The revival of the Royal Meteorological Society (RMetS) North-West Local Centre got off to a cracking start on 31 October 2006 with an evening consisting of three talks on different aspects of thunderstorms. An audience of 65 people, some of whom travelled from as far as Doncaster, Warton, Leeds and Buxton, filled the seminar room of the Tyndall Centre at the University of Manchester. After some welcoming words by committee members *Andrew Russell* and *Emily Norton*, the meeting started with a bang!

The first speaker, *Prof. Keith Browning* (University of Reading), discussed convective initiation and showed results from a recent field campaign. Various mechanisms of convective initiation were presented. The Convective Storm Initiation Project (CSIP) was centred around the Chilbolton Radar Facility in Hampshire and took place in the summer of 2005. Prof. Browning first showed how, as the convective boundary layer heats up during a summer's day, an inversion or 'lid' often prevents the convection from ascending any further. Two important concepts were introduced: Convective Available Potential Energy (CAPE), which is the measure of energy available for release if deep convection takes place, and Convective Inhibition (CIN), which is the energy that is required to overcome the inversion. Deep convection can then take place when this occurs. Examples from CSIP of the primary mechanisms of convective initiation were shown including lid penetration, lifting of the lid through orography and frontal upglide. A particularly interesting case was shown where orographically induced convection, identified by cloud streets over the CSIP area (Figure 1), eventually led to the initiation of the tornado that did much damage in Birmingham in July 2005. Furthermore, convective storms can themselves lead to initiation, known as secondary initiation – the mechanisms discussed here were gust fronts from thunderstorms and convection induced by gravity waves. The talk ended with a discussion of the ability of the Met Office's Unified Model (UM) to pick out the points of initiation. The new 1.5 km resolution UM shows significant improvements over the 12 km UM and implies that progress is being made towards the goal of predicting severe precipitation events such as the Boscastle flood of 2004. Data were still being analysed but the first results looked interesting and were well received.

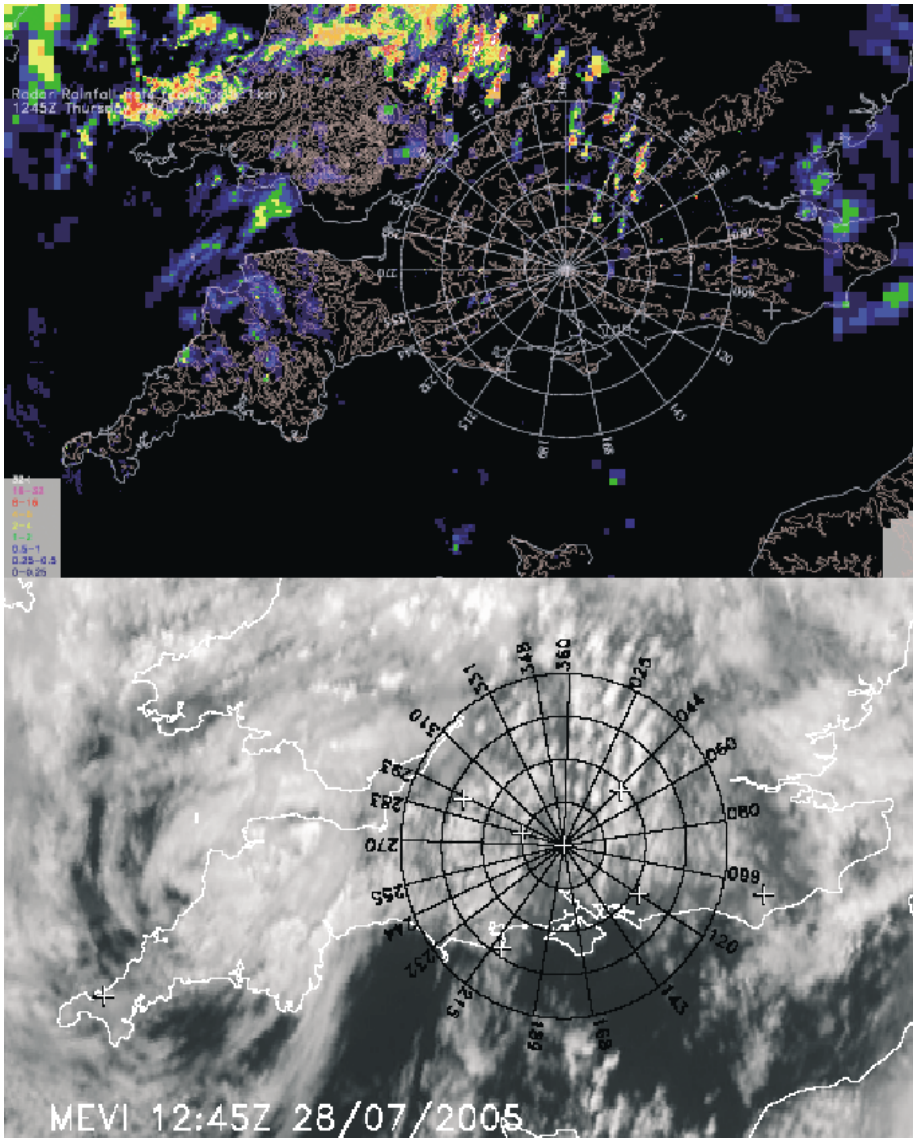

Figure 1. Network rainfall radar (top) and visible satellite image (bottom) from Meteosat 8 (© Eumetsat 2005) for 28 July 2005 1245 UTC.

