

## **Oceanic Submesoscale Currents**

James C. McWilliams

*Department of Atmospheric and Oceanic Sciences Institute of Geophysics and  
Planetary Physics, University of California*

This talk is a perspective on the recently discovered realm of submesoscale currents in the ocean. They are intermediate-scale flow structures in the form of density fronts and filaments, topographic wakes, and persistent coherent vortices at the surface and throughout the interior. They are created from mesoscale eddies and strong currents, and they provide a dynamical conduit for energy transfer from the general circulation toward microscale dissipation and diapycnal mixing. Consideration is given to their generation mechanisms, instabilities, life-cycles, disruption of approximately diagnostic force balance (e.g., geostrophy), turbulent cascades, internal-wave interactions, and transport and dispersion of biogeochemical materials. Much has been learned from realistic, multiscale simulations and theory, but at a fundamental level many questions remain open, implicating a program for further research.