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Evaluation of remotely sensed and modelled soil moisture products using global ground-based in situ observations

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In situ soil moisture data collected from more than 200 stations located in various biomes and climate (Africa, Australia, Europe and the United States) are used to determine the reliability of three soil moisture products, (i) one analysis from the ECMWF (European Centre for Medium-Range Weather Forecasts) numerical weather prediction system (SM-DAS-2) and two remotely sensed soil moisture products, namely (ii) ASCAT (Advanced Scatterometer) and (iii) SMOS (Soil Moisture Ocean Salinity). SM-DAS-2 is produced offline at ECMWF and relies on an advanced surface data assimilation system Extended Kalman Filter) used to optimally combine conventional observations with satellite measurements. ASCAT remotely sensed surface soil moisture is provided in near real time by EUMETSAT. At ECMWF, ASCAT is used for soil moisture analyses in SM-DAS-2, also. Finally the SMOS remotely sensed soil moisture data level two product developed at CESBIO is used. Evaluation of the times series as well as of the anomaly values, shows good performances of the three products to capture surface soil moisture annual cycle as well as its short term variability. Correlation values with in situ data are very satisfactory over most of the investigated sites located in contrasted biomes and climate conditions with averaged values of 0.70 for SM-DAS-2, 0.53 for ASCAT and 0.54 for SMOS. Although radio frequency interference disturbs the natural microwave emission of the Earth observed by SMOS in several parts of the world, hence the soil moisture retrieval, performances of SMOS over Australia are very encouraging.