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Neural Networks Based Prediction of Long Term Rainfall: Nine Pilot Study Zones over the Mediterranean Basin

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Abstract : The Mediterranean Basin is a very diverse region of nationalities and climate zones, with a strong dependence on agricultural activities. Predicting long term (with a lead of 1 to 12 months) rainfall, and future droughts could contribute in a sustainable management of water resources and economical activities. In this study, an integrated approach was adopted to construct predictive tools with lead times of 0 to 12 months to forecast rainfall amounts over nine subzones of the Mediterranean Basin region. The following steps were conducted: (1) acquire, assess and intercorrelate temporal remote sensing-based rainfall products (e.g. The CPC Merged Analysis of Precipitation [CMAP]) throughout the investigation period (1979 to 2016), (2) acquire and assess monthly values for all of the climatic indices influencing the regional and global climatic patterns (e.g., Northern Atlantic Oscillation [NOI], Southern Oscillation Index [SOI], and Tropical North Atlantic Index [TNA]); (3) delineate homogenous climatic regions and select nine pilot study zones, (4) apply data mining methods (e.g. neural networks, principal component analyses) to extract relationships between the observed rainfall and the controlling factors (i.e. climatic indices with multiple lead-time periods) and (5) use the constructed predictive tools to forecast monthly rainfall and dry and wet periods. Preliminary results indicate that rainfall and dry/wet periods were successfully predicted with lead zones of 0 to 12 months using the adopted methodology, and that the approach is more accurately applicable in the southern Mediterranean region.

Keywords : rainfall, neural networks, climatic indices, Mediterranean
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