New insights on the mineralization of dissolved organic matter in central, intermediate, and deep water masses of the northeast North Atlantic

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ABSTRACT: An optimum multiparameter (OMP) analysis was applied to samples collected during a cruise in the northeast North Atlantic with the aim of objectively defining water mass realms and calculating water mass mixing-weighted average (archetypal) concentrations of dissolved organic carbon (DOC) and nitrogen (DON) and fluorescent dissolved organic matter (FDOM). The profile of archetypal DOC, which retains the basin-scale variability from the formation area of the water masses to the study area, was modeled with a constant initial concentration of 60 $\pm$ 1 mmol kg^{-1} that decreased linearly with increasing apparent oxygen utilization (AOU) at a rate of –0.20 $\pm$ 0.03 mol C per mol of AOU. The archetypal C:N ratio of dissolved organic matter was also modeled with a constant initial molar ratio of 11.5 $\pm$ 0.4 that increased at a rate of 0.06 $\pm$ 0.01 per μmol kg^{-1} of AOU. The profile of archetypal FDOM was modeled with a constant initial humic-like fluorescence of 0.54 $\pm$ 0.07 quinine sulfate units that increased at a rate of 0.009 $\pm$ 0.001 g equivalent of quinine sulphate per mol of AOU. Only the Denmark Strait Overflow Water departed from this behavior because of the marked terrestrial influence of Arctic rivers during the formation of this water mass. The variability not explained by the archetypal concentrations, which retain the local variability, suggesting that N-poor DOM was mineralized in the study area, and that the efficiency of the local production of humic-like substances was directly proportional to the ventilation of the corresponding water mass realms.

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