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Spatiotemporal analysis on a 30 year record of merged satellite soil moisture

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The spatiotemporal behavior of soil moisture at a global scale was analyzed using a harmonized data set from both passive and active microwave observations by a series of satellites going back to late 1978. This study is part of the Water Cycle Multimission Observation Strategy (WACMOS) project of ESA and it presents the first results of the analysis on a 30 year merged soil moisture dataset. A continuous product was developed by scaling percentiles of the cumulative moisture distribution within each grid cell to the percentiles of a reference sensor. An error analysis was applied to rank the different datasets and only the products with the lowest error were used in the harmonization routine. On general, the passive microwave products were used for the sparse vegetated regions and the scatterometer products for the moderate vegetated regions. The coefficient of correlation and root mean squared error between rescaled merged product and in situ observations generally suggest good agreement.
Using the merged data product, strong Ocean Oscillation signals like the El Nino Southern Oscillation in the surface soil moisture were confirmed. Spatial patterns of trends in annual averages show that several dry and wet hot spots all around the globe. For example north-western Australia has experienced an increase in soil moisture content, while the east and south-east experienced a decrease. These results give us confidence in the product and we expect that this dataset will enhance our understanding on the impacts of climate on the terrestrial hydrology.