Whitmore/Shiller GP17 Statement of Interest for GP17-OCE & GP17-ANT

We propose studying dissolved Ba, Ni, REEs, V, Ga, and CH_4, which will both complete our large-scale Pacific survey, complement other investigators' related efforts (e.g., Ba/Nd isotopes, Al, Mn, Sc, Th-232, Ra), and add to our understanding of how the Southern Ocean affects distributions of these elements. We'll also determine Cu, Cd, and Mn, allowing for intercalibration with others.

These elements allow examination of various processes affecting the GP17-OCE/GP17-ANT sections. Dissolved Ga is a dust tracer on the low end of reactivity of a suite of terrigenous tracers including Al and Th-232. Dissolved REEs (and their ratios/anomalies) can help identify water sources, removal processes, redox effects, and margin influences. The Circumpolar Deep Water (CDW) section will be particularly informative for understanding bio-intermediate elements (Ba and Ni), which have comparatively high shallow water concentrations relative to bio-active elements (i.e., Ba/Ni have high preformed concentrations). The margins could substantially influence V, which can be removed in association with Fe/Mn-oxyhydroxide cycling (Whitmore et al., 2019; Scholz et al., 2017). We expect to see V removal from CDW as it flows across the shelf-slope break and is influenced by mixing and sediment interactions. Modeling suggests that Amundsen Sea shelf waters are a sink of atmospheric CH_4 (Bui et al., 2018). We will determine air-sea CH_4 fluxes, identify sources and sinks in the region (partly through comparison with TEIs), and compare to modeled methane emissions.

Comparison of element distributions across the Chilean and West Antarctic margins with our EPZT section across the Peru margin will be instructive given differences in oxygen as well as physiography (e.g., Chilean coastline with fjords, islands, and peninsulas; Antarctic glacial/subglacial inputs). Comparisons of tracer distributions across the Tahiti-to-Antarctica productivity gradient could be instructive regarding removal and remineralization and how these processes in this region ultimately affect broader oceanic elemental distributions.