Links between diel vertical migrations and ocean oxygen

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Diel vertical migration of zooplankton and micronekton - the largest migration on Earth, is a major but poorly quantified component of the ocean's biological pump. The impact of this migration on oceanic oxygen has received relatively little attention, partly due to the lack of a predictive framework. By using a global synthesis of acoustic data we show that diel vertical migrations are characterized by coherent large-scale patterns, which are strongly correlated with the distribution of subsurface oxygen. Open ocean oxygen minima, when present, emerge as potential refuges for vertical migrators. Including a representation of the respiratory needs of migrating populations in a three-dimensional ocean model suggests that, by focusing respiration in poorly-ventilated regions of the upper ocean, diel vertical migrations intensify oxygen depletion at the upper margin of oxygen minimum zones. This coupling between migrating animals and marine oxygen may have important implications for fisheries and oxygen minimum zone chemistry in a changing ocean.

The river Po: geochemical fluxes and related insights on weathering processes and erosion rates

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The Alps and the Apennines both convey water and sediments to the Po river that is the most important fluvial system of the Italian Peninsula, characterized by a length of 650 Km, an hydrological basin of 74000 km^2 and an average discharge of 47 Km^3/yr. Major and trace elements, stable isotope composition of water and radiogenic strontium isotopes were used to characterize the sources and fluxes of solutes. Compared with the local meteoric isotopic signature, stable isotopes ($\delta^{18}O$ between -10.8 and -9.2; δD between -70.0 and -65.4) reveal that most of the recharge occurs in the north-western part of the basin, i.e. conveyed mainly from the highlands. Although subordinate, carbonatic lithologies are preferentially involved in the weathering processes inducing the typical Ca-HCO_3 hydrochemical facies and a specific strontium isotopic signature ($^{87}Sr/^{86}Sr$ 0.7090-0.7092) that is intermediate between that of Mesozoic carbonates (0.707-0.708) and felsic igneous and metamorphic rocks (> 0.701). The data also provide insights on the erosion and denudation rates of the orogens bordering the basin. The observed TDS (average and median of 39 measurements are 268 and 292 mg/l, respectively) suggest that a solute flux in the order of $13*10^6$ t/yr is transferred from the Po River toward the Adriatic Sea. A total erosion of $68*10^6$ t/yr is estimated within the Po River drainage basin, assuming that solute represent a fraction (of ca 20%) of the weathering products. This estimation conforms to other recent investigations [1].

[1] Hinderer *et al*, 2013. *Earth Science Review* **118**, 11-44.

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