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The derecho episode in the Bory Tucholskie district 11 August 2017 - the present state of the predicting severe storms by awiacja_imgw_pl

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This extremely severe thunderstorm incident was caused by the abrupt inflow of the highly unstable air mass of tropical origin gradually displaced by cool polar air. It resulted from wind speed jumps, both in velocities and directions. Mesoscale models used by us indicated that in the region from the south-west, partly central to central-northern Poland, a strong heavy-rain storm system can be formed. Despite of directional wind faults, the location of supercell storm was accurately nowcasted anticipating destructive gusts of wind and high rainfall. Eventually, the system was to take on the character of a thunderstorm with a well-developed line segment (derecho), with the bow echo wind pattern. The considered MSC thunderstorm system contributed to the enormous material damage, also resulted in death of six people. Particularly impressive are the destruction of entire forests, including in the Bory Tucholskie district, where the final estimates indicated about 80,000 hectares of forests completely destroyed.
In 2011 the Virtual Synoptic 3D_Laboratory a concept was proposed to understand the synoptic background on which the convective storm process can be developed. The phenomenological analysis concerned the potential of the NWP model output, radar and lightning data. The first stage of the pre-convective period and the second one-day forecast, are hoped to be well predicted by operational models. However, the 3rd stage – lasting a few hours – and preceding supercell formation is difficult to predict. The process of successive absorbing of new radar and lightning data is essential for tuning the model and extending forecast range. Based on the optimistic facts that: 1) the non-hydrostatic and compressible COSMO model has shown to restore the characteristic wind jump and related vortex tube, 2) the assimilation of Doppler rotational wind component provide a realistic approximation of the tornado oscillation, and, 3) the lightning data are a good proxy of the “visible” tornado – it seems to lead to prediction. The solution can be moving grid being positioned every 10 minute accordingly to data inflow and stimulating by lightning data. Most likely the essential to initiate tornado forecast is assimilation of tangential Doppler wind. However, remembering tens of hectopascals losses in tornado centers, the next retrieval procedure concerning nonhydrostatic pressure (Parfiniewicz, et al., 2011) can be probably unavoidable.

Parfiniewicz J., Barański P., Jaczewski A., 2011: Concerning tornado prediction – a real case conclusions. 9-th International SRNWP-Workshop on Nonhydrostatic Modelling

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