In the second talk *Prof. Geraint Vaughan* (University of Manchester) discussed the more intense tropical convection that takes place over Northern Australia. He presented details of another recent field campaign called Aerosol and Chemical Transport in Tropical Convection (ACTIVE), which was based at Darwin between November 2005 and February 2006. The storm being examined is known as Hector (Figure 2) and is initiated on most summer days over the Tiwi Islands off the coast of Australia. The initiation mechanism responsible is a sea-breeze formation over the island group, leading to convergence and convection. These powerful storms can reach well into the lower stratosphere and thus transport tropospheric air into these upper levels. A fleet of scientific aircraft was flown during the campaign to measure gas and particle concentrations being transported and deposited in the middle and upper atmosphere. Traces of carbon monoxide (CO) and nitrogen monoxide (NO) were found in the stratosphere following a Hector event. CO is produced in the troposphere and NO is a product of lightning. NO is also of interest as it is a good generator of ozone. Work is still continuing and a lot of data analysis remains to be carried out but the personal and historic perspectives that Prof. Vaughan gave of this international meteorological campaign were fascinating.

The third speaker of the evening was *Dr Clive Saunders* (University of Manchester). He presented past and present theories on the production of lightning. The electrical

Figure 2. Photograph of Hector courtesy of Prof. Geraint Vaughan (University of Manchester).

potential difference between the ground and a point high in the atmosphere provides a measure of thunderstorm activity around the Earth. The presentation of this gave an interesting global view of what are usually considered to be relatively small-scale events. This steady state is caused by a balance of charge brought to the ground by lightning and a general seeping of charge through the atmosphere. It was shown how lightning was primarily negatively charged, but positive lightning could also occur. Measurements of charge were carried out by flying a plane through clouds with field detectors. It was found that the electrical charge within was complex, but generally the ice crystals caught in the updraught transported positive charge upwards and graupel transported negative charge downwards, forming a dipole within the thunderstorm. Sometimes the polarity in the thunderstorm switches, particularly in winter, leading to positive lightning. Research is still very active, especially in explaining the occurrence of sprites and blue jets (Figure 3) – these are electrical discharges that can be found in the stratosphere above the storms.

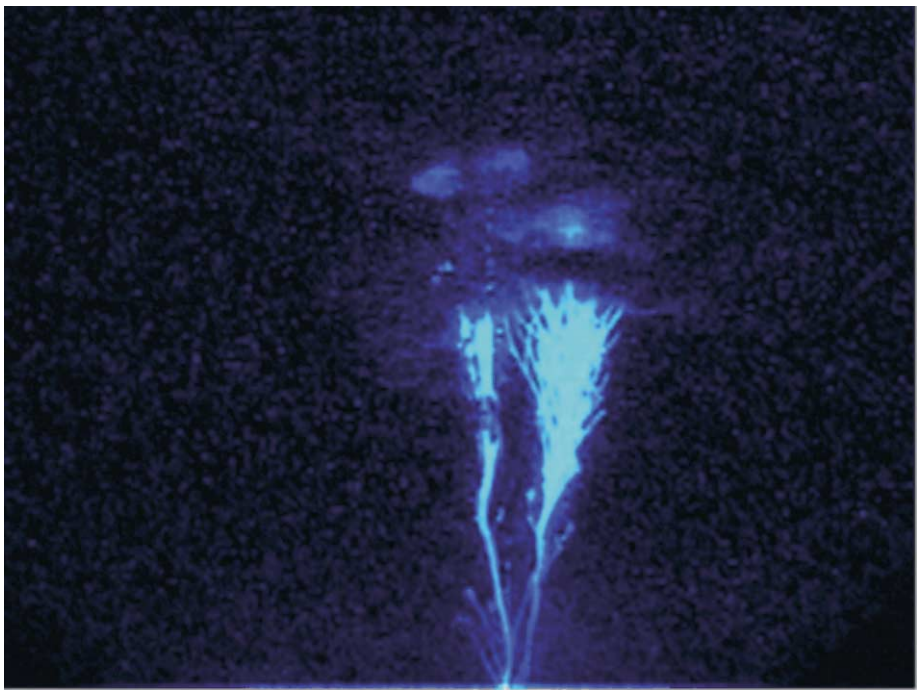

Figure 3. Image of a blue jet courtesy of Prof. Victor Pasko (Penn State University).

Whilst the quality of the talks was consistently first rate, the real success of the meeting was the effort shown by RMetS members, young and old, from across the region, in attending the meeting. However, we would still love to see more of our local members attending and, to entice them in, we have organized a schedule of exciting and informative meetings on important and interesting meteorological topics – the quality of the Thunderstorms meeting is hopefully a testament to this. For more information on forthcoming meetings and social events either see the local centre web-page – http://www.rmets.org/groups/centres/detail.php?ID=16 – or contact the current chairs of the committee – Andrew Russell (andrew.russell-2@manchester.ac.uk) and Emily Norton (emily.norton @manchester.ac.uk) – to be added to the north-west RMetS email mailing list. Alternatively, keep an eye out for updates on the *Weather* meetings insert.

Hugo Ricketts
Andrew Russell
Emily Norton

Correspondence to:
Centre for Atmospheric Sciences,
University of Manchester,
Sackville Street, M60 1QD.

doi: 10.1002/wea.31