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The next generations of altimeters (e.g. SWOT) are expected to perform two- dimensional SSH mapping at unprecedented resolutions (15km wavelength) with typical time revisits of 10-20 days. However, the short mesoscales not yet adequately observed with conventional altimetry (eddies between 15km and 100km) have time scales on the order of a few days that are much shorter than the revisit intervals, as opposed to the large and slowly-evolving mesoscale eddies currently observed by altimeters with similar or shorter time revisit. Therefore, the short-mesoscale dynamic signals will be inadequately sampled in time by missions like SWOT.

For the purpose of producing high-level products for the general user community, new strategies need to be developed to address the temporal sampling problem. Because of the significant mismatch between the time scales of the signals and the sampling intervals, the classic optimal interpolation methods successfully used so far to produce the altimetry maps by Aviso will probably not work well.

In this study, we apply the concept of dynamic interpolation to reconstructing the time evolution between two high-resolution SSH images, based on the basic principles of geophysical fluid dynamics. The conservation of interior potential vorticity or surface potential vorticity (through buoyancy anomalies) has been investigated in a quasi-geostrophic framework. We will show, from preliminary experiments based on a high-resolution 3D model as the truth, that such approach produces drastic improvement over classical interpolation.

As opposed to the advanced OGCMs, the dynamic interpolator does not rely on external parameters (e.g. forcing) and 3D state initialization (not observable at the scales of interest). It is highly efficient and self contained for producing gridded products for research and applications. Practical issues in the implementation of the method to SWOT as well as existing altimetry missions will be discussed.
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