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Using high-resolution groundwater data for the validation of a global hydrological model: evaluating WaterGAP and calibration/data assimilation (C/DA) performance over France

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The dynamic global water cycle is of ecological and societal importance as it affects the availability of freshwater resources and influences extreme events such as floods and droughts. This work is set in the frame of the GlobalCDA Research Unit, which has the goal of developing a calibration/data assimilation approach (C/DA) to improve the quantification of freshwater resources by combining the global hydrological model WaterGAP with geodetic (GRACE, altimetry) and remote sensing data. This presentation focuses on the validation of the C/DA results using an independent in-situ groundwater data set based on ~1500 monitoring boreholes in France.

The resulting validation data set is applied to independently assess the output of several C/DA experiments: data assimilation using different combinations of the available geodetic and remote sensing data sets and different methods of model calibration, based on either an ensemble Kalman filter approach or a Pareto-optimal calibration algorithm.

To further understand in-situ groundwater and WaterGAP data set, we subtract the coherent signals using Empirical orthogonal function (EOF). Over 85% variances can be explained by the first 3 EOFs for both data sets.