4–8 November 2019, Kraków, Poland
ECSS2019-67

Mountain related supercell events analysis using radar observations and the COSMO model pre-convective environments in the Western Carpathians

Róbert Kvak (1,2), Petr Zacharov (1), and Marek Kašpar (1)

(1) Institute of Atmospheric Physics CAS, Meteorology, Prague, Czech Republic (kvak@ufa.cas.cz), (2) Charles University, Faculty of Science, Department of Physical Geography and Geoecology, Prague, Czech Republic

Currently, it is a matter of great concern to understand a spatial activity of deep atmospheric convection within mountains in mid-latitudes. The process of clustering thunderstorms into long-lived systems or rotating supercells over complex terrain and its vicinity has received a little research attention to date. The aim of this study is precisely analyze a bond between supercells occurrence – convective environment – terrain characteristics, searching for cases, in which mountains can enhance the potential for supercell's formation in their close proximity. The area of interest covers the geomorphological unit of the Western Carpathians within the domain of Slovak weather radar network range (300 x 500 km). Digital elevation model is described by the specific morphometric characteristics (e.g. altitude). The presence of supercells in the mountain areas in warm parts of the years 2010 – 2018, primarily since 2015, is studied. Multiple events are chosen thanks to Slovak radar detection network, and complete observational reports (SHMI). Based on ERA-interim reanalysis as initial and boundary conditions, basic fields of physical quantities (e.g. dew point) and pre-supercell indicators (e.g. wind shear) are performed using NWP model COSMO during the events. COSMO is the non-hydrostatic compressible model which we use with the 2.8 km grid-spacing and 50 atmospheric model levels up to a height of 20 km. The products of simulations (starting time at 00 UTC) are statistically compared with spatial changes in the maximal vertical reflectivity of radar detection and with basic morphometric characteristics of the topography using digital earth model with appropriate spatial resolution. In addition, maximal vertical reflectivity is simulated to verify the COSMO's capability of forecasting severe convection storm activity in a mountainous region.