

Zero-valent sulfur–thiosulfate redox anomaly at the chemoclines of stratified basins

A. KAMYSHNY JR.^{1,2,3*}, E. YAKUSHEV⁴ AND G. JOST¹

¹Leibniz Institute for Baltic Sea Research Warnemünde, D-18119, Rostock, Germany

²Max Planck Institute for Marine Microbiology, D-28359 Bremen, Germany

³Present address: Department of Geology and ESSIC, University of Maryland, College Park, Maryland, 20742, USA (*correspondence: kamyshny@umd.edu)

⁴Norwegian Institute for Water Research, Gaustadalleen 21, NO-0349, Oslo, Norway

Anoxic conditions in the water column are abundant in upwelling areas as well as in aquatic systems with restricted circulation, such as Black Sea, parts of Baltic Sea, Cariaco Basin, some fjords, meromictic and monomictic lakes. In many stratified aquatic systems such as Cariaco Basin [1], Mariager Fjord [2] and Gotland Deep (Baltic Sea) [3] the highest concentrations of zero-valent sulfur were detected above the peak of thiosulfate. Taking into account that sulfur in thiosulfate is more oxidized than zero-valent sulfur, the distribution should be opposite.

We present the detailed concentration profiles of sulfide, thiosulfate, zero-valent sulfur, nitrate, nitrite, ammonia and oxygen as well as of iron and manganese speciation in Gotland Deep. Our results show that an onset of thiosulfate ($[S_2O_3^{2-}] > 90$ nM) never occurs at depths shallower than an onset of zero-valent sulfur ($[S^0] > 250$ nM). Maximum of thiosulfate concentration is always at least 3 m deeper than the maximum of zero-valent sulfur concentration.

We propose two possible explanations to this anomaly. The first explanation is based on our observation that $[NO_3^-]$ is usually depleted to < 40 nM (in 3 profiles of 4) at the depth, where $[S_2O_3^{2-}] > 90$ nM were observed. This may point to the fast denitrification coupled to thiosulfate oxidation. The second explanation is based on the observation [4] that sulfate reducers can produce thiosulfate at low electron donor concentrations. We observed $[S_2O_3^{2-}] > 90$ nM only at the depths, where oxygen concentrations were below the detection limit (3 μ M). These possible hypotheses were analyzed with a model [5].

[1] Li *et al.* (2008) *Mar. Chem.* **112**, 53-64. [2] Zopfi *et al.* (2001) *Mar. Chem.* **74**, 29-51. [3] Volkov and Demidova (2003) *Oceanology* **43**, 805-810. [4] Sass *et al.* (1992) *Arch. Microbiol.* **158**, 418-421. [5] Yakushev *et al.* (2007) *Mar. Chem.* **107**, 388-410.

Global sources of organic aerosols in the atmosphere: Reconciling model results with observations

M. KANAKIDOU^{1*}, S. MYRIOKEFALITAKIS¹, K. TSIGARIDIS² AND N. DASKALAKIS¹

¹Environmental Chemical Processes Laboratory, Department of Chemistry, University of Crete, 71003 Heraklion, Greece

(*correspondence: mariak@chemistry.uoc.gr)

²NASA Goddard Institute for Space Studies, New York, NY 10025, USA

Atmospheric aerosols are important atmospheric constituents since they affect health, visibility and climate. They are mixtures of several components with different physicochemical properties at various sizes and state of mixing that are important characteristics of aerosols determining their impacts on the environment.

The organic aerosol component (OA) is an important fraction of atmospheric aerosols. Due to the large number of organic compounds present in the aerosol phase of the atmosphere and their chemical complexity, the organic aerosol component still remains poorly characterized, with regard to its origin and impact.

Comparison of simulated and observed OA concentrations published in literature indicated a general underestimate of OA levels by the chemistry transport model simulations. Recent findings with regard to OA sources and especially the marine ones, as well as their formation and ageing in the atmosphere, tend to fill the gap between observed and simulated OA.

In order to construct a more distinct picture of the global budget of OA in the troposphere, this information has been incorporated in the global 3-d chemistry model TM4-ECPL that is able to simulate coupled gas phase chemistry and aerosols including their secondary components. The model results are evaluated against observations of OA. Remaining challenges for further research are highlighted. The importance of various primary and secondary global sources of OA is discussed.