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The DIAMET campaign

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DIAMET (DIAbatic influences on Mesoscale structures in ExTratropical storms) is a joint project between the UK academic community and the Met Office. Its focus is on understanding and predicting mesoscale structures in synoptic-scale storms, and in particular on the role of diabatic processes in generating and maintaining them. Such structures include fronts, rain bands, secondary cyclones, sting jets etc, and are important because much of the extreme weather we experience (e.g. strong winds, heavy rain) comes from such regions. The project conducted two field campaigns in the autumn of 2011, from September 14 – 30 and November 24 – December 14, based around the FAAM BAe146 aircraft with support from ground-based radar and radiosonde measurements. Detailed modelling, mainly using the Met Office Unified model, supported the planning and interpretation of these campaigns. This presentation will give a brief overview of the campaigns.

Both in September and November-December the weather regime was westerly, with a strong jet stream directed across the Atlantic. Three IOPs were conducted in September, to observe a convective band ahead of an upper-level trough, waves on a long trailing cold front, and a warm conveyor belt associated with a secondary cyclone. In November-December six IOPs were conducted, to observe frontal passages and high winds. This period was notable for a number of very strong windstorms passing across the north of the UK, and gave us an opportunity to examine bent-back warm fronts in the southern quadrant of these storms where the strongest winds are found.

The case studies fell into two basic patterns. In the majority of cases, dropsonde legs at high level were used to obtain a cross-section of winds and thermodynamic structure (e.g. across a front), followed by in situ legs at lower levels (generally where the temperature was between 0 and -10°) to examine microphysical processes, especially ice multiplication and the extent of supercooled water droplets. The remaining cases were low-level flights to measure sensible and latent heat fluxes from the ocean surface in high wind conditions.

Two cases will be briefly described. The first, in September, observed a band of showers which passed over Ireland ahead of an upper-level trough and intensified over time. The second case concerns the passage of a cold front across the UK in late November, which saw the front sharpen considerably as it approached land. Microphysical measurements in this case were enhanced by observations from the Chilbolton S-band radar as the front passed by. The scientific questions in these cases are of a similar kind: why did the features intensify and what role did the release of latent heat have on the overall structure of the storms?