
N3	66.421	14.679	5.13	613.573	47.60
N212	67.083	20.967	2.98	356.759	32.32
N5	67.148	16.070	4.24	506.675	51.27
N108	67.790	24.430	1.80	214.831	12.16
N211	67.833	20.205	2.58	308.817	46.13
N400	69.420	30.800	1.87	223.541	276.01
N4	69.652	30.025	1.59	189.976	267.88

Table 180: Mine locations from other sources

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
TIT	58.23	6.43	14.018	1558.74	28.330
BLA	59.31	6.95	12.940	1438.87	29.989
NYG	60.39	5.34	12.453	1384.72	34.213
Varanger	70.480	28.500	1.40	155.764	228.72

Table 181: JOG mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
JOG1	59.650	9.680	11.97	1430.810	27.55
JOG2	59.660	9.650	11.97	1430.590	27.61
JOG3	59.660	9.690	11.96	1429.460	27.56
JOG4	59.670	9.680	11.95	1428.680	27.59
JOG5	59.680	9.680	11.94	1427.620	27.61
JOG6	59.690	9.540	11.97	1430.510	27.81
JOG7	59.760	9.810	11.84	1415.470	27.63
JOG8	59.770	9.520	11.90	1422.590	28.02
JOG9	59.790	9.500	11.89	1421.050	28.09
JOG10	62.040	10.820	9.61	1148.870	32.28
JOG11	62.100	10.210	9.72	1161.430	33.35
JOG12	62.100	9.800	9.82	1174.200	33.92
JOG13	62.110	9.820	9.81	1172.580	33.93
JOG14	62.110	9.900	9.79	1170.070	33.82
JOG15	62.130	10.090	9.72	1162.150	33.52
JOG16	62.150	10.080	9.71	1160.460	33.70
JOG17	62.150	10.680	9.55	1141.990	32.84
JOG18	62.280	10.320	9.54	1140.030	33.78
JOG19	62.320	10.600	9.43	1127.360	33.51
JOG20	62.330	10.620	9.42	1125.750	33.52
JOG21	62.380	10.400	9.43	1127.580	34.01
JOG22	62.380	10.420	9.43	1126.950	33.98
JOG23	62.410	10.270	9.44	1128.660	34.29
JOG24	62.410	10.280	9.44	1128.350	34.28
JOG25	62.440	10.860	9.26	1107.360	33.53
JOG26	62.440	10.870	9.26	1107.05	33.52
JOG27	62.520	11.220	9.10	1088.34	33.26
JOG28	62.540	11.100	9.12	1090.00	33.51

Table 181: JOG mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
JOG29	62.540	11.250	9.08	1085.42	33.29
JOG30	62.550	11.810	8.93	1067.57	32.44
JOG31	62.570	11.820	8.91	1065.25	32.49
JOG32	62.630	11.550	8.93	1067.29	33.13
JOG33	62.670	11.280	8.96	1071.49	33.69
JOG34	62.690	11.280	8.95	1069.50	33.76
JOG35	62.710	11.280	8.93	1067.50	33.83
JOG36	62.770	11.280	8.88	1061.53	34.05
JOG37	62.790	11.250	8.87	1060.47	34.17
JOG38	62.810	11.260	8.85	1058.17	34.22
JOG39	62.820	10.050	9.16	1095.44	36.05
JOG40	62.840	11.550	8.75	1046.28	33.88
JOG41	62.870	11.630	8.71	1040.84	33.86
JOG42	62.920	11.680	8.65	1034.34	33.96
JOG43	62.940	11.500	8.68	1037.88	34.32
JOG52	67.070	20.970	3.00	358.027	32.16
JOG44	67.180	20.620	2.98	356.104	35.20
JOG45	67.180	20.670	2.97	354 764	34.94
JOG46	67.200	20.670	2.95	352.798	35.16
JOG47	67.200	20.710	2.94	351.728	34.95
JOG68	67.350	32.530	3.40	406.023	313.45
JOG70	67.450	32.660	3.37	402.314	311.74
JOG69	67.550	30.330	2.67	319.011	320.56
JOG53	67.630	21.030	2.52	301.490	38.59
JOG54	67.670	33.630	3.52	420.468	305.89
JOG48	67.830	20.190	2.59	309.557	46.15
JOG49	67.880	20.230	2.54	304.106	46.77
JOG56	67.880	34.550	3.69	441.550	300.89

