Geophysical Research Abstracts
Vol. 14, EGU2012-6485, 2012
EGU General Assembly 2012

On the changes in the precipitation in the middle and lower Danube basin under the NAO influence

I. Mares (1), C. Mares (1), A. Stanciu (1), and M. Mihailescu (2)

(1) National Institute of Hydrology and Water Management, Bucharest, Romania (ileana.mares@hidro.ro), (2) Agricultural University, Bucharest, Romania

The North Atlantic Oscillation (NAO) evolution has a great importance on the climate variability in the most parts of Europe. The influence of this phenomenon on the different climatic variables was especially emphasized taking into account its characteristics in the cold period of the year.
The purpose of this study is to assess possible changes in the 21st century in the Danube lower basin discharge, taking into account NAO simulation by four general circulation models and their capability to reproduce the NAO event in the 20th century.
As precipitation is the main predictor in discharge estimation, we analyzed observational seasonal precipitation at 18 stations located in the middle and lower Danube basin, in connection with the NAO evolution. Observational data analysis was performed over a period of 42 years (1958-1999). The NAO index was estimated by means of the first principal component of the EOF development of the sea level pressure (SLP) over the region (30-65N, 50W-40E). It was chosen this method to estimate the NAO index, because it is more efficient for the analysis of model capability to simulate this phenomenon. Observational data for SLP were assimilated with SLP from ERA-40 along the period 1958-1999.
Precipitation field analysis was made both by the EOF decomposition of this field and by considering the separate seasonal time series from each of the 18 stations. As expected, from such correlative analysis between the first main component of SLP (representing NAO) and the first component of the EOF analysis of precipitation and corresponding individual stations, the most significant connection between NAO and precipitation is done during the winter season.
Then, the capacity of four general circulation models of reproducing the NAO (for the positive phase as well as the negative one) was analyzed in comparison to the results found in the observations. These models are CNRM, ECHAM5-MPI, EGMAM and IPSL, which were achieved within the ENSEMBLES project.
According to the models performance of reproducing the NAO in the 20 century, some estimation for the 21st century are made, taking into account the NAO simulation for this century, considering A1B scenario.
These estimates lead to the conclusion that the occurrence frequency of both negative and positive phase NAO will increase in the 21st century compared to the 20th century, but this increase is greater for positive phase.
Direct analysis of the influence of NAO on the Danube discharge in the lower basin revealed that the winter NAO signal is most significant in the evolution of the Danube discharge during the spring. This fact is confirmed also by the significant influence of the precipitation from some stations situated in the middle basin of the Danube in winter, on the spring discharge in the Danube lower basin. These stations are generally located at higher altitudes and the snows melting in the spring contributes to the increase in the discharge in the lower Danube basin in the spring season.
Therefore, in the 21st century is expected to increase the frequency of occurrence of extreme events in winter and spring in the lower Danube basin, compared to the 20th century, especially those related to the dry periods.