Seasonal cycling and off-shelf transport of dissolved, soluble and colloidal iron in the Celtic Sea

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Shelf sea sediments are an important source of dissolved iron (dFe) to the open ocean [1], yet at present this source is poorly understood. In particular, very little is known about the relative contribution of soluble (sFe) and colloidal (cFe) iron to dFe near shelf regions. Here, we report the first seasonal study of dFe, sFe and cFe cycling in the shelf system of the Celtic Sea and its fate during off-shelf transport.

On the shelf during early spring the water column was well mixed, resulting in homogenous dFe concentrations with cFe typically representing >50%. While, in winter the water column was stratified due to warm air temperatures. In surface waters biological uptake depleted dFe concentrations to a minimum of 0.12 nM. The dFe in the upper mixed layer was dominated by sFe. This suggests biological preference for cFe or, more likely, loss of cFe due to aggregtion and/or sorption to particulate forms.

Regardless of season, large scale resuspension events were evident, resulting in high dFe concentrations (4.3 nM) at shallow on-shelf stations. This dFe was dominated (up to 80%) by the cFe fraction. Offshore transpost of dFe was evident with elevated dFe concentrations (1.6 nM) between 600-800 m. The proportion of cFe in these waters increased and cFe below the ferricline was consistently 60-80% of dFe indicating both an input of colloidal material from shelf sediments and dynamic cycling between cFe and sFe to maintain this proportion.

At present the relative bioavailbilty of sFe and cFe is poorly understood but initial studies suggest sFe is taken up more rapidly and hence is more bioavailable [2]. If so our findings have important implications for assesing the impact that shelf sediment derived dFe could have in feulling marine primary producton.

[1] Tagliabue *et al* 2014. *Geophysical Research Letters*. **41**. 920-926 [2] Wang & Dei 2003. *Aquatic Mircobial Ecology*. **33**(3) 247-259