

**Final Report:**  
**Arctic Ocean Model Intercomparison Project (AOMIP): Travel  
Support for Workshops**

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## **LONG-TERM GOALS**

Our long-term goal is to improve arctic sea ice – ocean numerical models by fostering communication and collaboration among the international modeling community.

## **OBJECTIVES**

The specific objective of this project was to fund travel to AOMIP workshops by scientists who are new to the field (e.g. graduate students and post-docs), with additional funding for use by Navy modelers and by other key senior modelers who provide insight for the younger scientists.

## **APPROACH**

PI Steele worked closely with AOMIP PI Andrey Proshutinsky (WHOI) to organize workshops, including time for talks on current research, break-out sessions, review talks designed to assess the current state of the field, and social activities.

## **WORK COMPLETED**

The *first* AOMIP workshop to use ONR funding took place at WHOI October 20-23, 2009. Forty two scientists came to WHOI from the US, Canada, France, Germany, Sweden, Russia, Poland, and England. An additional dozen local WHOI scientists participated in discussions during the week. There were 44 talks and 11 posters presented. Talks were grouped according to the following themes:

- Freshwater
- Sea ice
- Model progress and results
- Observations and methods
- Water masses: straits and ecosystems

- Atlantic and Pacific water dynamics

The first day of the meeting was designated as the first-ever “AOMIP School for Young Scientists” where 6 invited overview talks were presented, with plenty of time left for questions and discussions. These talks were:

- Elizabeth Hunke (LANL): Sea ice modeling and challenges for the future
- Luc Rainville (APL/UW): Mixing in the arctic seas
- Axel Schweiger (APL/UW): Atmospheric forcing data and surface air temperature
- Katya Popova (NOC, Southampton): Ecosystem modeling overview
- Mike Steele (APL/UW): Arctic Ocean freshwater: past, present, and future
- Andrey Proshutinsky (WHOI): Wind-forced dynamics of the Arctic Ocean

We also arranged a 1 hour tour of the WHOI engineering facility, and organized an evening dinner meeting where senior scientists gave more details on emerging “hot topics” in the field and the young scientists had time to introduce themselves and speak about their concerns as they begin their careers.

This ONR grant supported the travel for 16 scientists:

- Luc Rainville (APL/UW): speaker for “AOMIP school”
- Axel Schweiger (APL/UW): speaker for “AOMIP school”
- Guoping Gao (UMASSD): grad student
- Zhigang Lai (UMASSD): postdoc
- An Nguyen (JPL): postdoc
- Sinead Farrell (NOAA): postdoc
- James Reagan (UMD): grad student
- Jackie Clement-Kinney (NPS): grad student
- Robert Osinski (NPS): postdoc
- Veronique Dansereau (McGill): grad student
- Alexandra Jahn (McGill): grad student
- J-P Paquin (UQuebec): grad student
- Zeliang Wang (BIO): new to arctic modeling
- Maria Luneva (POL): new to arctic modeling
- Per Pemberton (SMHI): new to arctic modeling
- Bill Hibler (IARC): senior scientist

All supported scientists gave talks or posters. I also used this grant funding to encourage participation of NRL modelers. Rick Allard from Stennis, Mississippi was able to attend.

On the last day of the meeting, break-out groups discussed coordinated experiments, many of which came to fruition as book chapters or journal articles that are presently in press or published. Most of these included the active participation of young scientists.

The *second* AOMIP workshop to use ONR funding took place at WHOI October 20-22, 2010. Eighty scientists came to WHOI from the US, Canada, China, England, France, Germany, Italy, Norway, Poland, Russia, and Sweden. Additional local WHOI scientists

participated in discussions during the week. There were 38 talks and 25 posters presented. Talks were grouped according to the following themes:

- Arctic Ocean state and variability
- Sea ice and ice-related modeling and observing
- Fresh water fluxes, transformations and trends
- Arctic Ocean circulation, exchanges and effects
- Models, model performance and observations
- Biogeochemistry and ecosystem modeling

Before the official first day of the workshop, we held the second “AOMIP School for New Arctic Scientists” on October 19, where 6 invited overview talks were presented, with plenty of time left for questions and discussions. These talks were:

- Jennifer Hutchings (IARC): Sea Ice Dynamics Overview: What role do ice dynamics play in a changing Arctic?
- Mary-Louise Timmermans (Yale): Dynamics in the deep Arctic Ocean
- Xiangdong Zhang (IARC): Atmospheric Reanalysis Data: Detection, Attribution, and Application in Arctic Climate Change Studies
- Jamie Morison (UW): Observations of Interannual Variability of Arctic Ocean Circulation: Water Samples to Satellites
- David Holland (NYU): A review of ice sheet - ocean interactions: Observations and modeling
- Rebecca Woodgate (UW): Getting around in the Arctic - what we do (and don't) know about boundary currents

We also arranged a 1.5 hour tour of the WHOI fluid dynamics tank lab plus the carbon isotope center, and organized an evening dinner meeting where senior scientists gave more details on emerging “hot topics” in the field and the young scientists had time to introduce themselves and speak about their concerns as they begin their careers.

