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A Scaling Layer for Downscaling Remotely Sensed Coarse Resolution Soil Moisture Products

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Recently, a number of global soil moisture data sets retrieved from spaceborne scatterometer and radiometer systems have become available. Despite their coarse resolution, which is in the order of tens of kilometres, high correlations to in-situ measurements, representing the soil moisture conditions at plot scale, are often observed. This is in principle not to be expected considering the high variability of soil moisture at all spatial and temporal scales. Nevertheless, similar scale relations can be observed for in-situ soil moisture data sets. Time series of point-like station data have been found to be highly correlated to area-averaged data derived from a station network. Additional temporal persistent patterns in soil moisture time series data were found in an extensive in-situ soil moisture data set from a test site in Spain. They can be addressed to the static influences of soil type, vegetation and topography.

Based on the hypothesis, that such patterns should also emerge in active remote sensing data, ENVISAT ASAR ScanSAR time series data acquired over test sites in Spain and South Africa are analysed. A regular grid with a regional and local spatial scale component was defined. Local scale backscatter is compared to the corresponding regionally averaged backscatter values. Extended areas with high correlations between local and regional scale backscatter were found. Regions with lower correlations can be explained by land cover and surface roughness changes due to agricultural practices. Based on these findings, a scaling layer is proposed, which can be used for downscaling of existing, remotely sensed large scale soil moisture data sets from regional to local scales.

Such a scaling layer has a high practical value because it allows potential users of

soil moisture data from the upcoming operational METOP and NPOESS satellites to relate the coarse-resolution information to processes at finer scale. For example, it could allow to downscale METOP ASCAT soil moisture data to be provided in the framework of the Hydrology SAF from 25 km to 1 km, which is more compatible with grid sizes used in hydrological models.