Geophysical Research Abstracts
Vol. 20, EGU2018-18111, 2018
EGU General Assembly 2018

Analog data assimilation of along-track nadir and SWOT altimetry observations in the Western Mediterranean Sea

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The growing availability of ocean data brought forth by recent advancements in remote sensing, in situ measurements and numerical models supports the development of data-driven strategies as a powerful, computationally-efficient alternative to model-based approaches for the interpolation of high-resolution, gap-free, regularly-gridded sea surface geophysical fields from partial satellite-derived observations.
In this work, we investigate such data-driven strategies for the spatio-temporal interpolation of Sea Level Anomaly (SLA) fields in the Western Mediterranean Sea from satellite-derived altimetry data. We develop and evaluate an Analog Data Assimilation (AnDA) framework, which exploits patch-based analog forecasting operators. Two different types of altimetry data are assimilated: along-track nadir data and wide-swath SWOT altimetry data. Using an OSSE, we analyze the sensitivity of the proposed framework to its most relevant internal parameters. We demonstrate the relevance of AnDA as an improved interpolation method, particularly for mesoscale features in the 20-100 km horizontal scale range. Results report an SLA reconstruction RMSE (correlation) improvement of 42% (12%) with respect to Optimal Interpolation (OI), and suggest an additional potential gain when the joint assimilation of SWOT and along-track nadir observations is considered.