Mesoscale Biological Interactions within a Cyclonic Eddy in the North Pacific Subtropical Gyre

Introduction
As part of the 2007 summer laboratory-field training course in “Microbial Oceanography: from Genomes to Biomes”, hosted by the Center for Microbial Oceanography: Research and Education (C-MORE) and sponsored by the Agouron Institute, we conducted a 10-day research expedition to study the physical, chemical and biological properties and interactions associated with a cyclonic eddy named “Bigelow” located at 21.17°N 158.08°W in the North Pacific Subtropical Gyre during July 10th — 20th, 2007.

Observations
• Uplifted density layers, nutricline, and Deep Chlorophyll Max (DCM) associated with eddy center.

Nutrient concentrations measured using Technicon AutoAnalyzer II system on water samples collected from known depths by CTD rosette at eddy center (St. 9) & eddy periphery (St. 16).

• Dramatically enhanced autotrophic and heterotrophic production was observed at eddy center despite near horizontal uniformity in planktonic abundance & biomass as indicated by epifluorescence microscopy, Chl a, and ATP measurements.

To elucidate the influence of eddy Bigelow on the microbial community we performed an across eddy sampling transect from the eastern trailing edge of eddy Bigelow (St. 8), through the center (St. 9), and across to the western leading edge of Bigelow (St. 16) performing an array of biological rate, microbial community composition changed during the eddy.

Conclusions
• Integrated primary production was 60% higher at eddy center and comparable to the highest rates observed at HOT Station ALOHA.

• Heterotrophic bacterial production was ~5 fold higher at eddy center, representing ~14% of contemporaneous primary production.

• Primary and secondary production were enhanced in the eddy center, but biomass was not, implying higher specific growth and loss rates in the eddy center.

• High carbon export was observed at both eddy center and periphery, with a particularly high silica export relative to carbon of 156 PSS/PC (μmol:μmol).

• Enhanced productivity in the center of the eddy did not result in any obvious shifts in microbial community composition.

Acknowledgements
We would like to thank the Agouron Institute and NSF for funding and C-MORE for hosting the course, the course organizers, Matt Church, Greg Steward, Mike Rapp, & Dave Karl, as well as the gracious visiting faculty, course staff, Tara Clemente, Kari Bjoerkman, Ken Doig et al & Bret Uyehara, and the crew of the Kōʻo Moana.