<u>Barbeau and Moffett Science Plan for Pacific Meridional Section</u>

We propose to measure Cu speciation and total dissolved copper on the cruise.   We will use competitive ligand exchange-adsorptive cathodic stripping voltammetry (CLE-ACSV) methodologies used on the NAZT cruises (by Moffett) and EPZT (by the Barbeau group).   Results to develop a speciation-based scavenging model for Cu. With this data set, the investigators will have full water column sections at the beginning (NAZT), middle (EPZT)and end of the oceanic conveyor belt.   Cu displays a simple linear increase with depth that is difficult to explain with current models used for other biologically active metals. We hypothesize that a dynamic relationship between complexed Cu in solution and binding sites on sinking particles leads to a decoupling of Cu cycling from the biological pump and hence divergence from elements such as Cd and Zn.

The most important part of the section is the deep North Pacific and we plan for high resolution profiles throughout the region.   Data will be used to develop a scavenging model that incorporates speciation information in collaboration with Seth John.   We are interested in the asymmetrical distribution of Fe and the primary nitrite maximum north and south of the equator.   The low Fe and intense primary nitrite maximum lead to a very high Cu demand, as Moffett observed in the EPZT in 2010 (Jacquot et al., 2010, doi:10.4319/lo.2013.58.4.1387).   Results will support ongoing collaborative efforts between Barbeau and Maite Maldonado to characterize the role of Cu in planktonic ecology at Ocean Station PAPA (Semeniuk et al. 2016, <u>10.1002/lno.10210</u>).

Moffett plans to study the approach to isotopic equilibrium in the competitive ligand methodology by using a method (Moffett and Zika, 1987, doi:10.1016/0304-4203(87)90053-3) coupled with Cu 63/65 measurements that enables physical separation of the ligand – exchangeable (i.e. labile) forms of complexed Cu and the inert formsResults will inform many of the assumptions we make about Cu in the scavenging model. We will perform multiple analytical window CLE-ACSV   to resolve the broadest range of ligand strengths.   These measurements can provide increased qualitative understanding of how the chemical nature of the Cu ligand pool changes in different regimes.

In addition to speciation work Moffett proposes to measure total dissolved Cu because Cu is an element which still has some disparities amongst analysts and therefore an additional dataset is a good idea.