# Processes affecting iron solubility in the Tropical North Atlantic

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Iron (Fe) has been clearly shown to be a limiting nutrient for phytoplankton productivity in many different oceanic regions. A critical apsect underlying iron limitation is the low solubility, under ambient seawater conditions, of solid iron phases supplied as aerosols or riverine particles to the ocean. Processes which enhance the solubility of iron in seawater, either through redox reactions or organic complexation, are key to our understanding of the biogeochemical cycling of iron and its global distribution. In this work we combine information from a recent meridional cruise through the Atlantic (PS ANT XXVI-4) with sampling performed within the SOPRAN project at the TENATSO time series site located near Cape Verde to examine processes influencing iron solubility in the Tropical North Atlantic in the region under the Saharan dust plume.

A promising indicator of iron solubility in deep waters is marine humic fluorescence (ex 320/em 420), as work in the Pacific [1] has shown strong correlations with Fe solubility and AOU. This suggests that iron solubility in deep waters is scaled to the release of iron complexing ligands from the decomposition of sinking organic matter. During ANTXXVI-4 we observed a region of intermediate waters with strong humic fluorescence consistent with observations of elevated Fe concentrations [2]. The humic fluorescence signal however is sharply attenuated in surface waters due to bleaching, suggesting that other ligands or processes are important in the euphotic zone. Our work at TENATSO suggest that iron solubility is not significantly enhanced by reactions with superoxide [3] and is controlled by the presence of non-fluorescing colloids or siderophore type ligands consistent with earlier previous work in the Mauritanian upwelling [4].

**[1]** Tani, H., *et al.* (2003) *Deep-Sea Research*, 50: 1063-1078. **[2]** Measures, C.I., *et al.* (2008) *Global Biogeochemical Cycles*, 22. **[3]** Heller, M.I. and P.L. Croot. (2010) *J. Geophys. Res.*, 115: C12038. **[4]** Schlosser, C. and P. Croot. (2009) *Geophys. Res. Lett.*, 36: L18606, doi:10.1029/2009GL038963.

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# Albite precipitation in mudstones – Comparison of natural and synthetic systems

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Closed system hydrothermal batch experiments on smectite (SWy-2, The Clay Minerals Society) and smectite + K-feldspar, reacted with NaCl solutions, were performed at 200 °C with each experiment runing for 2-3 weeks. The experiments show that dispersed albite readily forms from smectite in systems supersaturated with respect to albite. This compares well with observations from natural mudstones, where micro-sized authigenic albite (mAlb) is found together with authigenic 2-4 $\mu$m micro-crystalline quartz (mQtz) embedded in an illitized clay matrix (Fig. 1). The amount of authigenic mAlb formed in the natural systems are about 10-15% of the produced authigenic mQtz. The suggested reaction equation indicate that less than 2 wt % sodium and 2-3 wt % potassium is required to account for both the estimated mAlb and illite formation from smectite and K-feldspar.

The findings indicate closed system diagenesis predicted from the physical and chemical properties of fine grained siliciclastic rocks during burial, and that the source for necessary sodium, silica and aluminum for authigenic mAlb formation is smectite and K-feldspar dissolution resulting in mainly illite and quartz formation.

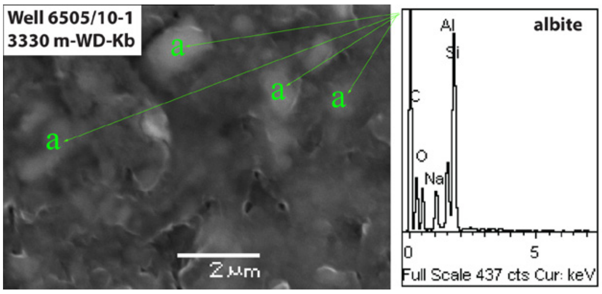

**Figure 1:** SEM image of natural mAlb (a) together with feldspar, quartz and clay from well 6505/10-1 sampled at 3330 m.