



Precipitation change in Southern Italy linked to global scale oscillation indexes

T. CALOIERO (1), R. COSCARELLI (2), E. FERRARI (3), and M. MANCINI (1)

(1) DIIAR, Politecnico di Milano, Milan, Italy, (2) CNR-IRPI, Rende (CS), Italy, (3) University of Calabria, Soil Protection Department, Rende (CS), Italy

Hydrological impacts from climate change are of principal interest to water resources policy-makers and practising engineers. Climate change has attracted extensive attention from every sector of the society because of the potentially large scale negative environmental and economic consequences. Particularly the analysis of the temporal evolution of precipitation is fundamental to evaluate water resources availability, especially in areas with a marked orography like in Southern Italy. To this aim several statistical tests can be used for exploratory analyses and detection of monotonic trends in time series data.

Moreover rainfall amounts occurred in seasonal periods, directly responsible for availability of water resources on a specified area, are strongly dependent on climate system. In order to highlight some features of such dependence, planetary-scale indexes based on the difference in the sea level pressure between two geographic areas tagging centres of climatic action have been taken into account. Such procedure, called teleconnection, shows that climatic conditions in different geographical areas, even relatively far from each other, can be interdependent. For instance, the conditions of the Atlantic, Pacific and Indian Oceans, which constitute heat and steam sources for the masses of air which cross them, in the intertropical zone are related to the precipitation regime, while at the latitudes of the temperate zones they modulate the circulation of the western winds, the high and low pressure zones distribution and the track of the low pressure areas responsible for the atmospheric phenomena.

Within this purview, some authors have drawn correlations between precipitation and indexes describing some planetary-scale oscillations, like the well-known El Niño–Southern Oscillation (ENSO) and the North Atlantic Oscillation (NAO). As example, several analyses of the relationships between large-scale pressure fields, such as the NAO, and European climate have linked high values of NAO index to low annual and seasonal precipitation (drought) and, on the contrary, low values to intense rainfalls and floods. For this reason, knowing the changes in monthly rainfalls, due to evolution of a planetary-scale oscillation, is useful for farmers and water management in a specific area.

This study presents an investigation on the rainfall trends in Southern Italy (Campania, Apulia, Basilicata, Calabria and Sicily) using a database of about 70 rain gauges with more than 70 years of observation. Statistical analyses for trend detection were performed on rainfall monthly records through the Mann-Kendall non-parametric test and a least-square linear regression. These analyses are made for the entire year and also on seasonal scale. The normalized rainfalls and some global climatic indexes were jointly analysed in order to find their possible correlations.

Results obtained for trend analyses of rainfall series show statistically significant negative trends for annual and winter aggregations in the most part of the series. The correlation analyses between the adopted planetary-scale indexes and the precipitation anomalies demonstrate that the indexes influence to some extent precipitation over Southern Italy, though in different way. The correlation coefficients between planetary-scale indexes and rainfalls appear more significant for winter precipitation.