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Integrating Model Evaluation and Observations into a Production-Release Pipeline

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The complexity of Earth System and Regional Climate Models represents a considerable challenge for developers. Tuning but also improving one aspect of a model can unexpectedly decrease the performance of others and introduces hidden errors. Reasons are in particular the multitude of output parameters and the shortage of reliable and complete observational datasets. One possibility to overcome these issues is a rigorous and continuous scientific evaluation of the model. This requires standardized model output and, most notably, standardized observational datasets. Additionally, in order to reduce the extra burden for the single scientist, this evaluation has to be as close as possible to the standard workflow of the researcher, and it needs to be flexible enough to adapt it to new scientific questions.

We present the Free Evaluation System Framework (Freva) implementation within the Helmholtz Coastal Data Center (HCDC) at the Institute of Coastal Research in the Helmholtz-Zentrum Geesthacht (HZG). Various plugins into the Freva software, namely the HZG-EvaSuite, use observational data to perform a standardized evaluation of the model simulation. We present a comprehensive data management infrastructure that copes with the heterogeneity of observations and simulations. This web framework comprises a FAIR and standardized database of both, large-scale and in-situ observations exported to a format suitable for data-model intercomparisons (particularly netCDF following the CF-conventions). Our pipeline links the raw data of the individual model simulations (i.e. the production of the results) to the finally published results (i.e. the released data).

Another benefit of the Freva-based evaluation is the enhanced exchange between the different compartments of the institute, particularly between the model developers and the data collectors, as Freva contains built-in functionalities to share and discuss results with colleagues. We will furthermore use the tool to strengthen the active communication with the data and software managers of the institute to generate or adapt the evaluation plugins.