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Synoptic versus orographic control on stationary convective banding

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When stationary convective bands are associated with high rain rates they can cause significant damage if they form over a region prone to flash flooding. A stationary convective band, approximately 100km in length and 10-20km wide, formed over the UK in August 2011. The band's location was closely related to the terrain and it remained stationary for 3-4 hours despite other nearby cells propogating with the mean wind. In this period the band produced radar-derived rainfall accumulations of over 32 mm, whilst nearby areas received little or no rainfall.

To determine the mechanisms leading to the formation of this band and to assess how predictable such a band is we use a nested ensemble of the Met Office Unified Model. The finest scale nested model has 1.5km grid spacing. As expected, not all members produce bands; however, a number of ensemble members do produce banded precipitation features to study.

An ensemble sensitivity analysis tool is used to determine the required ingredients that lead to the heavy, persistent rain. This allows us to establish the importance of both synoptic scale flow and mesoscale features. We find that the precise details of the large-scale pressure pattern are important in controlling the wind upstream of the band and its flow around the terrain. Additionally the local temperature and humidity are important in governing where the convection is and is not initiated. Despite the predictable changes to the flow as it encounters terrain, the band itself is relatively unpredictable. The location and stationarity of the band are critically dependent on the upstream flow conditions such that subtle changes in either the synoptic or mesoscale pattern disrupt the stationary band.