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Contribution of remote sensing and auxiliary variables in the study of the evolution of periods of droughts

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In semi-arid areas, plant water use and plant water stress can be derived over large areas from remotely sensed evapotranspiration estimates. Those can help us to monitor the impact of drought on the agro- and ecosystems. Both variables can be simulated by a dual source energy balance model that relies on meteorological variables (air temperature, relative humidity, wind speed and global radiation) and remote sensing data (surface temperature, NDVI, albedo and LAI). Surface temperature acquired in the Thermal InfraRed (TIR) domain is particularly informative for monitoring agrosystem health and adjusting irrigation requirements. However, available meteorological observations period may often be insufficient to account for the variability present in the study area. Statistical downscaling methods applied to reanalysis data can serve to generate surrogate series of meteorological variables that either fill the gaps in the observation period or extend the observation period in the past. For this aim, a stochastic weather generator (SWG) is adapted in order to compute temporal extension of multiple meteorological variables. This surrogate series is then used to constrain the dual-source model Soil Plant Atmosphere and Remote Evapotranspiration (SPARSE). Stress index anomalies retrieved from SPARSE are then compared to anomalies in other wave lengths in order to assess their capacity to detect incipient water stress and early droughts at the kilometer resolution. Those are the root zone soil moisture at low resolution derived from the microwave domain, and active vegetation fraction cover deduced from NDVI time series.