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Meteorological drought forecasting models

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Droughts are long-term phenomena affecting large regions causing significant damages both in human lives and economic losses. Droughts are the costliest natural disaster of the world and affect more people than any other natural disaster. Early and timelines forecasting of a drought event can help to take proactive measures and set out drought mitigation strategies to alleviate the impacts of drought. Drought forecasting plays an important role in the planning and management of natural resources and water resource systems in a river basin. Due to the random nature of contributing factors, occurrence and severity of droughts can be treated as stochastic in nature. This study uses linear deterministic (e.g. regression models) and stochastic timeseries models (ARIMA, SARIMA models, etc.), and nonlinear models (e.g. artificial neural network models) to forecast droughts in time. The models are applied to forecast droughts using standardized precipitation index (SPI) timeseries at multiple timescales in the Pinios river basin in Thessaly region of central Greece. The results obtained from the study models and their potential to forecast drought over different lead times are presented and compared with the observed SPI timeseries. The predicted results show reasonably good agreement with the actual data for short lead times, whereas the forecasting accuracy decreases with increase in lead-time. An attempt is made to use the time forecasting models with spatial variation models for concurrent temporal and spatial drought forecasting. The results indicated that most of the models could be operationally used to forecast droughts with improved accuracy.