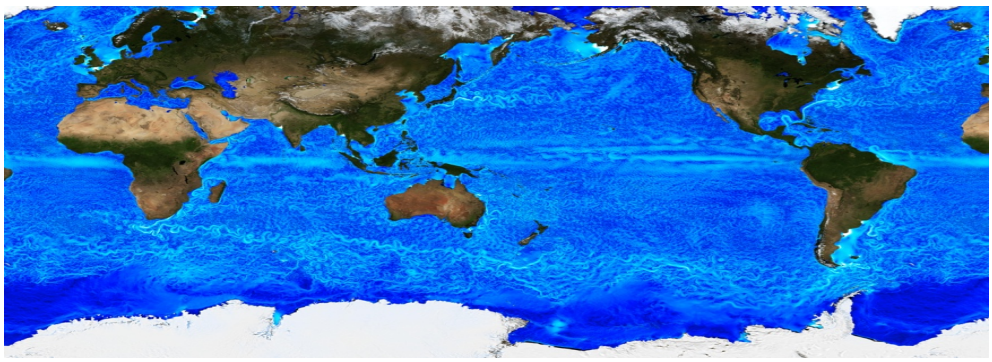
# Ocean Submesoscale Processes in the World Ocean: Potential Breakthroughs from High-Resolution Realistic Simulations

**(Labex-Mer, Ifremer, Plouzané, March 21–23, 2016)**



Sea surface speed from a simulation that resolves internal tides and admits submesoscale processes (NASA ECCO-IcES project)

A new generation of ocean realistic simulations at very high resolution have recently been performed in large domains — basin to global scale. All of these simulations highlight **strong and unexpected regional and temporal differences in terms of the impact of submesoscales on larger scales**. These differences include submesoscale seasonality, the relative importance of the different components of ageostrophic motions (including internal waves and cyclostrophic motions) versus geostrophic motions, the potential vorticity pump induced by interactions between internal waves and meso/submesoscale eddies and topography, energy cascades to and from submesoscale processes and internal tides, etc.

Because of their potential impact on the energy pathways that link submesoscales to larger scales, it is very timely and forward-looking to review the simulated submesoscale processes and assess their consequences on basin and global scales. Another motivation to assess these simulations is the advent of a new generation of satellite altimetry sensors (such as SWOT) with a resolution ten times higher than the existing ones. Reviewing the recent, high-resolution, realistic simulations will help setup better frameworks to analyze data from these satellite missions when they become available.

In that context, the organizers of this workshop would like to investigate the physical mechanisms that could be responsible for the differences in the behavior of the high-resolution simulations, in particular the regional contrasts. We also propose to address the accuracy of the simulations and how well they represent submesoscale processes. Specific questions pertains to: choice of vertical coordinate system, representation of stratification and topography, impact of high frequency wind forcing, boundary layer closure (taking into account instabilities such as symmetric instability), bottom friction, etc. We propose to discuss the prioritization of model development and mesoscale characterization questions and to define analysis steps and numerical experiments that may help answer them. Other issues to be discussed include the possible impact of more realistic surface boundary conditions, e.g., the inclusion of interactive, high-resolution atmospheric forcing; validation using existing satellite and in-situ experimental data.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