SUBMESOSCALE WRINKLES IN THE ANTARCTIC CIRCUMPOLAR CURRENT

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The Southern Ocean is home to the Antarctic Circumpolar Current (ACC), one of the earth's major current systems, flowing around the globe from west to east. The ACC plays a central role in the global ocean overturning circulation by providing a pathway by which water can move from the ocean interior to the surface along surfaces of constant density. The Southern Ocean is also known to have hotspots of mesoscale eddy activity. On smaller scales, submesoscale eddies and fronts with scales between 1-10km are associated with enhanced vertical velocity that aids the exchange of water between the mixed layer and thermocline. Despite their importance in other regions, very little is known about the role of submesoscale features in the ACC.

Here, we will present new observations and high-resolution numerical simulations of submesoscale features in the ACC. Observations were made as part of the SMILES project from April-May 2015 east of Drake Passage in the Scotia Sea. During the cruise, a large northward meander of the ACC was sampled at high resolution using towed bodies, surface drifters, microstructure, and dye release. Satellite imagery indicated the presence of submesoscale 'wrinkles' along the sharp temperature gradient associated with the ACC. Observations using a moving vessel profiler (MVP) will be shown which reveal rich three-dimensional structure associated with these features. Numerical simulations, initialized with an idealized version of the observed front qualitatively reproduce these features. The numerical simulations allow us to quantify the vertical velocity associated with the submesoscale features, and their interaction with the strong barotropic flow associated with the ACC.

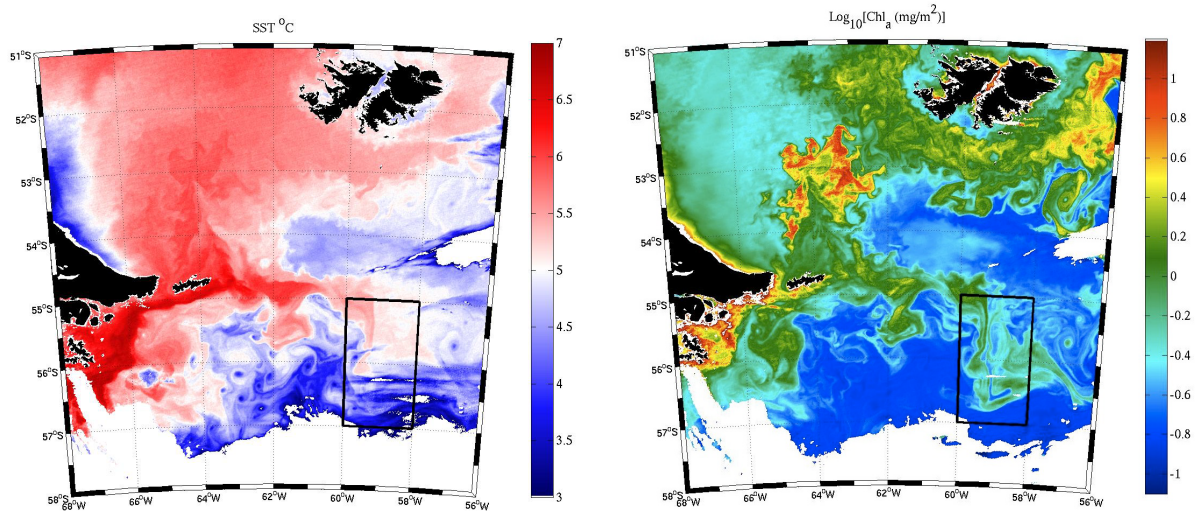

Figure 1. Sea surface temperature (left) and near surface Chlorophyll (right) from the NASA MODIS satellite