Length Scales of Hydrological Variability as Inferred from SMAP Soil Moisture Retrievals

The length scale plotted at a given point represents the distance one can travel from that point and still have similar time variations in soil moisture (with a correlation at or above 1/e). These length scales were estimated from SMAP near-surface soil moisture data for the Northern Hemisphere warm season (May–September, or MJJAS) (top) and cold season (November through March, or NDJFM) (middle). Areas of insufficient data are whited out in the plots. The difference between the warm season and cold season length scales (bottom) reflects the different character of precipitation in those seasons – warm season precipitation is generally dominated by moist convection, which operates at relatively small spatial scales.

SMAP data provide a unique global picture of this important facet of hydrological variability, a picture that is arguably unattainable with other datasets. Among other applications, the above maps can serve as targets for climate model validation.