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# The contribution of iron isotopes to the understanding of the biogeochemistry of the Equatorial Pacific Ocean.

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This study presents seawater dissolved iron (DFe) and particulate iron (PFe) concentrations and isotopic compositions ($\delta^{56}$DFe and $\delta^{56}$PFe) in Western and Central Equatorial Pacific Ocean. The EUCFe cruise (RV *Kilo Moana*, PI: J. W. Murray, 2006) aimed to characterize Fe sources to the Western Equatorial Pacific and its transport by the Equatorial Undercurrent (EUC), a narrow and fast eastward current flowing along the equator. For the first time, iron isotopic compositions have been measured in a vast area of the Equatorial Pacific Ocean. This study covered 15 stations in the equatorial band (2°N-2°S) between Papua New Guinea and 140°W, over more than 8,500 km along the equator and in the top 1,000 m of the water column.

$\delta^{56}$DFe and $\delta^{56}$PFe ranged from $d^{56}Fe_{/IRMM-14}$ values of −0.25 to 0.79 ± 0.07 ‰ and from −0.56 to 0.48 ± 0.07 ‰ (95 % confidence interval), respectively. Both biogeochemical processes and transport allow an understanding of the distribution and speciation of Fe in this region. Two distinct areas emerge from the data. In the coastal area, the high PFe concentrations along with $\delta^{56}$DFe values systematically heavier than that of $\delta^{56}$PFe indicate a permanent dissolved-particulate exchange without redox reactions. This exchange may occur through non reductive dissolution, as previously proposed in studies based on limited data[1][2]. In the open ocean area, away from major sedimentary inputs, iron chemistry becomes sensitive to water mass transport. Our results reveal the preservation of the isotopic signal from Papua New Guinea to the Central Equatorial Pacific (8,500 km), transported by the EUC. At 140°W, lighter isotopic values suggest a distinct source of iron, the Californian and/or the Peruvian oxygen minimum zones (OMZ). This poorly documented source from the OMZ could provide new insights into marine primary production in the Central Pacific and possibly in the Eastern Pacific high nutrient low chlorophyll (HNLC) region.

[1] A. Radic, F. Lacan, J. W. Murray, Earth Planet Sc Lett, 306, 1, 1–10, 2011.

[2] M. Labatut, F. Lacan, C. Pradoux, J. Chmeleff, A. Radic, J. W. Murray, F. Poitrasson, A. M. Johansen, F. Thil, Global Biogeochem Cy, 28, 10, 1044–1065, 2014.