



## **Wintertime centres of action of the atmosphere in the Northern Hemisphere: changes, interactions, influence on climate in Poland**

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There were analysed long-term changes, variability and interactions of centres of action of the atmosphere (CAA) in the Northern Hemisphere in January and their influence on climatic conditions in Poland in the second half of the 20<sup>th</sup> century. The geographical coordinates and the atmospheric pressure value in the center of each baric system were read in maps of mean monthly sea level pressure basing on gridded 2,5° x 2,5° data of Reanalysis Project of the National Center for Atmospheric Research for the period 1951-2000. The dependence of the mean air temperature (in 14 meteorological stations), precipitation and snow cover (in 41 stations) in January in Poland for the period of 1954-2000 on individual features and on complex of features of CAA was investigated. The homogeneity of all series was controlled by using the SNHT Single Series test. The inhomogeneous series of longitude of the Asiatic High of two precipitation series (Sandomierz and Bialystok) and a few snow cover series were corrected. There were following methods used in the investigation: simple and multiple regression, correlation, time-lagged analysis, principal component analysis, canonical analysis.

The initial investigation results are as follows:

- in the second half of the 20th century the center of Icelandic Low in January has moved northwards and the sea level pressure in the center of the Asiatic High increased significantly; the latter change was probably the reason for the

significant increasing tendency of the difference between the Azores High and Icelandic Low and for the decreasing trend of the difference between the sea level pressure of the Asiatic and Azores highs. These two trends caused the intensification of the western advection and the diminishing of S-N air flow over Europe;

- the Northpacific Low has significantly moved eastwards during the period 1951-2000;
- a significance influence on winter climatic conditions in Poland reveal: the Icelandic Low, the Azores High and directly the Asiatic High;
- the variability of features of the CAA over the North Atlantic influences the strongest the climatic conditions in NW, N and NE Poland;
- changes of sea level pressure in the Icelandic Low and the longitude of the Azores High in January (taken into account as a complex of features) explain about 40 per cent of the temperature and snow cover variability in Poland;
- the mean air temperature is also directly proportionally correlated with the sea level pressure in the Azores High and with the difference between atmospheric pressure of the Azores High and the Icelandic Low. The significant upward trends of these two features of CAA seem to be a good explanation of the increasing tendency of the winter air temperature in Poland;
- the variability of some features of CAA describes the changes of precipitation and snow cover in Poland stronger than the NAO index;
- the canonical correlation coefficient between the features of the CAA and temperature and precipitation in Poland in January (1901-2000) is 0.56.