Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07863, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07863
EGU General Assembly 2008

Potential of North Atlantic Oscillation Index to forecast drought in Sicily

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Drought monitoring and forecasting play a very important role for an effective drought preparedness and management. Due to the general slow evolution in time of drought, mitigation of its impacts can be carried out in a very effective manner, more than in the case of other extreme events (e.g. floods, earthquakes, hurricanes, etc.), provided a timely monitoring and forecasting of an incoming drought is available.

The performance of a drought monitoring system is deeply influenced by an accurate selection of indices for drought identification, providing a synthetic and objectives description of drought conditions. Among the several proposed drought monitoring indices, the Standardized Precipitation Index (SPI) has been widely applied to monitor dry and wet periods on monthly precipitation aggregated at multiple time scales. However, limited efforts have been made to analyze the role of the SPI for drought forecasting.

Moreover, the use of large scale climatic patterns, that supposedly exerts an influence on the climatic variability, such as ENSO, NAO or EB, can potentially improve drought forecasting models. For instance, following the results of many studies, the NAO index seems to have a strong influence on European climate. In particular, during its positive phases, the North Atlantic westerlies shift northward and this, in turn, results in drier conditions over southern Europe, the Mediterranean Sea and northern Africa.

In the presentation, a model for estimating transition probabilities of Standardized

Precipitation Index, both from a current drought class and from a current single SPI value to a future class, corresponding to drought of different severities, is extended in order to include information provided by an exhogenous variable such as a large scale climatic index. The analytical structure of the model enables to overcome the difficulties related to the relatively limited number of droughts generally observed in historical records.

The model has been applied to SPI series computed on areal precipitation in Sicily, making use of NAO as exhogenous variable. Results seem to indicate that drought transition probabilities are affected by the NAO index, especially by its negative values and for transitions from Extreme drought to Extreme drought and from Extreme drought to Non-drought condition. The statistical significance of such variation has been tested by means of Montecarlo analysis under the null hypothesis of no correlation between SPI and NAO, revealing that the effect of NAO on drought transition in Sicily should be considered significant.