



Homogeneity testing of the global ESA CCI multi-satellite soil moisture climate data record

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ESA's Climate Change Initiative (CCI) creates a global, long-term data record by merging multiple available earth observation products with the goal to provide a product for climate studies, trend analysis, and risk assessments. The blending of soil moisture (SM) time series derived from different active and passive remote sensing instruments with varying sensor characteristics, such as microwave frequency, signal polarization or radiometric accuracy, could potentially lead to inhomogeneities in the merged long-term data series, undercutting the usefulness of the product. To detect the spatio-temporal extent of contiguous periods without inhomogeneities as well as subsequently minimizing their negative impact on the data records, different relative homogeneity tests (namely Fligner-Killeen test of homogeneity of variances and Wilcoxon rank-sums test) are implemented and tested on the combined active-passive ESA CCI SM data set. Inhomogeneities are detected by comparing the data against reference data from in-situ data from ISMN, and model-based estimates from GLDAS-Noah and MERRA-Land. Inhomogeneity testing is performed over the ESA CCI SM data time frame of 38 years (from 1978 to 2015), on a global quarter-degree grid and with regard to six alterations in the combination of observation systems used in the data blending process. This study describes and explains observed variations in the spatial and temporal patterns of inhomogeneities in the combined products. Besides we proposes methodologies for measuring and reducing the impact of inhomogeneities on trends derived from the ESA CCI SM data set, and suggest the use of inhomogeneity-corrected data for future trend studies. *This study is supported by the European Union's FP7*

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