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Investigation of climate change impact on olive trees in Tunisia via MODIS LST and NDVI products and correlation measures

Oumayma Bounouh¹, Ana M. Tarquis^{2,3}, and Imed Riadh Farah¹

¹Laboratoire RIADI, Ecole Nationale des Sciences de l'Informatique, Mannouba, Tunisia

²Grupo de Sistemas Complejos, ETSIAAB, Universidad Politécnica de Madrid, Ciudad Universitaria, 28040 Madrid, Spain

³CEIGRAM, Universidad Politécnica de Madrid, calle Senda del Rey, 28040 Madrid, Spain

Olive trees play a vital role in Tunisia, a North African Mediterranean country. The Mediterranean basin region is experiencing severe climate change conditions. Indeed, traditional olive trees have the distinguishable ability to resist climatic conditions. However, warming trends and unusual both raining, and drought periods are threatening this crop by causing drying phenomenon and decreasing yield's quality and quantity. Therefore, this culture is attracting great attention for effectively analyzing, and monitoring their changes to cope with the projected changes accurately and put the necessary adaptation strategies. Such work remains a challenge via field measurement approaches. Meanwhile, satellite imagery provides a wide range of data. In this work, we took advantage of MOD13Q1 products to analyze the relationships between vegetation indices and their hidden components and the land surface temperature (LST) for various reasons: Firstly, to assess the relationship between the LST and vegetation indices and their components. Secondly, to determine which temporal profiles are more closely related to each other. Thirdly, to quantify the impact of climate change on olive sites. To this aim, the wavelet transform is used to decompose the time series. Moreover, various similarity and statistical measures are calculated to better quantify these relationships. On one hand, no significant correlation is measured for the trend components. Moreover, the olive trend has shown a positive slope. In contrast, LST depicted negative dynamics. On the other hand, interestingly, the temporal profiles seemed similar. And the wavelet coherence showed a consistent relationship between them. Based on our findings, we remark the limitation of classical correlation measures in depicting the relationship between the discussed variables. Therefore, we conclude that a good causality study must rely on time point relation detection and not on the overall similarity between the environmental variables and the vegetation indices.