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Quantitative estimates of labile and semi-labile dissolved organic carbon in the western Arctic Ocean: A molecular approach

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ABSTRACT: A novel molecular approach based on carbon-normalized yields of combined amino acids was developed to quantify concentrations of labile (L), semi-labile (S), and refractory (R) dissolved organic carbon (DOC) in shelf and basin waters of the Western Arctic Ocean. Concentrations of L-DOC were seasonally and spatially variable (0.1-14.2 µmol L"). In contrast, concentrations of S-DOC were much less variable (20.2 \pm 0.68 μ mol L⁻⁻ SE). Average concentrations of L-DOC in shelf waters increased from 0.7 µmol L" to 2.4 µmol L" between the spring and summer of 2002 and from 1.4 µmol L" to 3.9 µmol L" between the spring and summer of 2004. Primary productivity increased 2-3-fold between spring and summer, indicating a strong linkage between plankton and L-DOC production. Patterns of L-DOC abundance in surface waters are suggestive of multiple mechanisms of L-DOC production, including direct release from phytoplankton and release during grazing. Concentrations of L-DOC were not correlated with those of total DOC. Elevated concentrations of L-DOC in halocline waters (40-200-m depth) of the Canada Basin indicated rapid transport of shelf-produced DOC into the basin. Chemical and physical properties of basin waters with elevated L-DOC concentrations indicated a sedimentderived source of basin L-DOC. The approach presented here for quantifying the labile and semilabile fractions of DOC is a potentially powerful tool for understanding processes controlling the distribution, production, and utilization of dissolved organic matter.

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