EMS Annual Meeting Abstracts
Vol. 15, EMS2018-351, 2018

Recent cloud cover changes driven by atmospheric circulation in Europe

Lucian Sfîcă (1), Christoph Beck (2), Andrei Niţă (3), Andreas Phillip (2), and Mirela Voiculescu (4)

(1) Alexandru Ioan Cuza University of Iaşi, Faculty of Geology and Geography, Department of Geography, Iaşi, Romania (sfical@yahoo.com), (2) Augsburg University, Augsburg, Germany, (3) Romanian Meteorological Administration, Bucharest, Romania, (4) Dunărea de Jos University, Galaţi, Romania

Due to its role in the radiation budget of the planet, the cloud cover represents a key element on the short and long term climate variability. For this reason, nowadays, there is a need for a better understanding of changes in the cloud cover which could modulate the amplitude of climate change at regional or continental scale. In Europe, COST733 synoptic classifications database offers the opportunity to disentangle the complex link between cloud cover and the atmospheric circulation, one of the main contributors to the climate variability.
In our work we will present the main features of this link using daily data for cloud cover and circulation atmospheric type classification. The cloud cover were taken from NCEP-DOE AMIP-II Reanalysis (Kanamitsu et al., 2002). The 27 atmospheric circulation types were obtained for two domain size in Europe (domain 00 -as defined in cost733 v.2 - and a smaller one restricted to the continent), applying an objectivise classification method (k-means) with 4 input variables which are relevant for cloud development (mean sea level pressure, 500 hPa height, 850-1000 hPa thickness and relative voricity at 500 hPa). Both types of data are available for the common period: 1979-2013.
The methodological steps imply firstly the identification of the key regions for the variability of the cloud cover at continental scale applying a principal component analysis to the cloud cover data. Secondly, for the 9 key-regions obtained in the first step, those circulation types which are causing positive or negative anomalies in the key-regions were selected. In the final step, from these circulation types inducing coherent positive/negative anomalies in the cloud cover only those circulation types characterized by a clear liniar trend (negative or positive) were kept. In this way we have identified the regions in Europe where the changes in cloud cover are directly connected with changes in atmospheric circulation.
This analysis delivers coherent results regardless of the domain size used. Two major changes in cloud cover in Europe in connection with atmospheric circulation could be depicted. The first one is related to a decrease of the cloud cover in the region of the Baltic Sea in connection with an increase of circulation types associated with atmospheric blocking development over central northern part of the continent. The second one indicates an increase of cloud cover in the south-west part of Europe as a result of a decrease in circulation types associated with the development of the Azores High and its north-eastward ridges.
The results are presented at annual and seasonal level. Also, the climatic impact of these changes is estimated.