Table 181: JOG mine locations

Label	Latitude	Longitude	Distance 1	Distance 2	Azimuth
JOG57	67.900	34.630	3.71	443.438	300.45
JOG55	67.930	34.480	3.65	435.766	300.36
JOG61	68.010	34.710	3.68	440.043	298.81
JOG60	68.020	34.370	3.56	426.083	299.34
JOG50	68.050	16.020	3.76	448.921	62.25
JOG58	68.150	33.250	3.13	374.669	299.91
JOG59	68.250	33.270	3.09	369.611	298.25
JOG51	68.470	16.050	3.57	426.531	68.19
JOG62	68.690	33.110	2.85	341.183	290.82
JOG63	68.820	35.370	3.60	429.796	286.09
JOG64	68.870	33.020	2.76	330.386	287.47
JOG65	68.930	33.080	2.77	330.784	286.20
JOG67	69.390	30.330	1.71	204.203	277.14
JOG66	69.420	30.280	1.69	201.685	276.16

APPENDIX 4

The following table gives the results of an attempt to associate reference events with a particular mine. For this purpose, the event identification reported in the Helsinki bulletin were used. An association was made between a group of events and the Helsinki identifications when, within a group, all Helsinki identifications were reasonably consistent. When both an old Helsinki location and a new Helsinki location were used to identify events within a group, only the new location was listed.

When a large number of events from the same source overlapped two adjacent areas, two reference events were defined, one for each area. These redundant events are not included in the list.

For each reference event, the table gives:

- the area number,
- the event orid used in the IMS database,
- the event number used in the processing,
- the event label corresponding to the grouping,
- the event location using the identification found in the Helsinki bulletin,
- the number of events found in the Helsinki bulletin with the same identification,
- comment about the groups: (1) defines event groups consisting of more than three events, (2) defines event groups including three or fewer events.

