



## **An unusual polar low development in the lee of Greenland**

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Modelling studies in recent years have demonstrated a large influence of Greenland's orography on synoptic-scale cyclone evolution in the North Atlantic. Operational NWP models often have difficulties in adequately capturing these evolutions, leading to significant errors in weather forecasts over Western Europe on 1-3 day time scales. To reduce these errors, an improved understanding is needed, via observational and modelling studies. We here present investigations of an unusual polar low development that took place west of Iceland on 11 January 2007, causing heavy snow showers and wind speeds exceeding 25 m / s in exposed locations. The operational models at the time captured rather well the formation of the low, but they disagreed in their predictions of the subsequent evolution and track of the polar low. Sensitivity studies using HIRLAM, in which the model's orography was modified, reveal that orographic forcing by Greenland has a huge impact on the strength and track of the polar low. In particular the high mountains over south-eastern Greenland seem to play a crucial role in forming the PV filament which is associated with the subsequent spin-up of the low. Without any mountains in Greenland, the surface pressure field is strongly altered, and a much weaker polar low is formed, despite the intense surface fluxes from the warm ocean to the cold air above. The weaker low quickly moves SE south of Iceland and dissipates, while in reality the low was quasi-stationary west of Iceland, suggesting phase-locking associated with the orographic forcing. When only a part of Greenland's orography is removed, the track and strength of the polar low change significantly, while other features of the simulation are intact. Results will also be shown from ongoing sensitivity studies investigating the sensitivity to modifications to the formulation of orography in the model parameterizations. The ultimate

purpose of these simulations is to improve future predictions of such events.