Abstract for CEEDA conference (11 April 2017)

Polar lows and how background environment can influence their development

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Polar lows are usually characterized as small and short-lived maritime cyclones with near-surface winds exceeding 15 m/s. Even nowadays severe weather associated with polar lows makes them a serious hazard to ships, oil rigs and coastal communities in the high latitudes. The chronic lack of in situ observations at high latitudes makes it challenging to forecast these explosive weather phenomena accurately.

The first part of the talk briefly presents the evolution of a shear-line polar low, based on comprehensive observations obtained during a field campaign in the Norwegian Sea, in conjunction with satellite data and high-resolution model simulations performed with the UK Met Office's Unified Model. The model reproduced the polar low structure reasonably well, allowing us to apply it for further analysis of polar low dynamics.

The life cycle of each of polar lows is uniquely shaped by its environment. Our current research focuses on the sensitivity of this and similar shear-line polar lows to the upstream orography of Svalbard as well as sea ice cover in the region. Preliminary results show that air streams that spawn polar lows more often flow from the ice-covered area in the north-west, so sea ice tends to be more important than Svalbard mountains. To prove this we conduct a series of model runs with artificially changed land mask and sea ice cover.