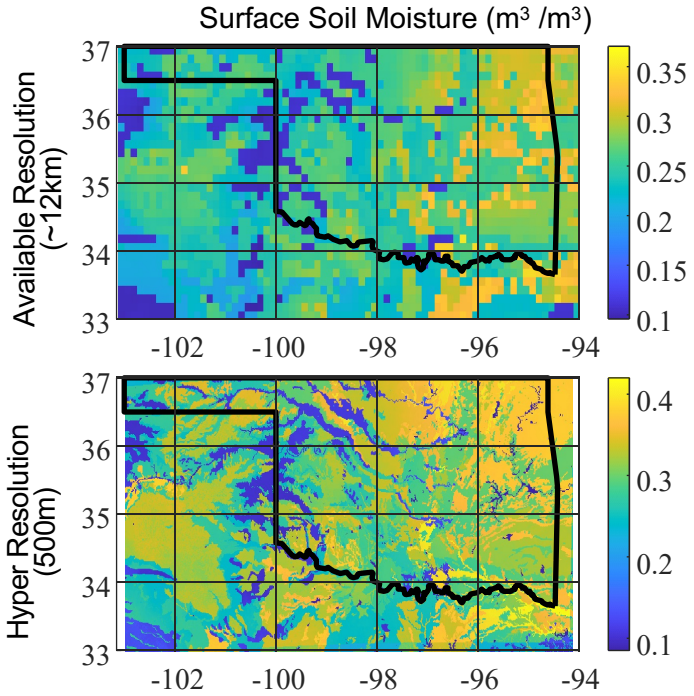
Assimilating satellite soil moisture observations in a hyper-resolution land surface model

Problem: Hyper-resolution land surface modeling combined with satellite observations has the potential to improve our estimation of surface and root zone soil moisture at resolutions that are useful for decision making and water resources management.



Finding:

- Surface meteorological downscaling techniques were successfully developed across Oklahoma to produce 500m atmospheric variables, which were validated against in-situ observations.
- The downscaled atmospheric data were used to force a land surface model, producing superior estimates of soil moisture with respect to the model forced with the original 12km dataset.
- SMAP soil moisture products were assimilated within the hyper-resolution land surface model using an Ensemble Kalman Filter:
  - Surface and root zone soil moisture anomalies were improved in terms of higher correlations with ground observations and smaller random errors.
  - The active-passive combined product was shown to be superior with respect to the passive-only one.

Impact: The proposed framework that merges SMAP retrievals with a land surface model (forced with a newly developed downscaled atmospheric dataset) was shown to produce estimates of surface and root zone soil moisture with higher accuracy and at higher resolution.

Rouf, Maggioni, Mei, Houser, 2020: Towards hyper-resolution land-surface modeling of surface and rootzone soil moisture, *Journal of Hydrology*