

Developing an Effective assimilation of SWOT data in Mercator Ocean Systems-II (DESMOS-II)

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The main objective of the DESMOS-II project is to prepare the assimilation of SWOT in Mercator Ocean International and Copernicus Marine Environment Monitoring Service (CMEMS) high resolution ocean models, to contribute to SWOT Cal/Val activities and to perform the first tests of assimilation of real SWOT data. The main challenge is to combine SWOT data with conventional along-track altimeters and in-situ observations together with very high resolution models (resolution of a few km) to allow a dynamical interpolation of SWOT data and a description and forecast of the ocean state at high resolution.

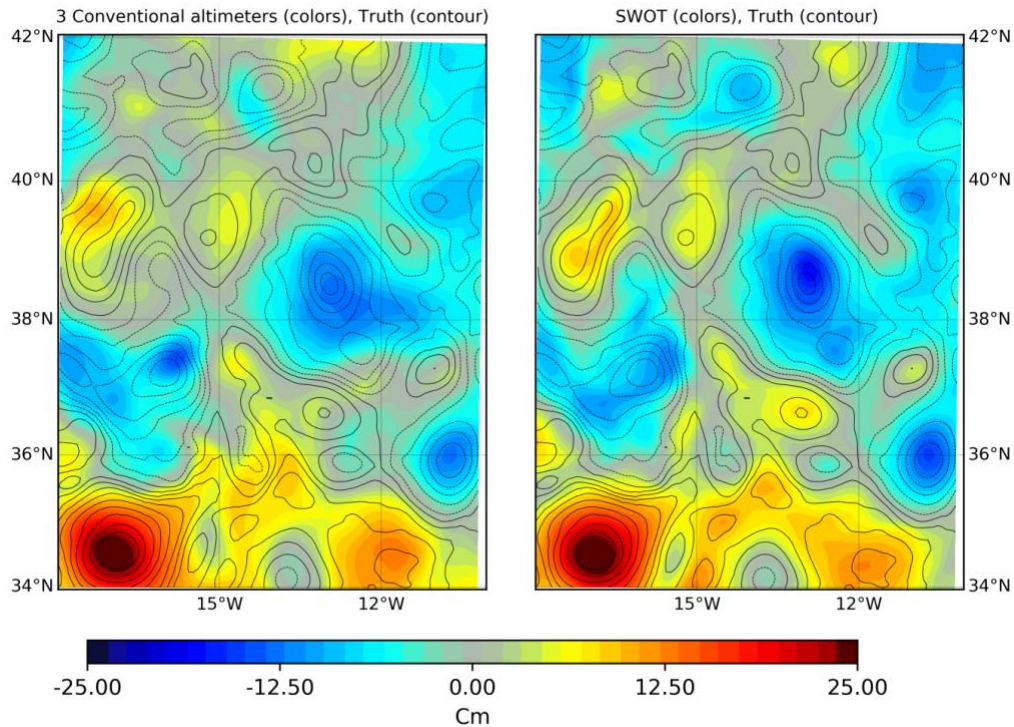
Our approach is based on the development of innovative data assimilation methods and on the use of Observing System Simulation Experiments (OSSEs) with global and regional high resolution models and using an end to end SWOT simulator that includes upstream data processing steps such as intercalibration with conventional altimeters and correction of large scale SWOT errors (via the DUACS processing chain).

We will also work on the analysis of first SWOT data and their comparison with Mercator Ocean data assimilation systems and perform data assimilation tests in regional configurations with data from the fast sampling phase (1 day repeat phase). The assimilation of SWOT data in its nominal (21 day repeat) phase will be tested from end of 2022 in an offline mode. A near real time demonstration will be carried out in 2023 and if successful we expect to include SWOT data in operational Mercator Ocean International and CMEMS systems in 2023/2024.

The following tasks are planned:

- Task 1: Design of advanced calibration methods to generate Level 3 DUACS SWOT products.
- Task 2. Prepare the assimilation of SWOT data into high resolution ocean models and assess the impact of SWOT data on representation and prediction of mesoscale/submesoscale ocean dynamics.
- Task 3. Characterization of tidal signals, balanced and non-balanced signals in a 1/36° global model.
- Task 4. Analysis of first data from the SWOT mission during its fast sampling phase and contribution to the SWOT Cal/Val phase.
- Task 5. Assimilation of first data from the SWOT mission during its fast sampling and its 21 day phases.

The project addresses the following TOSCA/ROSES research priorities: ocean state estimation, Cal/Val, tides and high frequency motions, and mesoscale ocean dynamics.



Observing System Simulation Experiments (OSSEs) in a North East Atlantic model 1/12° model (the “truth run” used to simulate observations is derived from a 1/36° model) that compare the performances of three conventional nadir altimeters (left) with the ones expected from SWOT (right). As part of DESMOS-2, global and refined (data assimilation scheme, observation error characteristics) OSSEs will be carried out. Assimilation of real SWOT data (fast phase and 21 day repeat phase) will be performed soon after SWOT launch.