



Assimilation of SCATSAR-SWI with SURFEX: Impact of local observation errors

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Soil moisture is a crucial ingredient of the terrestrial water-energy cycle due to evapotranspiration determining the partitioning of the incoming solar radiation into sensible and latent heat. By assimilating remotely sensed soil moisture in a land surface model, numerical weather forecasts can be improved significantly. In addition, the knowledge of soil moisture on large scales can be beneficial to a number of other fields, e.g. hydrology and agriculture. With this in mind, our aim is to provide a high-resolution soil moisture product for the European domain.

The SCATSAR-SWI (Soil Water Index) combines daily scatterometer measurements (SCAT) with high resolution Synthetic Aperture Radar (SAR) measurements to a daily soil moisture product with 1 km resolution for several soil layers. On the basis of the SCATSAR-SWI, soil moisture was assimilated using the surface model SURFEX in a multi-layer diffusion scheme approach (ISBA-DIF) and the simplified Extended Kalman Filter (sEKF). In the standard configuration of the assimilation system, the observational error covariance matrix contains the same error value for all grid points in the domain. This assumption is generally considered unrealistic. As a novel approach, local observational error variances, which were determined for each grid point employing Triple Collocation Analysis (TCA), were included into the assimilation system. For testing purposes, the computation were performed on the Austrian domain.

The errors obtained with TCA for the uppermost layer of the SCATSAR-SWI are on average approximately half as large as the previously assumed constant error and become smaller with increasing depth. As a result, the analysis increments tend to have a larger spread. We initialised our forecast model with the soil moisture analysis and compared the skill metrics of 2 m temperature and 2 m relative humidity of the local error approach to the ones of the standard setup. Dependent on the time of the day, the skill metrics can be either slightly improved or slightly degraded. In total, the difference between the experiments is rather small but significant.