

# Abstract

## Influence of orography on supercells in Slovakia

Spatial distribution of supercells is strongly inhomogeneous across Slovakia with a higher frequency of occurrence in the east and in the Gemer region. Main aim of the thesis is to find reasons for this inhomogeneity by studying the real cases. The most important influence was found to be an interaction of large-scale flow with local orography, which affected a whole range of processes in the troposphere. As a result of the various orographic effects, such as blocking, wrapping, gap wind, lee cyclogenesis, upslope, etc., we have detected zones of enhanced convergence and spatial anomalies of ingredients important for the development of deep moist convection. We described, categorized and statistically evaluated these effects using a non-hydrostatic numerical model with a horizontal resolution of 1 km. Thesis illustrates these effects using several case studies. In most of the analyzed cases we noted local increase in the vertical wind shear, which in combination with other effects led to a higher probability of the formation of organized convective storms, including supercells. In the cases with prevailing southerly flow cases, supercells typically formed in the vicinity of the Spišsko-šarišské medzihorie, Volovské vrchy mountains and Revúcka vrchovina mountains. Convergence lines and upslope flow initiated convection and local enhancement of vertical wind shear was essential for the genesis of supercells. In the cases with prevailing northerly flow, blocking allowed for maintenance of a warm and humid air mass (with non-zero CAPE values) into the south of Western Carpathians. Due to the weakening of the flow in the lower levels, there was also a slight increase in the vertical wind, but its spatial anomaly was insignificant. Convergence zones were more pronounced than those forming in prevailing the southerly flow. We plan to use the acquired knowledge to further research the orographic effects on severe convective storms. Furthermore, presented conceptual models will be applied in operational weather forecasting of severe convective hazards associated with supercells, which should lead to an improvement of the severe weather warnings.

**Key words:** supercell, orography, vertical wind shear, convergence, CAPE.