The title (العنوان):

Spatiotemporal sensitivity analysis of surface soil moisture to precipitation and temperature variations: a case study of the Cheliff Basin in Algeria

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Abstract : Since a trend towards aridification is expected in Algeria, as in the countries of the Maghreb and the Mediterranean basin, changes in precipitation and temperature can have a significant impact on various water and energy balance processes and, consequently, on surface soil moisture (SSM). The latter is an important measure for monitoring and even forecasting meteorological and hydrological droughts, as well as irrigation for water resource optimization. This study examines the spatiotemporal sensitivity of SSM to variations in precipitation and temperature in different climatic zones of the Cheliff basin. The monthly mean data from four datasets of SSM, extracted from two reanalysis products (ERA-Land and ERA5), active and passive microwave satellite observations (ESA CCI SM), GLEAM model, along with precipitation and temperature records over the period from 1980 to 2018 from 104 weather stations, were analyzed by using the Modified Mann–Kendall test (MMK) and canonical correlation; the study revealed that (1) SSM generally increased from September to December or March, depending on the dataset; (2) monthly precipitation increased from September to November; (3) SSM decreased from June to August, coinciding with rising temperatures; (4) the results of the canonical analysis revealed that monthly SSM is positively correlated with delayed precipitation from 1 to 3 months, depending on the climatic zone; (5) SSM is negatively correlated with temperatures over the previous 2 months for the stations in Csa and Bsk climate zones and with temperatures over the previous 1 and 2 months for the stations in Bsh climate zone from 1 to 2 months prior, also depending on the climatic zone. These results highlight the crucial role of SSM in monitoring and forecasting weather events such as droughts and provide insights for irrigation strategies aiming to optimize water resources.

Key words : Surface soil moisture (SSM) ,Precipitation and temperature , Algerian climate zones , Modified Mann-Kendall, Test, Canonical correlation analysis (CCA)

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