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Comparing SMAP to Macro-scale and Hyper-resolution Land Surface Models over Continental U. S.

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SMAP sensors collect moisture information in top soil at the spatial resolution of ∼40 km (radiometer) and ∼1 to 3 km (radar, before its failure in July 2015). Such information is extremely valuable for understanding various terrestrial hydrologic processes and their implications on human life. At the same time, soil moisture is a joint consequence of numerous physical processes (precipitation, temperature, radiation, topography, crop/vegetation dynamics, soil properties, etc.) that happen at a wide range of scales from tens of kilometers down to tens of meters. Therefore, a full and thorough analysis/exploration of SMAP data products calls for investigations at multiple spatial scales - from regional, to catchment, and to field scales.

Here we first compare the SMAP retrievals to the Variable Infiltration Capacity (VIC) macro-scale land surface model simulations over the continental U. S. region at 3 km resolution. The forcing inputs to the model are merged/downscaled from a suite of best available data products including the NLDAS-2 forcing, Stage IV and Stage II precipitation, GOES Surface and Insolation Products, and fine elevation data. The near real time VIC simulation is intended to provide a source of large scale comparisons at the active sensor resolution. Beyond the VIC model scale, we perform comparisons at 30 m resolution against the recently developed HydroBloks hyper-resolution land surface model over several densely gauged USDA experimental watersheds. Comparisons are also made against in-situ point-scale observations from various SMAP Cal/Val and field campaign sites.