Geophysical Research Abstracts, Vol. 8, 00593, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00593

Quantification of CDOM and FDOM Photo bleaching Rates in UK Coastal Waters

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Spectral absorbance and fluorescence characteristics of estuarine coloured dissolved organic matter (CDOM) were determined along axial transects extending from the Tyne River and estuary to the adjacent North Sea, NE England. In subsequent, long-term (4 days) irradiation experiments on a solar simulator, we investigated spectral changes of CDOM optical characteristics. With regard to CDOM absorbance, both estuarine transects showed largely conservative mixing between riverine (absorption coefficient at 350 nm, a (350) = 24/m) and marine end members (a (350) = 1.2/m). Excitation-Emission matrices of CDOM fluorescence showed a fluorescence intensity gradient similar to that of CDOM absorbance, with 'humic-like' fluorescence (ex ∼340 nm; em ∼430 nm) being approximately 21-fold higher in the riverine end-member as compared to the marine end-member. In irradiations, both river and sea-water samples showed continuous loss of CDOM absorbance and humic-like fluorescence. Overall absorbance loss after 4 days was about 41% for Tyne river water, 33% for Cullercoats bay water and 22 % for North Sea water sampled 10 km offshore. In river water, the highest CDOM absorbance loss was observed at short UV wavelengths, and the wavelength of maximum photobleaching showed a blue shift from initially 320 nm to 295 nm after 4 d. In North Sea water, we found maximum absorbance loss centred around 280 nm, and no blue shift was observed. Initial (0 to 8 h) first-order loss rates of CDOM absorbance at 350 nm were 0.01/h to 0.02/h and decreased over the course of the irradiations, indicating half lives of 1.4 d to 2.9 d under our experimental conditions. Initial loss rates of humic-like fluorescence intensity were similar to corresponding absorbance loss rates. We will discuss implications

of our findings with regard to spectral characteristics and photochemical turnover of coastal CDOM.