Oceanic Submesoscale Eddies in the Western Pacific

Ocean variability is dominated by processes and features at a variety of scales, including both mesoscale (ranging from 10-300 km) and submesoscale (ranging from 1 to 10 km) motions. This study focuses on the submesoscale processes, which includes small-scale fronts, filaments, and eddies – with the submesoscale eddies being of particular interest. While most ocean submesoscale studies are focused within the mixed layer of the upper ocean, recent studies have shown submesoscale processes have significant impacts throughout the ocean column, and are thus not restricted to the mixed layer. Such impacts include the vertical transport and heat exchange between the ocean surface and mixed layer as well as between the mixed layer and the ocean interior, ocean restratification, currents, biological tracers, and even weather patterns and climate. In this study, we use the Navy Coastal Ocean Model (NCOM) to produce ocean model simulations over the Western Pacific region with 375 m horizontal resolution and vertical resolution varying from 0.5 m at the ocean surface to 250 m at depth. The high horizontal and vertical resolutions are necessary to fully capture the relevant motions related to the submesoscale processes and the subsequent impacts on the surrounding ocean environment. Atmospheric forcing for NCOM is provided by a Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) simulation with 3 km horizontal resolution. Within this study, we are able to identify and track submesoscale eddies separately from other submesoscale processes and will show the dynamics and subsequent impacts throughout the submesoscale eddy lifecycle. Additionally, by identifying the submesoscale eddies, we are able to determine the influence of the submesoscale eddies compared to the full submesoscale field.

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