Occurrence of supercells in Slovakia in 2000 - 2012

Miroslav Šinger
Slovak Hydrometeorological Institute, Bratislava, Slovakia
Comenius University, Faculty of Mathematics, Physics and Informatics, Bratislava, Slovakia

Using the Doppler radar network of Slovak Hydrometeorological Institute, we investigated the occurrence of supercells in Slovakia in the period between 2000 and 2012. To detect supercells, we used both direct (mesocyclone detection) and indirect methods, which involve interrogation of typical radar features associated with supercells, such as WER, BWER, hook-echoes, overhang, splitting or typical movement. On average four days per year with supercells were found for the investigated period. Unfortunately, radar data is not completed (mainly in the first 6 years), thus statistics likely underestimate the actual number of supercells in Slovakia. Occurrence of supercells is strongly inhomogeneous over Slovakia, with eastern part exhibiting more cases than the rest of the country, as well as higher frequency of conditions favourable for supercells. We looked at the synoptic-scale conditions that are associated with development of supercells over Slovakia, too. Only a few cases have been documented as they occurred multiple years before this research even started.

Typical synoptic conditions

![Fig. 1](image1.png)
Fig. 1 – Typical synoptic-scale patterns associated with development of supercells over Slovakia. The front of upper level trough with southwesterly flow over Slovakia (A, C), and northern-northeastern edge of upper level ridge (B, D).

Regional differences

![Fig. 7](image2.png)
Fig. 7 (left) – Trajectories of supercells (only right-moving). Most supercells occur in eastern Slovakia.

Statistics

![Fig. 5](image3.png)
Fig. 5 – Number of supercells detected in one day. Usually, only one to two supercells occur on a given day.

Extreme season 2017

![Fig. 10](image4.png)
Fig. 10 – 500 hPa anomaly, May - August 2017.

![Fig. 11](image5.png)
Fig. 11 - Severe weather and clouds associated with supercells in season 2017.

![Fig. 12](image6.png)
Fig. 12 – Tornadic supercell near Wien 10.7.2017.

![Fig. 13](image7.png)
Fig. 13 – Supercell near Prešov 27.8.2017 with typical radar features.

Statistics

- 25 days with a supercell
- Most of them in June and July
- More than 50 supercells
- Agreement with other statistics above

Severity

- At least 75 % severe cases
- 50% with heavy rain
- 33% with large hail (bigger than 2 cm)
- 33% with severe wind damage