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Using GEOTRACES Intermediate Data Product to constrain model ocean Fe cycling in the Pacific Ocean

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The micronutrient iron (Fe) limits biological productivity in about half of the world's oceans, including a large area in the Pacific Ocean, thereby influencing the cycling of carbon and essential nutrient elements and marine ecosystems in this ocean basin. In the Pacific Ocean, complex interactions between external sources of Fe from continental margins, hydrothermal vents, coastal rivers, and atmospheric deposition with various physical and biogeochemical processes hinder our understanding of the ocean Fe cycling and limit the confidence in our projection of future ocean changes. Recently, there is an emerging opportunity to improve our understanding of these processes as Fe data set is rapidly expanding along various GEOTRACES transects, which cover all major basins of the world's oceans. In this poster, we compare results from a suite of computer simulations from a regional physical-biogeochemical model for the Pacific Ocean with seven GEOTRACES transects showing dissolved Fe patterns in this basin. This comparison emphasizes the role of low-oxygen benthic sediments in releasing Fe, sinking particles in stripping Fe out of the euphotic zone, ligands produced by remineralization processes in protecting Fe from being removed in the subsurface waters (200m-1000m), and ocean circulation in transporting Fe from source regions to the Fe-limited open ocean along various zonal pathways. In combination, these processes reproduce the observed high gradient of dissolved Fe concentrations between surface and subsurface waters and between coastal and open ocean regions, which is not well captured by previous global ocean biogeochemistry models. This comparison also highlights limitations in our understanding of the Fe release and transport from hydrothermal vents, oxygenated sediments, and rivers, which should be the focus of future studies.