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Estimation of drought transition probabilities in Sicily making use of exogenous variables

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Drought monitoring and forecasting play a very important role for an effective drought management. A timely monitoring of drought features and/or forecasting of an incoming drought do make possible an effective mitigation of its impacts, more than in the case of other natural disasters (e.g. floods, earthquakes, hurricanes, etc.). An accurate selection of indices, able to monitor the main characteristics of droughts, is essential to help decision makers to implement appropriate preparedness and mitigation measures.
Among the several proposed indices for drought monitoring, the Standardized Precipitation Index (SPI) has found widespread use to monitor dry and wet periods of precipitation aggregated at different time scales. Recently, some efforts have been made to analyze the role of SPI for drought forecasting, as well as to estimate transition probabilities between drought classes.
In the present work, a model able to estimate transition probabilities from a current SPI drought class or from a current SPI value to future classes, corresponding to droughts of different severities, is presented and extended in order to include information provided by an exogenous variable, such as a large scale climatic index as the North Atlantic Oscillation Index (NAO). The model has been preliminarily applied and tested with reference to SPI series computed on average areal precipitation in Sicily island, Italy, making use of NAO as exogenous variable. Results seem to indicate that winter drought transition probabilities in Sicily are generally affected by NAO index. Furthermore, the statistical significance of such influence has been tested by means of a Montecarlo analysis, which indicates that the effect of NAO on drought transition in Sicily should be considered significant.