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The sting jet that roared – a remarkable windstorm crosses Scotland

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On 3rd January 2012 a small but remarkably vicious cyclonic windstorm left a swathe of damage about 50km wide as it moved east across the most densely populated parts of central Scotland. Eyewitness reports referred to a roaring sound being heard a little while before the damaging gusts arrived. Preliminary estimates of maximum gust return periods suggest values of around 20 years. The cause of these damaging gusts is believed to be the "sting jet" - a very rare, transient, descending, pulsing, stream of air that can emanate from the tip portion of the cloud head of a rapidly deepening cyclone.

This presentation will first provide an overview of the synoptic setting and evolution surrounding the storm, and will then focus on mesoscale structure, using model and imagery products, and 1-minute resolution gust observations. Rapid scan imagery, together with the surface data, reveals the location of the sting jet, and also suggests that evaporation was playing a role in its formation, consistent with the mechanism hypothesised by previous authors. Output from high resolution operational models, run at the Met Office at 1.5km and 4km resolution, will be illustrated. These runs seem to depict the sting jet phenomena very well, showing it as a smaller, more intense and much shorter-lived feature than the cold conveyor belt flow that replaced it as the cyclone approached maturity on arriving over the North Sea. However the cyclone, and thus the sting jet, were also misplaced slightly in the model forecasts, into areas with low population density. Such predictability issues mean that the sting jet presents a major challenge for both the forecaster and for the response community; these issues will also be discussed.

Studies such as this can provide useful input into projects addressing the 'windstorm climate change' problem. The IMILAST project (Intercomparison of MId-LAtitude STorm diagnostics) falls into this category. Within this project storm tracking algorithms have been applied to ERA-Interim, a state-of-the-art re-analysis. It is noteworthy that the intrinsic resolution of this analysis, about 80km, is rather broader than the Scotland sting jet discussed above. An additional, and perhaps related problem is that the pressure pattern around some intense cyclones is not well represented within this re-analysis. Using examples some of these problems will be illustrated and discussed, along with some suggestions for how they might be addressed in both the short and long term.