

Cyclonic Windstorms over Europe and the Difficulty of representing them in Models

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Cyclonic windstorms are one of the most costly of the severe weather phenomena that affect Europe, yet prediction and detailed representation thereof can still confound numerical models. This talk will first present a conceptual model of different types of windstorm, based on in-depth observational studies of ~30 cases. It will show how the different types relate to different phases in a cyclone's life-cycle, and discuss with examples how the representivity and predictability challenges vary with type. There will be special focus on the "sting jet" phenomena, highlighting how certain characteristics make this particularly threatening for inland locations, and illustrating its fine scale structure. It will become clear that boundary layer destabilization is key. Re-runs of the ECMWF high resolution model will be used to illustrate the difficulties of gust representation, and similarly a high sensitivity to subtle changes in boundary layer stability.

Reference will also be made to the importance of model resolution, showing how the ERA-Interim re-analysis suffers because of its low resolution, but highlighting how its successor, ERA-5, which is now providing test output, can do much better. There will also be discussion of the difficulties of identifying cyclone and windstorm tracks in low resolution, longer period re-analyses, such as ERA-20C (and equivalently global climate runs), asking whether re-calibration is viable. Meanwhile, at the other end of the range, convection-resolving models have the capacity to generate 'Armageddon' scenarios; it seems this issue may also require further work.