Geostatistics of large scale in-situ and satellite derived soil moisture data

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Abstract. The spatial pattern of soil moisture varies at different scales due to evapo-transpiration and precipitation which are transformed by topography, soil texture, and vegetation. The mapping of soil moisture by remote sensing has several advantages over conventional field measurement techniques especially in the case of heterogeneous landscapes. However, validation of low resolution satellite soil moisture products is difficult using only field point measurements. One validation approach is to use existing soil moisture measurement networks and scale these point observations up to the resolution of remote sensing footprints. This is possible by characterizing the variability of soil moisture data using a geostatistical approach. The aim of this study is twofold. First, the characteristics of the in-situ OK Mesonet data variogram are compared to AGRMET (Agricultural Meteorology model) and WindSAT soil moisture and precipitation data using Bias, RMSE, and variance ratio. Second, the kriging prediction is cross-validated at sampling locations not used in kriging analysis.

This study aims to use 100+ Oklahoma Mesonet field soil moisture data points to compare to the AGRMET and WindSAT soil moisture products. AGRMET is a near real-time global land surface analysis model generating soil moisture output at 47 km spatial resolution. Temporal de-correlation length trends are correlated to precipitation events in both data sets. The average RMSE value of estimated soil moisture at 11 sampling locations not used in the kriging analysis is found to be 3.5% of the soil moisture value.