

Biological and Physical Comparison of Cyclonic
Eddies in an Open Sea Region and in a
Coastal Channel

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Abstract:

Cyclonic eddies characteristically move cold, salty nutrient-rich water into the euphotic zone. Eddies with a diameter of under 100 km (submesoscale) have been much less studied than their larger counterparts, due to the difficulty and expense of tracking, finding, and sampling these comparatively short lived features. The effect of cyclonic submesoscale eddies on biological biomass, measured by fluorescence, was investigated in two areas; the North Sargasso Sea and the Northwest Providence Channel, South of the Bahamas. Two eddies were compared. The North Sargasso Sea eddy, formed as a spin off of a larger nearby eddy, and the Providence channel eddy formed by the interaction wind shear with channel currents. Both surface and subsurface samples to a depth of 600 meters were taken across the eddy centers in single transects. In the center of both eddies current magnitude decreased and current direction changed, while temperature decreased and salinity increased markedly. Fluorescence was most intense near the edges of the North Sargasso eddy, and decreased towards the center. This is a signature of a decaying eddy. In the Providence Channel eddy the fluorescence was heightened across the feature, with high levels on either edge and in the center. Together with a strong increase in salinity and decrease in temperature this pattern is a signature of a mature cyclonic eddy. We also observed enhanced subsurface fluorescence during the entire cruise, both within and outside the eddy structures. Small scale cyclonic eddies were found to effect both physical and biological properties in coastal and oceanic regions.