This ONR grant supported travel for 25 scientists:

1. Jennifer Hutchings (IARC): AOMIP school lecturer
2. Mary-Louise Timmermans (Yale): AOMIP school lecturer
3. Xiangdong Zhang (IARC): AOMIP school lecturer
4. Jamie Morison (UW): AOMIP school lecturer
5. Rebecca Woodgate (UW): AOMIP school lecturer
6. Loubna Benyahya (UQAM): grad student
7. Oceana Francis (UAF): grad student
8. David Hebert (NRL): post-postdoc
9. Jackie Clement-Kinney (NPS): grad student
10. Nikolay Koldunov (Hamburg U): postdoc
11. Helene Langehaug (Bergen): grad student
12. Maria Luneva (NOC): new to arctic modeling
13. Sebastian Martensson (Stockholm U): grad student
14. Alex Matveev (UQAM): grad student
15. Tim McGeehan (NPS): grad student
16. An Nguyen (JPL): post-postdoc
17. Laura Niederdrenk (MPI): grad student

18. Robert Osinski (NPS): post-postdoc
19. J-P Paquin (UQAM): grad student
20. Per Pemberton (Stockholm): grad student
21. Cecilia Ferriz (UW): grad student
22. Pierre Rampal (MIT): postdoc
23. Gunnar Spreen (JPL): postdoc
24. Qiang Wang (Alberta U): grad student
25. Evgeniy Yakushev (NIV): new to arctic modeling

All supported scientists gave talks or posters. Grant funding was also used to encourage participation of Navy modelers. David Hebert from NRL in Stennis, Mississippi was able to attend, as were Jackie Clement-Kinney and Tim McGeehan from the Naval Postgraduate School in Monterey, CA.

On the last day of the meeting, break-out groups continued to discuss coordinated experiments have presently resulted in publications both in press and already published. Most of these include the active participation of young scientists.

The *third* AOMIP workshop to use ONR funding took place at WHOI November 2-4, 2011. Before the official first day of the workshop, we held the third “AOMIP School for New Arctic Scientists” on November 1, where 6 invited overview talks were presented, with plenty of time left for questions and discussions. These talks were:

- Mary-Louise Timmermans (Yale): Structure and dynamics of the upper Arctic Ocean
- Daniel Feltham (University College London): Melt ponds: from understanding of controlling physics to climate model parameterization
- Peter Gent (NCAR): Eddy parameterization in models
- Fiamma Straneo (WHOI): Ice sheet - ocean interactions
- Ron Lindsay (UW): Sea ice prediction
- Mike Steele (UW): Heat in the Arctic Ocean

We also had an hour-long discussion about outreach and how numerical modeling can be used in such activities, and an evening dinner meeting where senior scientists gave more details on emerging “hot topics” in the field and the young scientists had time to introduce themselves and speak about their concerns as they begin their careers.

## RESULTS

A main result of this grant is that younger modelers and those new to the field have been able to attend a meeting where they have gained an invaluable insight into the state-of-the-art, and where they have met colleagues who became co-authors on collaborative papers. Dr. Proshutinsky and I have been told by many participants during the course of these meetings that the AOMIP School in particular has been very useful to them. We were also told by several senior, “new-to-the-field” scientists that our meeting was unusually open to new ideas and new people, in comparison with other oceanographic focus groups that they have participated in. Drs. Allard and Hebert from NRL have been very positive about their experiences at AOMIP.

Some papers resulting from this grant:

- Clement Kinney, J., W. Maslowski, Y. Aksenov, B. de Cuevas, J. Jakacki, A. Nguyen, R. Osinski, M. Steele, R. A. Woodgate, and J. Zhang, On the flow through Bering Strait: A synthesis of model results and observations, *AGU monograph, in press*, **2012**.
- Popova, E. E., A. Yool, A. C. Coward, F. Dupont, C. Deal, S. Elliott, E. Hunke, M. Jin, M. Steele, J. Zhang, What controls primary production in the Arctic Ocean? Results from an ecosystem model intercomparison, *J. Geophys. Res.*, *117*, doi:10.1029/2011JC007112, **2012**.
- Proshutinsky, A., Y. Aksenov, J. Clement-Kinney, R. Gerdes, E. Golubeva, D. Holland, G. Holloway, A. John, M. Johnson, E. Popova, M. Steele, and E. Watanabe, Recent advances in Arctic Ocean studies employing models from the Arctic Ocean Model Intercomparison Project, *Oceanography*, *24*(3), 102-113, **2011**.

## **IMPACT/APPLICATIONS**

Potential future impact of AOMIP activities is the improvement of models and observation strategies. In particular, the future impact of exposing young and new-to-the-arctic scientists to the state-of-the-art in arctic modeling is an enhanced capability for more accurate modeling and scientific discovery.

## **RELATED PROJECTS**

None

**REPORT DOCUMENTATION PAGE**

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