Particulate iron, an important source of dissolved Fe

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It is well established that iron (Fe) is essential micronutrient for the growth of phytoplankton and hence plays a crucial role in ocean ecosystems. The sensitivity of ecosystems to Fe supply is largely due to its short residence time, which is in the order of days to months in surface waters and tens to a few hundred years in deeper waters. The dissolved phase (dFe) is considered the most biologically available however, rather ironically, the main source of new Fe to the ocean is through particulate sources (i.e. dust deposition, sediment re-suspension, ice-rafted debris). The oceanic Fe inventory is dominated by the particulate phase (pFe) and is most evident in shelf systems yet this fraction is not well understood compared to dFe.

Here we present dFe, pFe and aerosol data to evaluate the input sources of Fe to the sub-tropical Atlantic Ocean and in the South Atlantic collected during two GEOTACES cruises (GA06 and GA10). In the subtropical Atlantic both atmospheric deposition and lateral advection from shelf systems was identified. Several studies in the sub-tropical Atlantic have suggested that the dominant source of dFe is dust deposition and biological remineralisation [1] [2]. Our data however reveal that lateral transport from the shelf accounted for 5000 μmol m^{-2} d^{-1} of dFe and up to 103,000 μmol m^{-2} d^{-1} of leachable particulate Fe. Further off-shore these fluxes decreased and were a similar to the atmospheric Fe flux, indicating the importance of this source of pFe to dFe in this region.

In the South Atlantic pFe was much higher in the western basin compared to the eastern basin and benthic storms resulted in large particle resuspension resulting in very high pFe up to 1000 m off the sea floor. This contributed to high dFe concentrations in this region.

[1] Fitzsimmons *et al* 2014. *Marine Chemistry* 154: 87-99. *Geophysical Research Letters*. **41**. 920-926 [2] Hatta et al. 2014. *Deep Sea Res II*