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Toward variational assimilation of SARAL/Altika altimeter data in a North Atlantic circulation model at eddy-permitting resolution: assessment of a NEMO-based 4D-VAR system

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In this project, the response of a variational data assimilation system based on NEMO and its linear tangent and adjoint model is investigated using a 4DVAR algorithm into a North-Atlantic model at eddy-permitting resolution. The assimilated data consist of Jason-2 and SARAL/AltiKA dataset collected during the 2013-2014 period.

The main objective is to explore the robustness of the 4DVAR algorithm in the context of a realistic turbulent oceanic circulation at mid-latitude constrained by multi-satellite altimetry missions. This work relies on two previous studies.

First, a study with similar objectives was performed based on academic double-gyre turbulent model and synthetic SARAL/AltiKA data, using the same DA experimental framework. Its main goal was to investigate the impact of turbulence on variational DA methods performance. The comparison with this previous work will bring to light the methodological and physical issues encountered by variational DA algorithms in a realistic context at similar, eddy-permitting spatial resolution. We also have demonstrated how a dataset mimicking future SWOT observations improves 4DVAR incremental performances at eddy-permitting resolution.

Then, in the context of the OSTST and FP7 SANGOMA projects, an ensemble DA experiment based on the same model and observational datasets has been realized (see poster by Brasseur et al.). This work offers the opportunity to compare efficiency, pros and cons of both DA methods in the context of KA-band altimetric data, at spatial resolution commonly used today for research and operational applications.

In this poster we will present the validation plan proposed to evaluate the skill of variational experiment vs. ensemble assimilation experiments covering the same period using independent observations (e.g. from Cryosat-2 mission).