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
28	7627	3	A	HM22	2	(2)
	19295	7	B	HM22	3	(2)
29	328210	17	A	HM8	2	(2)
	10023	1	B	HM8	2	(2)
	14427	3	C	HM8	2	(2)
	18599	5	D	HM8	1	(2)
	343478	24	E	-	-	(2)
	19829	6	F	-	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
30	315331	47	A	HV10	2	(2)
	7858	11	B	HV10	1	(2)
	303526	44	C	HV10	7	(1)
	343678	85	E	HV10	3	(1)
	36719	29	F	HV10	4	(1)
	323109	58	G	HV10	1	(2)
	336551	74	H	HV10	1	(2)
34	13811	10	A	-	-	(2)
	322157	48	B	-	-	(2)
	2752	1	C	-	-	(2)
	329124	59	D	-	-	(1)
	34078	26	E	-	-	(1)
	320401	46	F	-	-	(2)
	23405	17	G	-	-	(2)
	330243	61	H	-	-	(2)
	38170	29	I	-	-	(1)
	326941	55	J	-	-	(1)
	15228	13	K	-	-	(1)
35	326822	35	A	HA19	1	(2)
	326811	34	B	-	-	(2)
	3205	1	C	HM24	1	(2)
	14237	10	D	-	-	(2)
	35558	22	E	HM24	2	(1)
	10048	4	F	HA19	1	(2)
	15576	11	G	HA19	1	(2)
	312962	28	H	HA19	1	(2)
	315332	30	I	-	-	(2)
	346652	45	J	-	-	(2)
	34288	18	K	-	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
36	314421	5	A	-	-	(2)
	19362	23	B	-	-	(2)
	19215	21	C	HA19	1	(2)
	302463	44	D	HM13	1	(2)
	39284	34	E	HM13	1	(1)
	21328	26	F	HM7	-	(1)
	321683	64	G	HM7	3	(2)
	301022	37	H	HM7[a]	8	(1)
	340869	94	I	-	-	(2)
	301526	40	J	HM7	7	(1)
	312989	53	K	HM7	7	(1)
	301865	41	L	HM7	4	(1)
	22470	28	M	HM7	2	(1)
	333862	82	N	[b]	-	(1)
	7920	7	P	HM7	7	(1)
37	340567	70	B	HC13	2	(1)
	337677	67	C	-	-	(1)
	344780	79	D	-	-	(1)
	328579	54	E	-	-	(1)
	6199	7	F	HM12	2	(1)
	19697	17	G	HM7	1	(2)
	3350	4	H	-	-	(1)
	23905	23	I	HM17	-	(1)
38	40626	22	A	HV9	1	(1)
	13162	6	B	HV9	3	(1)
	18204	12	C	HV9	4	(1)
	14918	8	D	-	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
39	346733	52	A	HV6	3	(1)
	330513	38	B	-	-	(2)
	22606	13	C	HV6	3	(1)
	37695	23	D	-	-	(2)
	303126	29	E	-	-	(1)
	325106	34	F	HV6	8	(1)
40	2902	1	A	HV4[c]	2	(1)
	37101	45	B	HV4[c]	5	(1)
	323548	73	C	HV7[c]	5	(1)
	329308	81	D	HV4[c]	3	(1)
	331311	83	E	HV4[c]	2	(1)
	17946	26	F	HV7[c]	5	(1)
	332488	87	G	HV7[c]	6	(1)
	26536	6	H	HV7[c]	3	(1)
	335191	93	I	[c]	-	(1)
	24674	38	J	[c]	-	(2)
	19816	30	K	[c]	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
41	3256	2	A	HV8[c]	3	(2)
	337963	107	B	[c]	-	(2)
	320892	78	C	[c,d]	-	(1)
	301688	59	D	HV1[c]	1	(1)
	337670	111	E	[c,d]	-	(1)
	344673	121	G	[c,d]	-	(1)
	13741	19	H	[c,d]	-	(1)
	321840	82	I	[c,d]	-	(1)
	4867	8	J	[c,d]	-	(1)
	23894	36	K	HV1B[c]	3	(1)
	19735	31	L	[c,d]	-	(1)
	22201	35	M	HC6[c]	1	(2)
	340382	113	N	HV5[c]	4	(1)
	16794	24	O	HV1[c]	2	(2)
	329554	97	P	[c,d]	-	(1)
	27875	45	Q	HB15[d]	2	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
42	325021	59	A	b	-	(2)
	9000	14	B	b	-	(2)
	322636	48	C	b	-	(2)
	313097	36	D	b	-	(2)
	325498	61	E	b	-	(2)
	335261	79	F	b	-	(1)
	331722	69	G	b	-	(1)
	3271	5	H	b	-	(1)
	300273	32	I	b	-	(1)
	18604	19	J	HV5[b]	1	(2)
	329583	66	K	b	-	(1)
	333426	72	L	b	-	(2)
	332131	71	M	b	-	(2)
	320890	40	N	b	-	(2)
	322731	51	O	b	-	(2)
	2003	1	P	b	-	(2)
43	338999	72	A	-	-	(2)
