4–8 November 2019, Kraków, Poland
ECSS2019-78

High-resolution simulation of an isolated tornadic supercell in Poland on 20 June 2016

Natalia Pilguj (1,3), Mateusz Taszarek (2,3), Łukasz Pajurek (3), and Maciej Kryza (1)

(1) Department of Climatology and Atmosphere Protection, University of Wrocław, Wrocław, Poland (natalia.pilguj@uwr.edu.pl), (3) Skywarn Poland, Warsaw, Poland, (2) Department of Climatology, Adam Mickiewicz University, Poznań, Poland

On 20 June 2016, a convective cell, which developed on the Polish-Slovakian border, under favorable kinematic and thermodynamic conditions, evolved into a supercell. It moved for 500 km, and remained isolated during its entire lifecycle. The storm was responsible for producing multiple large hail (up to 7.5 cm) and severe wind gust events. Additionally, at around 17 UTC, a tornado was reported near Sulów (Lubelskie Voivodeship). The peak intensity of the tornado was estimated at F1/T3 in the Fujita/TORRO scale. In this paper, we perform two simulations using the WRF model to evaluate the possibilities of predicting this event. The first simulation is a WRF base run, while the second version uses data assimilation techniques. The surface observational data, together with the atmospheric soundings, are assimilated in the second model run. Three one-way nested domains were defined, with spatial resolutions of 9 km, 3 km and 1 km. Observations from meteorological stations, severe weather reports, and radar reflectivity are compared with the simulations to assess their quality. An additional parameter of an updraft helicity track is used to analyze the lifecycle of a simulated supercell. Results indicate a slight overestimation of temperature, dew point and wind speed. Our findings confirm that downscaling to convection-permitting resolution makes it possible to successfully predict tornadic supercells. From two simulations, we proved that assimilation of observational data may increase the quality of the simulation. We show that assimilated data have made it possible to more accurately define the number of cells and their tracks. In addition, high-resolution visualizations showed that numerical simulation with assimilated observational data had successfully sampled the wind field environment conducive to tornadic formation.