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Analysis and predictability of drought in North Africa using optical, thermal and microwave remote sensing time series

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Agricultural drought occurs after a meteorological drought. Below-normal soil moisture can prevent plants from developing normally over a period of time having important consequences on food security and social stability, particularly in already low-water resource areas like semi-arid areas. We propose to analyze the potential of multi-remote sensing sensors for the quantification and predictability of drought. This study is applied in North Africa at the administrative division for the period 2007-2018. Three satellite products are considered in estimation of drought indices, NDVI, soil moisture index SWI, and land surface temperature LST. Three anomaly indices are considered in our study, VAI, MAI and TAI are normalized temporal indices built on the same formalism. Based on a vector considering these three indices, drought severity mapping is proposed using supervised classification. Then, an analysis of the inter-variable correlation and the time lagged correlation are performed. We analyze the ability of two methods to make an early prediction of drought. The analog method aims to search for the closest season available in the time series compared to the current season. This method appears to offer good performance in terms of likely trajectories, with 72% of the objective season set in April already found in January, yet the short length of our study period should temper those results. We will also implement the more traditional stochastic model called Vector AutoRegressive (VAR) and analyze the performance of the forecast. Most of the work presented here is implemented into a web application that allows to navigate in space and time to explore the trajectories of the state and anomaly indicators.