Benefit of Assimilating SMAP and ASCAT Soil Moisture Retrievals
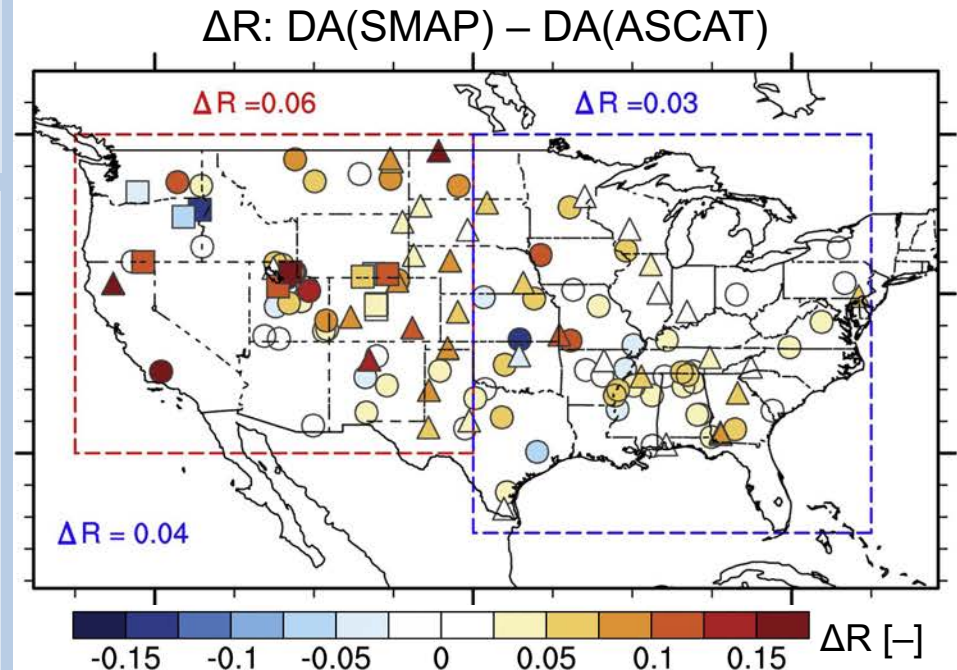
Problem: How much do SMAP and ASCAT soil moisture (SM) retrievals contribute to the skill of SM data assimilation estimates?

Finding: SMAP and ASCAT SM retrievals were assimilated into the JULES land surface model using the Local Ensemble Transform Kalman Filter.

SMAP retrievals are more beneficial than ASCAT retrievals for SM skill improvement, primarily because of the greater skill of the assimilated SMAP retrievals compared to that of the ASCAT retrievals, and despite the 3-4 times greater number of assimilated ASCAT retrievals.

The skill improvement is greater in the western than the eastern US because of greater SM sensitivity (Kalman gain) there.

ΔR: DA(SMAP) – DA(ASCAT)

Fig. 1. Skill difference between surface SM estimates from data assimilation (DA) of SMAP and ASCAT retrievals. Positive values indicate that SMAP DA is better than ASCAT DA. Skill is measured as anomaly time series correlation (R) vs. in situ measurements. Domain-average skill difference is ΔR=0.04.

Impact: SMAP observations are important for improving soil moisture estimates in data assimilation systems such as those used for drought monitoring.