



Influence of the atmospheric blocking on the hydrometeorological variables from the Danube basin and possible response to the solar/geomagnetic activity

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In order to test the large-scale atmospheric circulation influence on the hydrometeorological variables from the Danube basin, four blocking indices were considered for the regions: Greenland (GBI), Atlantic-European (AEBI), Atlantic (ABI) and Europe (EBI). In addition, an index for Greenland-Balkan Oscillation (GBOI) was introduced.

For the Danube basin were analyzed: precipitation and temperatures at 15 stations and the Danube discharge at Orsova. Also, for each station were calculated four indices of Palmer type and a simple drought index (TPPI). Solar activity was represented by Wolf numbers and 10.7cm solar flux and the geomagnetic activity by the aa index.

The time series of temperatures and precipitation were represented by the first principal component (PC1) of the development in empirical orthogonal functions (EOFs) and the four Palmer indices were analyzed by the PC1 of the development in multivariate EOFs (MEOFs).

Cross correlations, power spectra and filters were performed. The analyses were achieved for two periods, 1901-2000 and 1948-2000, separately for each season.

Concerning the simultaneous connections, for spring, the most significant results with a high confidence level (99%) were obtained for GBOI and EBI, which influence the discharge and the other hydrometeorological variables. Signals of solar or geomagnetic activity have been found only in EBI at level of 95%. For the summertime, the results are weaker. It is noted however, the significant influence of GBOI on the variables in the Danube basin, mainly on precipitation, and of EBI signal on temperatures. Solar signal is statistical significant (90% - 95%) in the GBI. Autumn, GBI, GBOI and EBI have a clear influence on all hydrometeorological fields. Signals statistically significant of aa index and 10.7 cm flux, were found in ABI and AEBI respectively. Winter, atmospheric circulation, quantified by GBI, EBI and GBOI, has an impact simultaneous on temperatures, precipitation and on the Orsova discharge. Also, significant signals of the aa index have been found in the GBI and GBOI.

An analysis of the relationship between large-scale fields in the wintertime and the variables at regional / local scale during spring was achieved. This analysis revealed that the GB, GBO indices and especially EBI in wintertime are good predictors for the spring discharge. Also, the aa index in winter has a statistically significant signal (99%) in hydrometeorological variables with the highest correlation with precipitation. Also, the 10.7 cm solar flux in winter shows a statistically significant signal (at a level of 95%) in the Palmer indices as well as in temperatures and in precipitation during springtime.

From the cross-correlation analysis with a lag of 5-years, between the hydroatmospheric variables and the geomagnetic or solar activity, were obtained very different results, depending on the season and variables analyzed. The most significant values have been found in summer for the 10.7 cm flux signal in variables from the Danube basin, with the 2-3 years before and after a maximum or minimum solar.