W and Mo in hypoxic-euxinic basins

OLAF DELLWIG[a], ANTJE WEGWERTH[a], BERNHARD SCHNETGER[b], HARTMUT SCHULZ[c], HELGE W. ARZ[a]

[a]Leibniz Institute for Baltic Sea Research, IOW, Rostock, Germany, olaf.dellwig@io-warnemuende.de
[b]Institute for Chemistry and Biology of the Marine Environment (ICBM), University of Oldenburg, Germany
[c]Eberhard Karls University Tübingen, Tübingen, Germany

Molybdenum (Mo), which behaves conservatively in the oxygenated ocean, but forms particle-reactive thiomolybdates at elevated sulfide levels[1], is a prominent redox proxy applied to modern and past aquatic ecosystems. Studies proposed that the redox behavior of tungsten (W) is also affected by sulfide, suggesting its potential as a promising new redox proxy[2,3]. Here we compare the behavior of W and Mo in the highly sulfidic Black Sea and the weakly sulfidic Landsort Deep (Baltic Sea). In addition, the Gotland Basin (Baltic Sea) serves as a current hypoxic example due to water column oxygenation by the major Baltic inflow in 2014[4]. In contrast to typical Mo depletion in euxinic waters, bottom water levels of dissolved W were elevated[5]. Strong adsorption of W on Mn/Fe oxides at redoxclines identified these particles as important carrier transferring W from oxygenated to euxinic waters. A further W source form highly sulfidic porewaters, as indicated by exceptionally high W levels in the Landsort Deep[5], which are compatible with the proposed greater solubility of thiotungsate than of tungstate[2]. Despite the absence of substantial W accumulation in sapropels of the Black and Mediterranean Seas, comparable patterns of S, Fe, and W may suggest sorption of internally cycled (thio)tungstate onto pyrite. Strong W enrichments in Landsort Deep sediments indicate a close relation to Mn carbonate formed during long-lasting hypoxia[5,6]. Although near-background levels of W in sapropels question its utility as a redox proxy, W may be useful in hypoxic systems due the strong affinity to Mn/Fe cycling.

References

[1]Helz, G.R. et al. (1996) *Geochim. Cosmochim. Acta* 60, 3631-3642.
[2]Mohajerin T.J. et al. (2016) *Geochim. Cosmochim. Acta* 177, 105-119.
[3]Bauer S. et al. (2017) *Mar. Chem.* 196, 135-147.
[4]Dellwig O. et al. (2018) *Front. Mar. Sci.* 5:248.
[5]Dellwig O. et al. (2019) *Earth-Sci. Rev*, in press.
[6]Häusler K. et al. (2018) *Mar. Geol.* 395, 260-270.