Using satellite remote sensing data to describe the environmental process that links the water, energy, and carbon cycles at the surface

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Evapotranspiration (ET) is the main driver of the environmental process that links the water, energy, and carbon cycles. ET is often limited by available energy which defines the energy-limited evaporation regime (stage I). But under some climates (e.g., arid and semi-arid) and in some seasons (e.g., dry seasons) the capacity of soils to transfer enough water to the land-atmosphere boundary at the surface becomes limiting. Under such conditions, the ET becomes water limited (stage II). The threshold between energy-limited and water-limited ET regimes is (SM*) dependent on seasonal soil water content as well as other near-surface atmosphere conditions. The aim of this work is the use satellite observations only (soil moisture (SM) from NASA's Soil Moisture Active Passive (SMAP) satellite and diurnal temperature (dT) from the geostationary satellite MSG-SEVIRI) to assess the surface inertia to climate variability and define the regions with the most variable environmental forcing and that set to the “tipping-point” in Sahel region. Specifically, to identify and implement an unsupervised classification scheme to categorize regions according to their dominant hydrological regimes in the same region. Therefore, SM at the drydown periods is correlated to dT in order to define whether the region is set to stage I, stage II, or transitional (Stage I and Stage II) regime. For this axis we raise the question of extracting SM* at 9 km resolution by filling the gap at temporal scale of the missed data. For this purpose, the simple methodologies have been proposed, the first one by linearly interpolating SM data (using 3 days moving average method), the second one by linearly interpolating dT data (using 3 days moving average method), and the third one where a machine learning algorithm is used to predict SM from LST and NDVI (Normalized Difference Vegetation Index). The results of the classification using the three methodologies will be presented during the conference.