

## The many flavors of oxygen-minimum zones past and present

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Oxygen-deficient oxygen minimum zones (OMZs) are concentrated today in only a few regions of the global ocean. They are truly anoxic and despite their limited areal extent, they are sites of globally-significant rates of nitrogen loss as N<sub>2</sub> gas. While this loss was traditionally ascribed to canonical heterotrophic denitrification, recent work has demonstrated that most nitrogen loss is, instead, channeled through the anammox (anaerobic ammonia oxidation) process. Active nitrogen cycling was thought to inhibit sulfate reduction, explaining the lack of sulfide into these oxygen-free waters. New results show, by contrast, that these waters likely support an active, but cryptic, sulfur cycle, where sulfide produced by sulfate reduction is actively oxidized through nitrate reduction. Metagenomic results confirm the presence of microbial sulfur-cycling communities, and through their activities, these organisms may contribute to significant amounts of organic matter mineralization in OMZ water and to the ammonia driving anammox. Accumulating evidence suggests that in the past, oxygen minimum zones supported chemistry quite different from those found today. Many instances of both sulfidic and ferruginous OMZs, extending well into the Precambrian, have now been described. We are still challenged to understand the circumstances responsible for the development of these different styles of OMZ water chemistry. However, the different flavors of OMZs through time must reflect the evolving chemistry of the coupled ocean-atmosphere system through time, and how this has controlled the variable expression of the different microbial populations known to inhabit OMZs today.

## The alteration and the fluid inclusion characteristics of the Çavdır (Burdur) copper mineralization, SW Turkey

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Çavdır (Burdur) copper mineralization, located in southwestern Turkey, occurs in the gabbros of the Lycian Allochthon. The mining district has a few meter wide vein systems that contain malachite±azurite, plus minor chalcopyrite, bornite, iron minerals such as goethite, hematite and magnetite in quartz gangue. The strike of major ore-bearing veins is N 30° to 45° E that are nearly parallel to the major fault in the study area. The veins are accompanied by extensive alteration.

Qualitative clay analysis were made to define alteration minerals and kaolinite, smectite, illite, zeolite, chlorite group minerals, cristobalite were determined by X-Ray Diffractometer method.

Microthermometric measurements were done on fluid inclusions of the quartz gangue. Fluid inclusions are two phased L+V (liquid+vapour) and NaCl-H<sub>2</sub>O in system. Mean homogenization temperature is measured as 283°C, the mean salinity is calculated from the equation %NaCl= [(-1,78x T<sub>m<sub>ice</sub></sub>)-(0,0442xT<sub>m<sub>ice</sub></sub><sup>2</sup>)-(0,000557xT<sub>m<sub>ice</sub></sub><sup>3</sup>)] [1] as %8 NaCl equivalent and the mean density is found as 0,82 gr/cm<sup>3</sup> by plotting % NaCl equivalent versus Th (°C) [2].

These alteration and microthermometric datas connote an epithermal system. In the light of the acquired datas, it is suggested that the mineralization occurred in the effect of tectonic control and the heated ground water by the crust thickening (because of the emplacement of the Lycian thrust sheets) and geothermal gradient mobilized copper minerals from parental rocks.

[1] Bodnar (1993) *Geochemica et Cosmochimica Acta* **57**, 683-684. [2] Wilkinson (2001) *Lithos* **55**, 229-272.