Ocean mesoscales and submesoscales: observability, modelling and data assimilation for SWOT

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Rationale of the project

Submesoscale-permitting ocean circulation models:
→ essential tools for preparing SWOT mission
→ allow to simulate the signal that SWOT mission will eventually observe.

By 2020,
→ ocean circulation models should be able to represent globally and realistically the scales observed during SWOT mission (10km implies $\Delta x \approx 2$km)
→ data-assimilation methods should be able to deal with huge amounts of data, a wide range of physical scales and heterogeneous data sources.

The rationale of this project is that ocean modelling and data assimilation
(a) should benefit from the impetus of SWOT for getting ready by 2020
(b) and should bring useful information to SWOT SDT along the way.
A. Characterizing ocean small scale dynamics under realistic physical conditions.

→ Describing the spatial variability of sea-level in the 10km-100km range in key regions.
  Impact of shelf dynamics and internal tides on SSH wavenumber spectra

→ Identifying the main limiting factors to vertical velocity reconstruction with eSQG theory
  Impact of interior balanced dynamics, shelf dynamics and internal tides on w reconstructions

→ Better understanding the surface signature of internal tides in realistic conditions
  What fraction of the surface signature of internal tides is periodic and predictable?

B. Moving towards submesoscale-ready ocean modelling and data assimilation.

→ Improving ocean circulation models in the submesoscale range
  Towards a reliable representation of vertical velocities at 1/36° resolution

→ Assessing the potential for robust internal tide representation in circulation models
  How are modeled internal tides in circulation models affected by numerical choices?

→ Pursuing the development of image data assimilation and multi-scale data assimilation
  How should operational ocean models use the information brought by wide-swath altimeters?
General strategy

→ High resolution (1/36°) modelling in two dynamically contrasted regions
→ Developpments in data assimilation: theory and idealized studies

WP1: High resolution modelling of the Solomon sea
WP2: High resolution modelling of the Kerguelen plume region
WP3: Image data assimilation and multiscale data assimilation