Geophysical Research Abstracts, Vol. 8, 07732, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07732

Impact of the diel cycle on the production of DMS and DMSP in batch cultures of *Emiliania huxleyi*

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Sulphate aerosols, which influence radiative forcing, are partly produced by the atmospheric oxidation of the oceanic sulfur compound dimethylsulfide (DMS) (Charlson et al., 1987). Its precursor, dimethylsulfoniopropionate (DMSP), is produced by phytoplankton and may serve as the first link of a cellular antioxidant system involving DMSP, its enzymatic breakdown products (DMS and acrylate), and dimethylsulfoxide (DMSO) (Sunda et al., 2002). Hydroxyl radicals and other reactive oxygen species are produced as byproducts of photosynthesis (Jakob et al., 1996); thus, the antioxidants DMSP, DMS, and DMSO may be expected to vary with diel variations in light and photosynthesis. To test this hypothesis, we measured DMS and cellular concentrations of DMSP, DMSO, nitrogen, carbon, and chlorophyll a in axenic batch cultures of the alga Emiliania huxleyi during exponential growth. We found that intracellular DMSP (normalized to cell volume) decreased by 30 % during the day, remained roughly constant during the first 7 hours of the dark period and increased sharply during the last 5 hours of darkness. These variations were closely related to variations in cellular N and fixed-C. They suggest strong links between photosynthesis, oxidative stress, and cellular DMSP concentrations. Moreover, the concentrations of intracellular DMSP and DMSO, considered together, provide support for the role of DMSP and DMSO as antioxidant scavengers of photosynthetically produced hydroxyl radicals.