A users perspective on SWOT portable ocean simulator.

Julien Le Sommer, Emmanuel Cosme and the MEOM group, Grenoble
Outline of this talk

1. Examples of questions addressed with SWOT portable simulator
2. Aspects to consider for future evolutions of the ocean simulator

Take home messages

#1 : *SWOT portable ocean simulator is very useful tool*

#2 : *Several evolutions will be needed in the future*
Ongoing activities with SWOT simulator since Sept. 2015

- Performing more realistic data assimilation experiments with SWOT data (with realistic sampling and error statistics)
- Improving the parameterization of error statistics in DA scheme for SWOT
- Studying the observability of ocean dynamics from SWOT SSH data
- Designing online SWOT observation operator for ocean models.
Adaptation of Data Assimilation method to the nature of SWOT sampling and errors.

Ruggiero et al. (in prep)

- Taking into account the correlation of errors improves the information retrieval
- In practice, involves simulating observations of SSH and its derivatives
- SWOT simulator useful for parameterizing error statistics in the DA scheme
Observability of ocean processes with SWOT measurements

Simulated SWOT SSH data [m] over a 5 days window in the Labrador sea (from a 1/60° model).

Examples of applications of SWOT portable simulator (3/4)

- estimation of velocity wavenumber spectra from SWOT SSH
- estimation of lateral gradients of sea surface height
- reconstruction of surface currents, surface relative vorticity…
Examples of applications of SWOT portable simulator (4/4)

Observability of internal tides with SWOT measurements

- estimation of internal tide rms amplitude from SWOT SSH
- idealized setting, simplified dynamics but realistic errors and sampling
- « non-conventional » use of the simulator, involving adaptations of the code
A users perspective on SWOT portable ocean simulator.

- how will the statistics of errors in SWOT simulator evolve before launch?
  - the simulator is used as a source of information on SWOT errors.
  - key information for designing DA methods for SWOT
  - this information needs to be in phase with existing knowledge

- regularity of the interpolation method with respect to SSH derivatives?
  - affects the estimation of $\nabla^2 SSH$
  - see example on next slide
  - the interpolation method should be adapted to scientific needs.

- evolution of the performance of the simulator (numerical cost)?
  - nonlinear dependence of the cost on the size of input arrays (ex: 1/60°)
  - >90% of the CPU used for computation of wet tropo
  - profiling / optimization will be needed
Impact of t interpolation method on estimated $\nabla^2 SSH$

- for large input arrays: restricted to nearest neighbour interpolation
- key for designing filters that preserve the regularity of SSH gradient
Extra material
Comparaison of data-assimilation strategies with SWOT measurements