



Initialization and state updating utilizing the OpenDA platform and Sentinel Satellite Series data for ecological modeling in the North Sea*

Alexander Ziemba (1,2) and Ghada El Serafy (1,2)

(1) Deltares, Boussinesqweg 1, 2629 HV Delft, Netherlands, (2) Delft University of Technology, Mekelweg 2, 2628 CD Delft, Netherlands

Ecological modeling relies on the mathematical reconstruction of natural processes which results in a simplification of interactions between a vast number of ecological functions and variables. Despite this simplification, models are able to provide an approximation of the future states of environmental systems, however, inherit therein is a degree of uncertainty due to the simplifications. In order to compensate for these uncertainties and resulting errors, it is possible to anneal real world measurements from both Remote Sensing and In-Situ observations into the model space utilizing data assimilation. Given this, the OpenDA platform and related algorithms are employed in order to initialize the model space and update the model states during hindcasting simulations in order to provide an optimal departure state from which forecasts can be made. Through such a method, future model states have a reduced uncertainty band and provide deterministic results with higher accuracy. This methodology is applied to the prediction of chlorophyll-a concentrations within the southern coastal zone of the North Sea, focusing primarily on the Dutch coastal zone and the Wadden Sea. By utilizing data assimilation with the Sentinel Satellite Series data, an improved forecast is obtained as seen through a comparison of both purely deterministic runs as well as ensemble results which do not implement DA. Various combination of Sentinel data re used in order to evaluate the efficacy and benefit of introducing multiple data sets in the DA process for Coastal and Estuarine Ecological modeling.

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