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Recent developments in the Earth System Model evaluation tool

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ESMValTool (**E**arth **S**ystem **M**odel **e**valuation **T**ool) is open-source, community-developed software for the evaluation of Earth system models, mainly in the context of multi-model analyses, e.g. the Coupled Model Intercomparison Project (CMIP). ESMValTool provides a large number of “recipes” that reproduce published figures, for example, some of the figures found in reports of the Intergovernmental Panel on Climate Change (IPCC). ESMValCore, the framework powering ESMValTool, provides capabilities that make it easy to work with data produced for CMIP as well as related observational and reanalysis data, e.g. discovering, downloading, and preprocessing these data. Here, we present new features that have been added to ESMValCore and ESMValTool in the past year.

Improved computational performance: it is now possible to use Dask Distributed to run the tool and almost all preprocessor functions are now using Dask arrays, resulting in lower memory use and faster computations. This enables the analysis of higher-resolution datasets, such as those expected for the next round of CMIP. Further performance improvements are planned this year as part of the ESiWACE3 service project.

New recipes and better-looking results: several new analyses have been added, including recipes for reproducing figures from the IPCC’s Fifth and Sixth Assessment Reports and generic recipes for monitoring and evaluating Earth System Model simulations. The webpage displaying the results of a recipe run now looks better and allows for interactive filtering.

More datasets: more observational and reanalysis datasets can now be converted to the CMIP data request standard using the tool. Grids used in the Coordinated Regional Climate Downscaling Experiment (CORDEX) are now better supported.

Communication: the ESMValTool tutorial at <https://tutorial.esmvaltool.org> has been updated, more Jupyter notebooks are available to demonstrate the use of ESMValCore, and there is a new, open-source website at <https://esmvaltool.org>.