Microgel's role in metal scavenging

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This research focuses on understanding the dynamics and reactivity of marine microgels and their relation to cycling of organic iron-binding ligands [1]. Iron is a limiting nutrient for phytoplankton in at least half of the global surface ocean. Reports suggest that an important fraction of the dissolve organic carbon pool (DOC: 662 PgC, [2]) reaching (10-30%) assembles to form a nutrient-rich pool of "microgels", thus converting dispersed recalcitrant DOC to a particulate form more directly accessible to the microbial loop [3], scavenging metals [4, 5] and having emergent properties that may affect the distribution of trace metals in the ocean [6]. The goal of this proposal is to understand and quantify DOC/gel dynamics and reactivity during the Geotracers proposed cruise track of the Alaska-Tahiti section along 152° W, applying the soft matter gel conceptual framework as a predictive theory [7, 8] for assessing colloidal processes and controlling factors related to the iron ligand complexation. The integration of these measurements would improve the understanding of the geochemical distribution of iron and other metals [5, 6]. This work, will include both lab study and field work along the proposed Geotracers cruise, and will evaluate polymer gel theory as a predictive tool to explain DOC/gel reactivity and dynamics in the ocean by characterizing gel assembly kinetics and thermodynamics, their annealing and further aggregation into larger particles, as well as the effects of volume phase transition phenomena with respect to changes in the concentration of iron (Fe^{+3}), other metals ($Al^{+3,}$ Ga^{+3}), and environmental parameters (pH, temperature). Our goal is to provide a mechanistic model to explain microgel polymer reactivity in relation to iron complexation as well as other metals.

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