

Comparison Between Co-Located Soil Moisture Measurements at the ARM Southern Great Plains (SGP) Central Facility

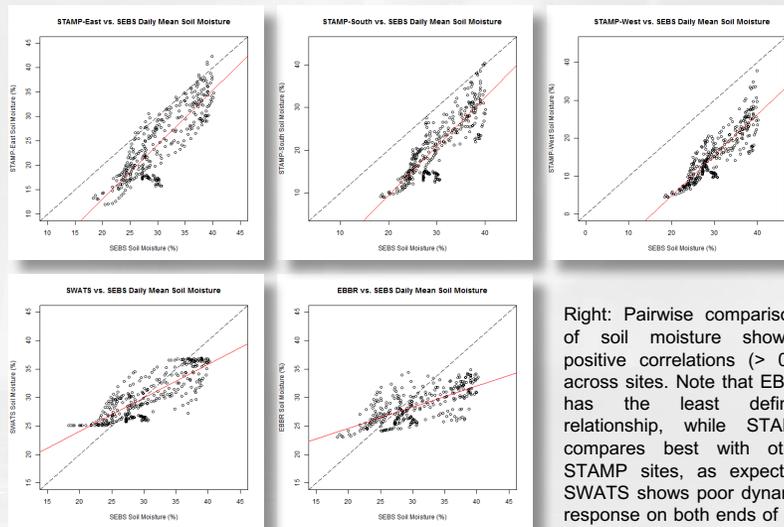


System	Sensor Model	Manufacturer	Sensor Depth	Sensor Method	Uncertainty
EBBR	SMP-1	REBS	5 cm	Capacitive Resistance Ratio (Fiberglass and Stainless Steel Mesh)	Not specified; detection 1% to 50% by volume
SEBS	SMP-1	REBS	5 cm	Capacitive Resistance Ratio (Fiberglass and Stainless Steel Mesh)	Not specified; detection 1% to 50% by volume
SWATS	229L	Campbell Scientific	5 cm	Matric Potential (ceramic matrix with thermocouple and heater)	Not specified
STAMP	HydraProbe	Stevens Water Monitoring Systems	5 cm	Electrical Signal Reflectance	±0.01 WFV (most soil) ±0.03 WFV (fine soil)

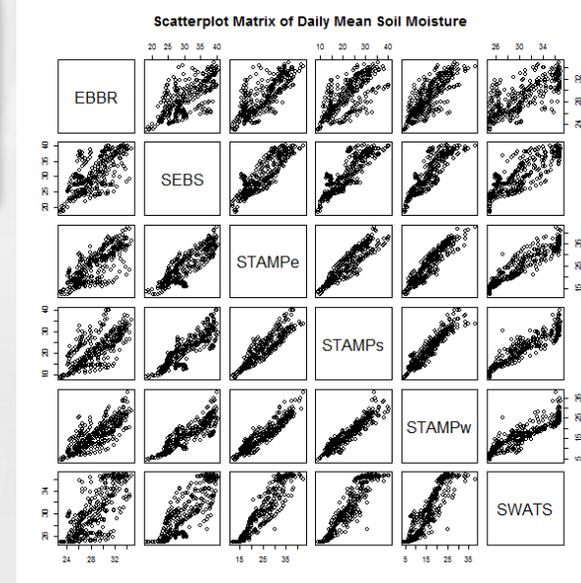
Courtesy of ARM Instrument Handbooks (David Cook, Environmental Science Division, Argonne National Laboratory)

Abstract

Soil moisture measurements from the EBBR, SEBS, SWATS (west only) and STAMP 5cm probes at the SGP Central Facility (CF) are compared for a year (March 1, 2016 through February 28, 2017) to check for consistency, range, and precipitation response. The SWATS, STAMP, and EBBR are all located on the "hill", within a maintained grassland. The SEBS is located in the agricultural area of the CF. EBBR and SEBS soil moisture data are translated for comparison (from measured gravimetric terms and bulk density to soil-water-content-by-volume). The SWATS had a decreased range (25-37%) in comparison to the other instrument systems. The EBBR had a decreased range as well (22.5-35.5%). The SEBS exhibited a greater range (18.5-40%) than the EBBR and SWATS. The STAMP exhibited the greatest range (4-43%). All exhibited similar trends, with the SEBS being somewhat different in magnitude of the trends because of its location. The four systems responded similarly to significant precipitation events.



Above: A closer look at the STAMP, SWATS, and EBBR (grassland) compared against the SEBS (agricultural). Note the small range in soil moisture percentage of SWATS and EBBR, and the large range exhibited by the STAMP. Trends suggest higher uncertainty when SEBS is compared to EBBR and SWATS, and better correlation with the STAMP.



Right: Pairwise comparisons of soil moisture showing positive correlations (> 0.7) across sites. Note that EBBR has the least defined relationship, while STAMP compares best with other STAMP sites, as expected. SWATS shows poor dynamic response on both ends of the soil moisture range, while SEBS shows good dynamic response on the low end. In general, the SWATS exhibits a better correlation with STAMP sites than EBBR or SEBS.