

Interactive comment on “DON as a source of bioavailable nitrogen for phytoplankton” by D. A. Bronk et al.

H. Paerl (Referee)

hpaerl@email.unc.edu

Received and published: 9 October 2006

This is an excellent review of the dynamics of dissolved organic nitrogen (DON) as a potential nitrogen (N) source for phytoplankton. The authors point out that, until the past decade or so, DON had been a largely neglected as a potentially-important source of N for phytoplankton because it was largely assumed to be a static as opposed to dynamic constituent of freshwater and marine N pools. Recent breakthroughs in analytical and ^{15}N tracer techniques, as well as sensitive automated techniques of assessing phytoplankton responses to various forms of N have pointed to DON as being far more “reactive” than previously assumed. The authors do an excellent job of laying the foundation for the argument that DON is far from a refractile source of N; specifically, that it should be considered (at least in part) to be biologically-reactive and

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

as such play a key role in freshwater and marine N budgets.

The potential roles of DON as new N sources supporting primary and secondary production are particularly important in the marine environment (from estuaries to the open ocean) where the availability of N is often the factor limiting primary production and hence controlling food availability and transfer to higher trophic levels. The authors devote a substantial portion of this review addressing methods and approaches for examining the utilization of both bulk and specific DON compounds. I found this part of the review to be both useful and enlightening. While Bronk and colleagues have conducted some of the groundbreaking work in the field of marine N cycling, they give credit to and comprehensively cover key works by many other investigators that have allowed us to better understand and appreciate the roles DON play in biogeochemical cycling and trophodynamics. The resultant review is a well-balanced document, having good depth and containing many applications to freshwater and marine investigations.

Clearly, the authors have a great deal of expertise in the analytic and kinetic aspects of DON cycling in natural waters and experimental settings. There have also been great strides made in the molecular aspects of DON uptake, utilization and cycling, including the identification and characterization of functional genes encoding for key enzymes involved in DON transformation. These studies have been cited in the current review, but understandably are not covered in great detail. It is recommended that readers of this review specifically consult these studies in order to obtain greater insights in the genetic regulatory aspects of DON cycling, which is a rapidly evolving and fascinating field in itself.

I was glad to see mention of some more “classic” approaches to examining the utilization and bioreactivity of DON compounds in natural aquatic microbial communities. Among these are enzyme-based assays, *in situ* bioassays and the use of microautoradiography, which either alone or combined with molecular probing and labeling techniques (e.g. fluorescence *in situ* hybridization), have allowed investigators to microscopically (including using image analysis) examine specific organisms involved in

BGD

3, S578–S580, 2006

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

the utilization and cycling of radiolabelled DON compounds. These techniques, while time consuming and requiring taxonomic expertise, are invaluable in that they allow investigators to identify the “players” involved in DON cycling, thereby complementing analytical, kinetic and bioassay studies.

The past decade has seen great strides made to clarify the overall importance of and multiple roles played by DON in aquatic biogeochemical cycling and trophodynamics. This review provides ample testimony to support that conclusion. The review will serve as an excellent, up to date reference that can be consulted by chemically- and biologically-oriented students, researchers, water quality and environmental managers.

Interactive comment on Biogeosciences Discuss., 3, 1247, 2006.

BGD

3, S578–S580, 2006

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper