Statement of interest for US GEOTRACES GP17-ANT (Amundsen Sea embayment)

Trace metals in suspended particles:
high spatial resolution GO-Flo sampling in the Amundsen Sea shelf/slope region.

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1. Specific research goals and relevance to the overall objectives of the section:
   A) Determine **total suspended particulate trace element concentrations** for every station and every TMC CTD-rosette depth on GP17-ANT in order to quantify the composition of suspended particles of biogenic, lithogenic (esp. as influenced by glacial melt), and authigenic phases. Collection of particles from 1-10L volumes from the TMC GO-Flo bottles will allow assessment of interactions with dissolved trace elements collected simultaneously.
   B) Apply **complete digestion, weak acid leaching and established ICP-MS techniques** to determine ~35 elements, including key/essential GEOTRACES trace elements (Fe, Al, Zn, Mn, Cd, Cu, Co) as well as other elements of interest (P, Ca, Sr, V, Cr, Ni, Ti, Y, Zr, Ba, Mo, Ag, REEs, Pb, Be, As, and U) to allow investigations of multiple geochemical processes and a complete suite of elemental data for future interpretation.
   C) **Collect near-bottom and surface sediment samples** by near-bottom CTD sampling of suspended particles within the nepheloid layer and collection of unconsolidated "fluff layer" samples (Hoffman et al., Mar. Chem, 2018) from monocore and multicore deployments, in collaboration with those proposing to make down-core measurements of the consolidated sediments.
   D) Maintain **transmissometer and optical backscatter sensors** during the transect and supervise calibration, collection and interpretation of data to quantify optical signals against major particulate phase concentrations, especially in comparison to high resolution sampling of the euphotic zone and nepheloid layer. Use optical data for spatial interpolation of suspended matter distributions between sampling depths.
2. Sample requirements: Up to full volume (11.5L) of one TM-clean Go-Flo bottle to filter through 0.45µm Supor membrane (mostly 25mm, some 47mm diameter) under <8psi air/N2 pressure. Filtrate can be used for dissolved TE's as on previous GEOTRACES cruises. We are interested in separate collection of large particles on a subset of samples, e.g. polynya euphotic zone >51µm particles, with immediate resuspension of particles to separate from filter matrix, to explore e.g. stoichiometry of colonial *Phaeocystis antarctica,* and possible associations of colonies with inorganic particles.
3. Berth requirements: this project will require one berth (in addition to co-Chief PI Sherrell and one TM Super-Tech devoted to particle collection, both funded through the Management grant), likely a postdoc to work with the Super-Tech to carry out the GO-Flo filtrations on each TMC CTD cast, sample and process large particle and fluff layer samples, archive the particulate filters, and supervise maintenance of the optical turbidity sensors.
4. Anticipated collaboration and synergies: We will coordinate closely with the Lam group (in-situ pumping) to match depths and complement the more limited vertical coverage of the pumps (but greater parameter coverage, e.g. POC, Th-Pa-Nd isotopes) in a manner arrived at by group consensus. We are open to collaborating on particle analyses, and are interested in complementary "Biogeotraces" approaches to the physiology and stoichiometry of autotrophs, but we also see some advantage in keeping all ICP-MS analyses within a single analytical lab. We will interact closely with those measuring dissolved and colloidal TEIs from GO-Flo samples, as dissolved-colloidal-particulate mass and TEI exchanges are key processes of interest. We will also work closely with those sampling upper sediments, since we are interested in the best combined quantification of exchange fluxes at the sediment-water interface. Finally, it will be critical to work with shipboard ADCP, CTD and nutrient data, as well as meltwater tracers like δ18O, as we hypothesize a strong influence of the ice shelf cavity "meltwater pump" on the distribution of particulate TEIs.