



Enabling Ensemble Data Assimilation in NEMO using PDAF

The NEMO model itself does not provide full functionality for data assimilation. To enable ensemble data assimilation with NEMO, it was coupled with the Parallel Data Assimilation Framework (PDAF, <https://pdaf.awi.de>). PDAF is open source software providing model-agnostic functionality for data assimilation and ensemble simulations. Fully implemented and parallelized data assimilation methods (ensemble filters and smoothers, and variational schemes), related diagnostics and tools are provided. For computational efficiency the coupling to NEMO was performed by inserting a few subroutines in higher-level routines of NEMO, which call functions of PDAF. This scheme allows for an in-memory exchange of model fields with the data assimilation software, which lets us avoid excessive file outputs and model restarts. Alternatively, an offline-coupling using disk files is possible. Next to the NEMO ocean physics, also components like the sea ice or biogeochemical models can be included in the data assimilation process, which allows for fully multivariate data assimilation coupled over the different component models. The implementations are available as open source at <https://github.com/PDAF/NEMO-PDAF>. We discuss the structure and functionality of the implementation with a focus on ensemble filters.

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