

Final Technical Report

AD-A239 818

ONR

Contract Number:

N00014-87-K-0144



Contract Period:

12/01/86 - 11/30/90 (including no-cost 1-yr extension)

Principal Investigator:

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Title of Contract:

Studies of the physical and chemical stability of natural sea-surface films

I. Background statement.

The primary research project proposed in the original submission was the use of fluorescent tracers to measure the turnover times of organic components in surface films. This particular project was terminated with the departure of the Postdoctoral Research Chemist responsible for carrying out this program, and accordingly, \$50,000 was returned to ONR. In its place, one major and two ancillary projects were proposed. The major effort was to measure the total dissolved organic content of surface films and the corresponding subsurface waters by high temperature combustion; the ancillary efforts were: firstly, to cooperate with Dr. Eric J. Amis of the University of Southern California in his ONR-sponsored project to measure the size, diffusive properties and density of colloids and small particulates in seawater; and secondly, to measure the ¹⁴C and ¹³C signatures of marine surface films.

II. Summary of all work accomplished

A. Measurements of the dissolved organic carbon (DOC) and nitrogen (DON) have been made on approximately one hundred samples of sea-surface films and their corresponding 5-15 cm subsurface waters. These measurements were made using high

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temperature oxidation techniques modified slightly from those reported by Sugimura and Suzuki, Mar. Chem., 24, 105-133 (1988). Most of these DOC values were twenty to fifty percent higher than earlier results in the coastal waters off Southern California and in oligotrophic waters similar to the ONR Bermuda stations. The DON values, however, were only ten percent or less greater than the earlier measurements.

These data have been made available to interested co-principal investigators in the Remote Sensing Program.

B. Carbon isotope (^{14}C , ^{13}C) measurements of DOC were made on surface films and 5-15 cm subsurface waters collected off Southern California and southeast of Bermuda, while ^{13}C and $\delta^{15}\text{N}$ measurements of suspended organic matter were made for samples collected on shore-to-open-ocean transects off the coast of Maine. These isotopic signatures for the films reflected small terrestrial inputs in the Maine coastal waters, but elsewhere were essentially identical to these same signatures in subsurface and deeper waters. An exception was off Bermuda, where hydrocarbon contaminations in the upper 20 m gave unrealistically "old" ages to the surface film and subsurface water organic matter.

Some of this data is available in annual summary reports to the Project Leader (see OGNR 112191-15 Report, May 1991).

C. We have provided filtered and unfiltered seawater samples to Dr. Eric Amis (Chemistry Dept., USC) for measurement of particle sizes of colloids and small particulates in natural and preserved (HgCl_2) aliquots. Using photon correlation spectroscopy (changes in the Doppler shift in frequency of scattered laser light), Dr. Amis has observed rapid aggregation of colloidal particles into larger particulates, especially in un-preserved samples. Potentially, this is an elegant method for studying marine colloids.

III. Index of technical reports and publications.

There have been no refereed publications. Most of the results have been included in the annual progress reports provided to the Project Leader. Some of the high temperature DOC data has been used by other PIs in this project.

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