EMS Annual Meeting Abstracts
Vol. 16, EMS2019-435, 2019

Analysis of compound events in the Carpathian Basin with special focus on concurrently hot and dry conditions

Ildikó Pieczka (1), Rita Pongrácz (1,2), Tímea Kalmár (1), Judit Bartholy (1,2)

(1) Eötvös Loránd University, Budapest, Hungary, (2) Eötvös Loránd University, Faculty of Science, Excellence Center, Martonvásár, Hungary

Climate models project a general temperature increase and substantial changes in the annual distribution of precipitation for the Carpathian Basin. The change of either of these climatic elements alone could have negative effects on the social-ecological system, but if we consider their simultaneous changes – which is often the case as they are inter-linked through various meteorological processes – the overall impact can be even more severe. A recent example is the summer of 2018: weather is not considered extreme in terms of temperature records in Hungary. However, an unprecedented long period of canicular days occurred due to the weakening of polar jet as some researches suggest. In our study, we analyse compound events in the Carpathian region based on observed and modelled climate data with multivariate statistics, including probability distribution functions, or the analysis of return time of compound events based on their observed occurrences. To find such conditions, 10 km horizontal resolution gridded data are used: (i) the CarpatClim database that contains daily values of several meteorological parameters, and (ii) regional climate model simulation outputs produced by our experiments of the RegCM model (regional climate model RegCM originally stems from the US National Center for Atmospheric Research/ Pennsylvania State University Mesoscale Model version MM4, and it is a 3-dimensional limited-area model maintained at the International Centre for Theoretical Physics, Trieste). For the dynamical downscaling the initial and lateral boundary conditions from both reanalysis data and global climate models are used for the historical period. Thus, on the one hand the reconstruction of specific events can be analysed, and on the other hand, more generally, the frequency of compound events can also be studied. This latter approach allows us to analyse the possible changes in the intensity and frequency of compound events in the Carpathian region during the 21st century. Furthermore, our results can serve as an important basis for detailed subregional scale analysis and specific impact studies as well as for developing national climate and adaptation strategies.