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DOM stoichiometry in the Mediterranean Sea

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Dissolved organic matter (DOM) is the largest reservoir of reduced carbon in the biosphere and represents the source of food for heterotrophic bacteria. Although its importance in the global carbon cycle, at today DOM remains the most complex and less understood pool of carbon in the ocean. Due to the very low concentrations of DOC, DON and DOP in the sea and to the difficulties to concentrate the water samples, information on its molecular characteristics, its lability, and its dynamics are very scarce.

Organic carbon is exported to the deep ocean mainly by POM (particulate organic matter). All the processes involved (production, remineralization, export) follow the Redfield stoichiometry (106:16:1). Data collected all over the global ocean for DOM (Hopkinson and Vallino, 2005) display a C:N:P ratio substantially greater than that reported by Redfield.

Aim of this work was to investigate why C:N:P ratio in DOM deviates from Redfield. In order to understand the mechanisms regulating production, export and remineralization of DOM we studied DOC, DON and DOP distribution in the Ionian Sea, in April 2002.

Looking at DOM stoichiometry, based on median values of DOC and DON in surface (0-100 m) and deep waters ($>$1000 m), a C/N ratio ranging between 7.7 and 8.3 was observed. These values are much smaller than those reported by Hopkinson and Vallino (2005) for the ocean. A larger impact of the semilabile fraction on the whole DOM bulk (refractory, semilabile and labile) can explain the smaller ratio observed. The short timescale of the water renewal in the Mediterranean basin (80-125 ys) do not allow a complete remineralization of the semilabile pool.

References:

C.S. Hopkinson and J.J. Vallino (2005). Efficient export of carbon to the deep ocean through dissolved organic matter. Nature, 433, 142-145