EMS Annual Meeting Abstracts
Vol. 16, EMS2019-83-1, 2019

Links between increasing drought severity and atmospheric circulation over Central Europe

Ondrej Lhotka (1,2), Martin Dubrovský (1,2), Miroslav Trnka (2), Jan Balek (2), Jan Kyselý (1,2,3), Martin Možný (2,4)

(1) Institute of Atmospheric Physics CAS, Praha, Czech Republic (ondrej.lhotka@ufa.cas.cz), (2) Global Change Research Institute CAS, Brno, Czech Republic, (3) Faculty of Environmental Sciences, Czech University of Life Sciences, Prague, Czech Republic, (4) Czech Hydrometeorological Institute, Prague, Agrometeorological Observatory in Doksany, Czech Republic

Long-lasting and severe droughts are one of the main threats to agriculture, ecosystems and society. The recent 2018 summer in Central Europe was characterised by unusually persistent heat and extraordinary drought, causing substantial economic losses especially in agriculture and forestry, and became a part of a several years long dry period observed across this region. The aim of the study is to assess a long-term variability of drought over Central Europe, with respect to changes in atmospheric circulation. Drought conditions were analysed using Palmer Drought Severity Index (PDSI) and Palmer Z-Index (PZI). PDSI was used to assess long-term drought variability since the end of the 19th century, using data from 8 stations distributed across the Czech Republic. Shorter-term droughts and their links to atmospheric circulation were evaluated using PZI. Changes in atmospheric circulation were analysed through circulation indices (flow strength, direction and vorticity) and respective circulation types, using mean sea level pressure data from the NCEP/NCAR reanalysis that is available since 1948 to present. Preliminary results show an increasing drought tendency across Central Europe with record-low PDSI values in the 2013–2018 period at the majority of stations. Changes in PZI are rather associated with flow vorticity (indicating cyclonic or anticyclonic conditions) than flow direction. An increased frequency of anticyclonic circulation types in the recent decades was found and this is associated with more severe droughts in this period. The outcomes of this study are useful also for conditioning an existing stochastic spatial weather generator on atmospheric circulation, which may result in more realistic weather data produced by the generator.

MT, JB and MM were supported by MŠMT ČR within the project „SustES - Adaptation strategies for sustainable ecosystem services and food security under adverse environmental conditions“ (CZ.02.1.01/0.0/0.0/16_019/0000797).