



Cyclonic windstorms over Europe and their representation in models

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Studies of cyclonic windstorms over the North Atlantic and Europe over two decades have culminated in a conceptual model of three different types of windstorm footprint, which will be presented. Every cyclone is different, and may be associated with one, two or all three such types. The footprints, or 'damage swathes', are labelled warm conveyor (WCB), cold conveyor (CCB) and sting jet (SJ). Key characteristics of each type will be described, along with evidence, focussing in particular on boundary layer structure and how this affects gust strength. For CCBs for example gusts tend to be highest on coasts, and notably weaker inland unless there is some destabilising mechanism such as insolation. Illustrative cases will include 'Christian' and 'Xaver' from the 2013/14 winter.

Under the auspices of the IMILAST project (Intercomparison of Mid Latitude STorm diagnostics) a list of about 20 cyclonic windstorms of wide-ranging types was compiled. The storm-centre mean sea level pressure evolution has been carefully retrieved for each storm, by referencing manual Met Office surface analyses and revisiting the surface observations. This evolution will be compared with representation in the ERA-Interim re-analysis. A key finding is that the maximum 6-hour deepening is systematically under-estimated in ERA-Interim, in extremis by as much as 10hPa. This also results in an under-estimation of gradients and wind strengths. Assessment of output of several models of differing resolution suggests that a horizontal resolution of order 5-10km may be necessary for accurate representation of pressure gradients and gusts unless the storm is large, as will be illustrated.

There are clear implications here for the use of re-analyses and climate models, which currently have low resolution. There is also the question of whether bias-correction or other proposed methods really can overcome the resolution problem. These issues will be discussed.