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# Comparison of land surface data assimilation results driven by MERRA-2 and ERA5 meteorological forcings

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## Abstract

In this study, the sensitivity of a land surface data assimilation system to the choice of meteorological forcing is explored. We assimilate microwave-based satellite retrievals of surface soil moisture into the Noah-MP land surface model using NASA's Land Information System (LIS). Two forcing data sets are tested: the Modern-Era Retrospective analysis for Research and Applications, version 2 (MERRA-2) from NASA, and the European Centre for Medium-Range Weather Forecasts (ECMWF) Reanalysis Version 5 (ERA5).

We explore the impact of this choice of meteorological forcing on the performance of the data assimilation system. More specifically, surface and root-zone soil moisture estimates of both data assimilation runs are compared with each other and evaluated against in situ observations as well as existing root-zone soil moisture products, such as the SMAP Level 4 Surface and Root-zone soil moisture product.

Our data assimilation approach uses a one-dimensional Ensemble Kalman Filter (EnKF) and allows to obtain consistent surface and root-zone soil moisture estimates over the European continent for the period 2002-2020. Satellite data are acquired from the combined active-passive ESA CCI Soil Moisture product, which harmonizes and merges soil moisture retrievals from multiple satellites.

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