	37026	31	B	-	-	(2)
	313363	41	C	-	-	(2)
	329739	60	D	-	-	(1)
	25868	25	E	-	-	(2)
	14718	12	F	HM1	1	(2)
	324077	48	G	-	-	(2)
	324449	49	H	-	-	(1)
	326614	54	I	-	-	(2)
	13237	7	J	-	-	(1)
	36898	30	K	-	-	(2)
	337770	71	L	-	-	(1)
	25537	24	M	-	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
44	14251	13	A	HM1	1	(1)
	330221	60	B	-	-	(1)
	329491	57	C	HM3	2	(1)
	31947	37	D	-	-	(2)
	312655	49	E	HM1	2	(1)
	19813	28	F	-	-	(2)
	2993	3	G	HM3	1	(1)
	328298	53	H	-	-	(2)
	18748	21	I	-	-	(1)
	19419	24	J	-	-	(1)
45	325787	51	B	-	-	(1)
	34714	39	C	-	-	(1)
	2652	1	D	-	-	(2)
	326266	55	E	-	-	(1)
	13559	16	F	-	-	(2)
	33013	36	G	-	-	(2)
	324786	53	H	-	-	(1)
	2924	2	I	-	-	(2)
	329142	60	J	-	-	(2)
	17894	22	K	-	-	(2)
	314238	7	L	-	-	(2)
	20044	24	M	-	-	(2)
	327532	58	N	-	-	(1)
54	5232	1	A			(2)
	328317	50	B	-	-	(2)
	328426	58	C	-	-	(2)
	16174	14	D	HE1[b]	1	(2)
	18745	21	E	[b]	-	(1)
	325725	43	F	[b]	-	(2)
	17751	17	G	[b]	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
55	19259	37	A	HE1	7	(1)
	31944	53	B	[d]	-	(1)
	302430	78	C	HE2	2	(2)
	38341	63	D	HE3	3	(1)
	302640	83	E	HE3	4	(1)
	39874	64	F	HE5	3	(1)
	340384	112	H	-	-	(2)
	314426	20	I	HE1	1	(2)
	301143	73	J	HE3	5	(1)
	330351	105	K	HE1	-	(1)
	332481	107	L	HE2	1	(2)
	41777	68	M	[d]	-	(2)
	2501	11	N	[d]	-	(1)
56	335075	100	A	HE9[c]	4	(1)
	334525	97	B	HM7	1	(1)
	325624	70	C	[c,d]	-	(1)
	323153	64	D	[c,d]	10	(1)
	4245	6	E	HE6[c]	1	(2)
	12924	17	F	HE5	2	(2)
	20309	33	G	[c]	-	(2)
	341044	108	H	HE5[c]	3	(1)
	313191	51	I	[c]	-	(2)
	335056	99	J	HE4[c]	2	(2)
	17292	25	K	HE4[c]	3	(1)
	327003	82	L	[c,d]	3	(1)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
57	332106	78	A	HE8[c]	7	(1)
	345332	89	B	[c,d]	-	(1)
	17933	14	C	[c,d]	-	(1)
	23989	21	D	HE8[c]	2	(1)
	321016	64	E	HE8[c]	1	(2)
	332780	81	F	HE8[c]	6	(1)
	313122	53	G	[c,d]	-	(1)
	314512	4	H	[c,d]	-	(1)
	24158	22	I	HE8[c]	4	(1)
	327925	69	J	[c,d]	-	(1)
	340648	88	K	HE8[c]	2	(2)
58	31266	5	A	HE11	5	(1)
	331061	23	B	HE10	2	(2)
	332018	24	C	HV11	1	(2)
59	320309	75	A	[b]	-	(1)
	5780	1	B	[b]	-	(1)
	328179	90	C	[b]	-	(2)
	331975	97	D	[b]	-	(1)
	7476	12	E	[b]	-	(2)
61	16584	20	A	[b]	-	(1)
	15942	18	B	[b]	-	(1)
	322826	59	C	[b]	-	(1)
	314334	7	D	[b]	-	(2)
	6992	8	E	[b]	-	(2)
	302990	47	F	[b]	-	(2)
	10021	6	G	[b]	-	(2)
	333609	66	H	[b]	-	(2)

Table 182: Identification of the reference events

Area	Orid	Event #	Group	Source	# of events	Comment
62	320015	52	A	b	-	(1)
	335507	69	C	b	-	(1)
	331394	63	D	b	-	(1)
	321515	54	E	b	-	(1)
	5206	10	F	b	-	(1)
	9356	13	G	b	-	(1)
	15462	18	H	b	-	(2)

a. Inconsistency in the identification found in the Helsinki bulletin, that we assume to be an error.

b. No reported mine in this area.

c. Several mines have been located on SPOT photos in this area or in the nearby areas.

d. Inconsistency in the identification found in the Helsinki bulletin because of the large number of mines in this area.