

Fe(II) in early abiotic processes

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Recently, it was suggested that Fe(II) preceded Mg(II) as an efficient co-factor in prebiotic catalysts on the early Earth [1]. Mg(II) has a special role in the folding and catalysis of biomolecules such as RNA because of its small size and ability to coordinate six oxygen atoms, including oxygens in oxyanions, in its first coordination shell [2]. In principle, Fe(II) can replace Mg(II) in this function and be even more efficient [1], but on Earth today Fe(II) is quickly oxidized to Fe(III) in the presence of molecular oxygen. However, before the Great Oxidation Event about 2.5 Ga Fe(II) would have been abundant in aqueous systems. Iron metabolism in modern organisms is controlled by small RNAs molecules (sRNA) [3]. Because of the ability of Fe(II) to coordinate oxyanions, Fe(II) minerals can catalyze the formation of pyrophosphate from activated phosphate compounds, such as acetyl phosphate, and inorganic phosphate [4]. It has also been found, that even though modern deep-sea water is oxidized, Fe(II) originating in hydrothermal fluids are stabilized because of its affinity to lipids, polysaccharides and proteins [5]. Abiotic formation of acetyl phosphate has been reported. It is, therefore, likely that Fe(II) would have been a powerful component in the formation of pre-RNA types of information molecules in early life systems.

[1] Athavale, Petrov, Hsiao, Watkins, Prickett, Gossett, Lie, Bowman, O'Neill, Bernier, Hud, Wartell, Harvey & Williams (2012), *PLoS One* 7(5). [2] Holm (2012), *Geobiology* 10, 269-279. [3] Massé, Salvail, Desnoyers & Arguin (2007), *Current Opinion in Microbiology* 10, 140-145. [4] de Zwart, Meade & Pratt (2004), *Geochimica et Cosmochimica Acta* 68, 4093-4098. [5] Toner, Fakra, Manganini, Santelli, Marcus, Moffett, Rouxel, German & Edwards (2009), *Nature Geoscience* 2, 197-201.

Compositional constraints on the mantle below part of the Andes SVZ

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This contribution discusses along and across arc differences in Pleistocene-Recent volcanic rocks of the SVZ based on new major and trace element and Sr, Nd and Pb isotope data from the T- and N-SVZ. We limit our discussion to little evolved compositions with high Mg#. Despite their primitive character most of these arc magmas display a strong negative correlation between silica and Ba/Th. Relative HFS-depletion is not caused by residual rutile is demonstrated by La-Nb systematics. Therefore, the relative enrichment in LILEs and LREEs is a reflection of source composition and show that that continental material with e.g. low Ba/Th rather than fluid was added to a source. The pre-enrichment mantle was more depleted in the C-NVZ than in the more northern T- and N-SVZ. Furthermore, all mantle below the arc is distinctly more depleted than the back-arc mantle, and compositional variation is thus indicated both N-S and E-W. Isotopically the depleted end-member is comparable to South Atlantic MORB mantle. Two distinctly different isotopically enriched endmembers show a similar elemental crustal signature. A Pb, Sr and Nd isotopic array of the northern backarc to T-SVZ arc magmas allow the arc-backarc mantle to be identified as distinct from the upwelling enriched Río Colorado component (Søager *et al.*, in prep.). There is a general decrease in water soluble components away from the trench. This may indicate that the fluid enriched source is generated over a more shallow part of the subducting slab than the crust enriched source. We model the crustal component that is added to the source as melts of subduction eroded continental crust that reacted with the overlying mantle.