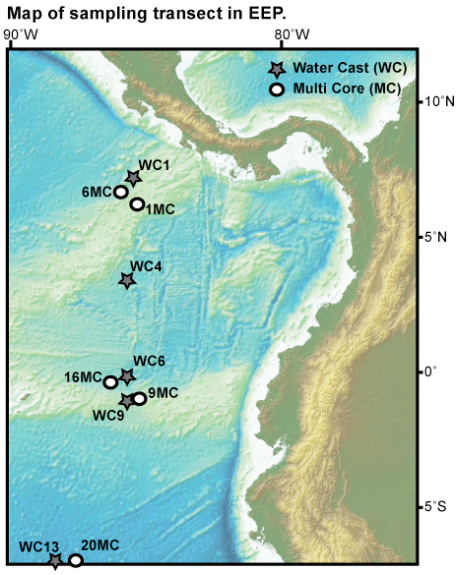
# Testing boundary exchange of Nd isotopes in the Eastern tropical Pacific Ocean

STELLA WOODARD[1]*, FRANCO MARCANTONIO[2], DEBORAH THOMAS[1] AND MITCHELL LYLE[1]

[1]Department of Oceanography, Texas A&M University, College Station, TX 77843, USA (*correspondence: swoodard@ocean.tamu.edu)
[2]Department of Geology & Geophysics, Texas A&M University, College Station, TX 77843, USA

We investigate the possibility of boundary exchange as a mechanism for altering the Nd isotopic composition of seawater along the eastern margin of the equatorial Pacific Ocean by analyzing Nd isotopes and concentrations in seawater and sediment collected along a transect in the Panama and Peru Basins during the Fall of 2010. The region plays an important role in the global carbon cycle due to enhanced productivity, upwelling and venting of $CO_2$ rich waters and is affected by enhanced precipitation and riverine runoff. In addition, the area is interesting in terms of intermediate water circulation with the confluence of NPIW and AAIW near the equator at depths of ~500-1000m.

Seawater dissolved $^{143}Nd/^{144}Nd$ and [Nd] profiles were determined for five locations (see map) and compared with the Nd isotopic composition of biogenic apatite (thought to reflect bottom water εNd) and lithogenic material isolated from the tops of five multi-cores (see map). Preliminary data from seawater collected at site WC13 show a decrease in εNd from -2.1 at 500m to -3.4 at 2750m water depth.




# Minor effect of physical size sorting on iron solubility of transported mineral dust

M.T. WOODHOUSE, Z.B. SHI, K.S. CARSLAW, M.D. KROM, G.W. MANN AND L.G. BENNING

School of Earth and Environment, University of Leeds, Leeds, United Kindom (m.woodhouse@see.leeds.ac.uk)

Observations show that the fractional solubility of Fe (FS-Fe, defined as the ratio of dissolved to total Fe) in dust aerosol increases from ~0.1% in regions of high dust mass concentration and up to 80% in remote oceanic regions where concentrations are lowest [1, 2]. Here, we combined laboratory geochemical measurements with global aerosol model simulations to test the hypothesis that the increase in FS-Fe is due to physical size sorting during dust transport. We determined the FS-Fe in size-fractionated dust generated from two representative Saharan dust source samples using a customized dust re-suspension and collection system. The results show that the FS-Fe is size-dependent and ranges from 0.1-0.8%. The size-resolved FS-Fe data were then combined with simulated (size-resolved) dust mass concentration data from a global aerosol model, GLOMAP, to calculate the FS-Fe of dust aerosol over the tropical and subtropical North Atlantic Ocean. We found that the calculated FS-Fe in the dust aerosol increased from ~0.1% at high dust mass concentrations (e.g., >100 $\mu g\ m^{-3}$) to ~0.2% at low concentrations (<1 $\mu g\ m^{-3}$) due to physical size sorting alone. These values are one to two orders of magnitude smaller than those observed on cruises across the tropical and sub-tropical North Atlantic Ocean [1, 3] under an important pathway of Saharan dust plumes for similar dust mass concentrations. Even when the FS-Fe of the sub-micrometer size fractions (0.18-0.32 $\mu$m, 0.32-0.56 $\mu$m, and 0.56-1.0 $\mu$m) in the model were increased by a factor of 10 over the measured values, the calculated FS-Fe of the dust was still more than an order of magnitude lower than that measured in the field. Therefore, the physical sorting of dust particles alone is unlikely to be an important factor in the observed inverse relationship between the FS-Fe and the atmospheric mineral dust mass concentrations. These results suggest that processes such as chemical reactions and/or mixing with combustion particles are the main mechanisms to cause the increased FS-Fe in long-range transported dust aerosols.

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