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Oceanographic and topographic influences on dispersal of hydrothermal vent species

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The population dynamics, community structure and gene flow of species living at deep-sea hydrothermal vents depend strongly on migration of their larvae between isolated vent sites. We are interested in quantifying the extent and direction of larval dispersal from vents near 9∞N on the East Pacific Rise. We also want to solve the reverse question – i.e., to what extent are EPR vent populations recolonized by their own larvae. Because retention and dispersal of larvae are controlled largely by the oceanic flow field, we propose to investigate these processes using a tracer-release experiment, current meter measurements and a hydrodynamic/transport model. However, we recognize that some larvae likely modify their vertical positions over the course of their larval stages, which can modify their dispersal in sheared flow. To account for larval behavior we plan to incorporate vertical larval swimming into our dispersal model. We will infer vertical swimming behaviors by sampling larvae near vents at heights between 1 and 200 mab to determine what layers of the deep water column they inhabit at different stages in their larval lives.
We anticipate that this study will require participation in 3 cruises over a period of 1 year. The tracers (dye and SF6) will be released and surveyed on Cruise 1, and surveyed again at 35 d (Cruise 2) and 1 yr (Cruise 3). The current meter array will be deployed on Cruise 1 and recovered on Cruise 3. Vertical distributions of larvae in the plankton will be sampled on each cruise.

We are hoping to coordinate these oceanographic measurements with studies of chemistry, heat flux or other processes that are influenced by circulation and dispersion at mid-ocean ridges.