Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.3700

Polysulfide dynamics in a marine euxinic environment (Rogoznica Lake, Croatia); importance of anoxygenic photosynthesis

SARAH MATEŠA, MILAN ČANKOVIĆ, SUZANA ŠEGOTA AND IRENA CIGLENEČKI-JUŠIĆ

Ruđer Bošković Institute

Presenting Author: smatesa@irb.hr

Rogoznica Lake (RL) is an eutrophic and affected by climate change marine lake on the eastern Adriatic coast (43°32'N, 15°58'E). During the year the lake is strongly stratified into oxic and anoxic layers. Due to intense sulfate reduction, anoxic bottom layer is enriched in dissolved HS^- (up to 5 mM). At the oxia-anoxia boundary, a pinkish colored chemocline (up to 50 cm) develops seasonally, and it is characterized by a dense population of purple phototrophic sulfur bacteria (PSB) [1]. PSB are known to store sulfur S(0) intracellularly, which by cell lysis would be released in water, and under euxinic conditions solubilized by HS^- in nucleophilic polysulfides, S_X^{2-}. S_X^{2-}can play an important role in metal, carbon and sulfur cycles.

In this work, for the first time, differential pulse voltammetry (DPV) was used for direct determination of S_X^{2-} in euxinic marine environment (RL), where total RSS (mainly HS^-) varied between 0.1 and 3 mM. Concentration of S_X^{2-}, as well as total RSS, varied seasonally depending on the chemocline position, light intensity and HS^- concentration. During stratification in summer, when PSB reached maximum abundance, the presence of S_X^{2-} was determined in the highest concentrations (up to 0.1 mM S(0)). Maximum was found approx. 1 m bellow the chemocline, where due to sinking of lysed PSB cells, maximum concentration of biologcally S(0) would be expected.

Presence of S(0) granules in the cells and their release into water upon cell lysses, induced in laboratory conditions by acidification of the studied sample, was confirmed by AFM. The acidification as a standard methodological step in electroanalytical determination of volatile and nonvolatile RSS (RSS_{NV}) [2] are now proved to overestimate RSS_{NV} for 30-50% in samples enriched in PSB. Results from this study clearly prove the S_X^{2-} presence in the anoxic water of RL and shed light on a crutial role of the PSB in their formation and dynamics.

This work was funded by MARRES 1717 project.

[1] M. Čanković, J. Žučko, I. Dupčić Radić, I. Janeković, I.Petrić, I. Ciglenečki, G.Collins, Syst Appl Microbiol, 2019.

[2] E. Bura-Nakić, G.R. Helz, I. Ciglenečki, B. Ćosović, Geochim Cosmochim Acta, 2009.