

Degree of pyritization and $\delta^{34}\text{S}$ -values record suboxic conditions in Eastern Equatorial Pacific sediments (ODP Site 1226)

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The reductive dissolution of solid phase Fe-oxides is considered an important process in ocean sediments, however, the role of Fe as an electron acceptor remains poorly quantified. Reactions involving solid phase substrates are limited by dissolution kinetics but can significantly contribute to biogeochemical reactions in the deep biosphere over geological time scales.

We report results from sequential Fe-extraction and solid phase S-distillation of sediment from a sequence drilled in the Eastern Equatorial Pacific (ODP Site 1226). These sediments contain a total of about 1 wt% solid phase Fe but only 10 % of it can be considered reactive (mainly ferrihydrite and lepidocrocite at this site). The degree of pyritization (DOP) with respect to reactive Fe is around 0.8 in the Fe-rich vs. 0.5 in the Fe-poor layers. Also, pyrite from the Fe-poor intervals shows about 10‰ more positive $\delta^{34}\text{S}$ -values with respect to the Fe-rich intervals. This isotopically heavier S reflects late pyrite formation with HS^- diffusing downward from a stratigraphically higher, more active interval. Apparently, before the deposition of these layers exhibiting more intense SO_4^{2-} -reduction, suboxic conditions prevailed for a long time due to organic C limitation. Only minimal Fe-reduction and pyrite formation occurred in the absence of HS^- .

The presented results demonstrate that the combined analysis of reactive Fe minerals, reduced Fe-sulphide phases and S-isotopes can be used to reconstruct the diagenetic history and paleo-deep biosphere activity under dynamic geochemical conditions.

SiO_2 -rich metasomatizing agent in the Southern Patagonian lithospheric mantle

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A spinel-bearing mantle xenolith suite from Estancia Sol del Mayo (Southern Volcanic Zone, SVZ, Patagonia) has been studied. Peridotites are characterized by two generations of clinopyroxenes (cpx) and orthopyroxene (opx). The large protogranular opx (opx1) crystals have mg# (MgO/MgO+FeO, at%) varying between 88.0 and 92.8 and Al_2O_3 content varying between 1.35 and 2.95 wt%. The small opx, which occurs in vein (opx2), has a lower and more restricted range of mg# (90.0-90.9) together with a significantly higher Al_2O_3 content (3.02-3.52 wt%). The two types of clinopyroxene occur as large protogranular individuals (cpx1) or as small crystals usually occurring around spinel (cpx2). Within the same sample, at similar mg#, cpx1 has lower Al_2O_3 , Cr_2O_3 and REE contents.

These textural and geochemical features indicate that opx2 was added to the pristine peridotite and that the cpx growth near spinel was not isochemical. Chondrite-normalized incompatible trace elements show deep negative Nb, Zr and Ti anomalies that are common within the entire SVZ lithosphere. Major and trace element compositions of both pyroxenes show a good agreement with those collected in SVZ by Dantas (2007) [1], suggesting that metasomatism may have played an important role in the re-fertilization of the lithospheric mantle beneath the area.

[1] Dantas C. (2007). Unpublished Ph-D thesis, University of Toulouse III, France.