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An empirical understanding of triple collocation evaluation measure

Klaus Scipal (1), Marcela Doubkova (2), Alena Hegyova (3), Wouter Dorigo (3), and Wolfgang Wagner ()
(1) European Space Agency (ESTEC), Noordwijk, Netherlands , (2) European Space Agency (ESRIN), Frascati, Italy, (3) Vienna University of Technology, Vienna, Austria

Triple collocation method is an advanced evaluation method that has been used in the soil moisture field for only about half a decade. The method requires three datasets with an independent error structure that represent an identical phenomenon. The main advantages of the method are that it a) doesn't require a reference dataset that has to be considered to represent the truth, b) limits the effect of random and systematic errors of other two datasets, and c) simultaneously assesses the error of three datasets.

The objective of this presentation is to assess the triple collocation error (Tc) of the ASAR Global Mode Surface Soil Moisture (GM SSM 1) km dataset and highlight problems of the method related to its ability to cancel the effect of error of ancillary datasets. In particular, the goal is to a) investigate trends in Tc related to the change in spatial resolution from 5 to 25 km, b) to investigate trends in Tc related to the choice of a hydrological model, and c) to study the relationship between Tc and other absolute evaluation methods (namely RMSE and Error Propagation EP).

The triple collocation method is implemented using ASAR GM, AMSR-E, and a model (either AWRA-L, GLDAS-NOAH, or ERA-Interim). First, the significance of the relationship between the three soil moisture datasets was tested that is a prerequisite for the triple collocation method. Second, the trends in Tc related to the choice of the third reference dataset and scale were assessed. For this purpose the triple collocation is repeated replacing AWRA-L with two different globally available model reanalysis dataset operating at different spatial resolution (ERA-Interim and GLDAS-NOAH). Finally, the retrieved results were compared to the results of the RMSE and EP evaluation measures.

Our results demonstrate that the Tc method does not eliminate the random and time-variant systematic errors of the second and the third dataset used in the Tc. The possible reasons include the fact a) that the TC method could not fully function with datasets acting at very different spatial resolutions, or b) that the errors were not fully independent as initially assumed.