

Uncertainty Estimation of Soil Moisture Datasets Using Triple Collocation Methods at Mongolian Grassland

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Uncertainties in soil moisture (SM) datasets were estimated at semi-arid grassland in Mongolia by applying the triple collocation methods (TC). Three SM datasets applied to TC are a SM product of AMSR-E, GLDAS with Noah, and the in-situ measurements.

First, in order to demonstrate capability of TC, the uncertainties acquired through TC and a statistical measure are compared. The results showed that the TC uncertainties of AMSR-E are found to be smaller than the root mean squared difference (RMSD) between AMSR-E and the in-situ measurements. This indicates that the latter includes the systematic errors as well as the random errors of AMSR-E and the in-situ, while the TC uncertainties only identifies the random error of AMSR-E. Therefore, it was shown that TC is capable of providing an absolute measure of uncertainties in a SM dataset, unlike other statistical measures such as RMSD.

Further analyses showed that differences of the vegetation amounts expressed in NDVI and difference between ascending/descending observations of AMSR-E do not cause significant difference in the magnitude of uncertainties. This suggests that these factors did not influence uncertainties of AMSR-E. It is also discovered that, in a few cases, TC cannot calculate uncertainties, which may be attributed to a violation of some of the TC assumptions. This is consistent with previous claims that TC is vulnerable to violations of the assumptions. The current findings suggest that the proper selections and pre-processing of the datasets are of significance.

Keywords: Soil Moisture, Satellite Remote Sensing, AMSR-E, Satellite products validation