



The life-cycle of a Greenland lee cyclone observed by aircraft during GFDex

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The Greenland Flow Distortion Experiment (GFDex) carried out a 3-week field campaign in the area east of southern Greenland in February-March 2007, in order to study Greenland's influence on airflow, e.g., barrier winds, tip jets and meso-cyclones. We here describe the first results from an ongoing study of a lee cyclone event off SE Greenland on 1-5 March, combining aircraft observations and modelling. After a week of easterly winds through most of the troposphere, a cold air outbreak from the north, which swept across Greenland on 28 February - 1 March caused geostrophic winds to turn westerly, inducing a lee low off SE Greenland. This low was initially weak, but on 2 March it started to deepen due to coinciding low-level warm advection and upper-level cold advection. On 3 March a fully mature lee cyclone had emerged, causing strong winds and precipitation over much of Iceland. Aircraft observations on 2 March, which focused on the cold air outbreak between Greenland and Iceland, revealed a low-level jet with wind speeds well in excess of 30 m/s, and surface fluxes of several hundred Watts per square meter. The flights on 3 March mapped out the structure of the mature cyclone and its associated cloud systems. On 4-5 March another major cyclone development took place south of Iceland. According to model simulations the PV anomaly associated with the former lee cyclone played a large role in this secondary development. A preliminary interpretation of the above findings, combined with previous model studies, is that the favoured position of deep wintertime extratropical cyclones off Greenland's SE coast is linked to orographic forcing in westerly flow over southern Greenland. When an upper-level PV anomaly approached from the

northwest explosive deepening took place. This anomaly was then advected eastwards and then went on to spin up another cyclone south of Iceland.