OFFICE OF HEALTH AND ENVIRONMENTAL RESEARCH
FINAL PROJECT REPORT
GRANT STARTED: 06/01/95
GRANT ENDS: 05/31/99

Project Title

Sources and fates of dissolved organic matter in the Mid-Atlantic Bight
Grant # DE-FG02-92ER61438.A003
Charles S. Hopkins, Jr. (Principal Investigator)

Objective

The objectives of the research program were to identify and determine the relative importance of various sources of dissolved organic matter to the continental shelf, and to estimate the net carbon balance for the Middle Atlantic Bight.

Approach

Identification of the various organic matter sources was determined using a multi-tracer approach with emphasis being on DOC and DON concentration, POC and PON concentration, and corresponding C/N ratios. The utilization of the various organic matter sources was determined from laboratory decomposition studies. Decomposition experiments were carried out to measure the rate of removal of DOM (including O₂ consumption, TCO₂ production and bacterial production) and the stoichiometry of remineralization. Information on the degree of chemical reduction of DOM was used to predict organic matter oxidation and microbial growth.

Completed Work

We have prepared several manuscripts and submitted them to journals for publication. Several have been published and others are still in review. We expect at least 1 or 2 more manuscripts to be submitted within the 2000 calendar year summarizing results of prior research. A list of publications to date follows:

- Hopkinson, C. S., L. Cifuentes, D. Burdige, S. Fitzwater, D. Hansell, S. Henrichs, P. Kähler, I. Koike, T. Walsh and B. Bergamaschi. 1993. The DON Controversy - A report. *Marine Chemistry* 41:23-36.
- Hopkinson, C. S. and J. Vallino. 1994. Toward the development of generally-applicable models of the microbial loop in aquatic ecosystems. *Microbial Ecology* 28(2):3212-326.
- Normann, B., U. Zweifel, C. Hopkins and B. Fry. 1995. Production and utilization of dissolved organic carbon during an experimental diatom bloom. *Limnology and Oceanography* 40:898-907.
- Hopkinson, C. S. and J. Vallino. 1995. The nature of watershed perturbations and their influence on estuarine metabolism. *Estuaries* 18:598-621.

DOE Patent Clearance Granted

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Date

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- Chen, R., B. Fry, C. Hopkinson, D. Repeta and E. Peltzer. 1996. Dissolved organic carbon on Georges Bank. *Continental Shelf Research* 16:409-420.
- Chen, R., B. Fry, C. Hopkinson, D. Repeta and E. Peltzer. 1996. Dissolved organic carbon on Georges Bank. *Continental Shelf Research* 16:409-420.
- Fry, B., C. Hopkinson, A. Nolin, B. Norrman and U. Zweifel. 1996. Long term decomposition of DOC from experimental diatom blooms. *Limnol. Oceanogr.* 41:1344-1347.
- Vallino, J. J., C.S. Hopkinson, and J.E. Hobbie. 1996. Modeling bacterial utilization of dissolved organic matter: Optimization replaces Monod growth kinetics. *Limnol. Oceanogr.* 41:1591-1609.
- Fry, B., E. Peltzer, C. Hopkinson, A. Nolin and L. Redmond. 1996. Analysis of marine DOC using a reference dry combustion method. *Marine Chemistry* 54:191-201.
- Wainright, S. C. and C. S. Hopkinson. 1997. Effects of sediment resuspension on organic matter processing in coastal environments: a simulation model. *J. Marine Systems* 11:353-368.
- Hopkinson, C. S., B. Fry, and A. Nolin. 1997. Stoichiometry of dissolved organic matter dynamics on the continental shelf of the Northeastern U.S.A. *Continental Shelf Research* 17:473-489.
- Fry, B., C. Hopkinson, A. Nolin and S. Wainright. 1998. $^{13}\text{C}/^{12}\text{C}$ composition of marine dissolved organic carbon. *Chemical Geology* 152:113-118.
- Hopkinson, C. S., I. Buffam, J. Hobbie, J. Vallino, M. Perdue, B. Eversmeyer, F. Pahl, J. Covert, R. Hodson, M. Moran, E. Smith, J. Baross, B. Crump, S. Findlay, K. Foreman. 1998. Terrestrial inputs of organic matter to coastal ecosystems: An intercomparison of chemical characteristics and bioavailability. *Biogeochemistry* 43:211-234.

In Review, In Press and Submitted manuscripts:

- Hopkinson, C. S., A. E. Giblin, J. Tucker and H. Garritt. Benthic metabolism and nutrient regeneration on the continental shelf off eastern Massachusetts, USA. In review: *Marine Ecology – Progress Series*.
- Hobbie, J. E., I. Buffam, H. Garritt, C. Hopkinson, A. Uhlenhopp and J. Vallino. A comparison of bioavailability of dissolved organic matter in runoff from various land covers. To be submitted to *Marine Ecology - Progress Series*.
- Hopkinson, C. S. and J. Vallino. Stoichiometry of dissolved organic matter on the Middle Atlantic Bight. To be submitted to *Deep-Sea Research*.
- Hopkinson, C. S. and J. Vallino. Preservation of carbon rich dissolved organic material – decomposition studies. To be submitted to *Deep-Sea Research*.

External Outreach

Results from this project are critical to synthesizing much process-based work of other DOE-OMP researchers.