

MODIS Maximum-Temperature Composite Data and Soil Factors for Drought Monitoring in the Central Great Plains

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ABSTRACT

Daily land surface temperatures (LST) derived from the Moderate Resolution Imaging Spectroradiometer (MODIS) data were correlated with concurrent climatic water budget variables. Land surface temperature deviations standardized for air temperature were expected to have a significant correlation with the water budget factors. To do correlation analyses on a weekly basis, daily MODIS data were integrated into three different types of weekly composites over western-central Kansas. Results showed that the maximum-temperature composite data set had the highest correlation with the climatic water budget measures, such as percent soil moisture, actual/potential evapotranspiration (AE/PE), and moisture deficit/ potential evapotranspiration (MD/PE). Time-integrated, or cumulative values of the LST-mean air temperature showed even stronger relationships with the water budget factors, increasing the correlation coefficients by 33.4% on average. High thermal signals, indicating high soil moisture deficit, emerged in the western region and moved toward eastern part of the state. The State Soil Geographic (STATSGO) database is a valuable source for assessment of soil properties at a state level. The influences of physical soil properties derived from the STATSGO on drought severity, which was estimated by NDVI departures from normal, were determined. Study results showed that soil properties and drought severity were significantly correlated with each other with correlation coefficients, ranging from -0.891 to 0.851. Also, it showed that different sets of soil factors influenced drought severity among early-drying and late-drying areas.