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Evaluation and Improvement of Arctic Forecast: Data Assimilation of MOSAiC Expedition Data for SynopSys Project

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The accurate and precise weather information in polar region have proved to be essential for the global weather and climate research. However, even though we leave in the 'golden age' of earth observations, there is a lack of in-situ observation coverage in the polar regions. Additionally, the use of radiances measured from polar-orbiting satellites is of limited use due to the difficulties using those kind of data over ice and snow. The major research expedition in Arctic, MOSAiC (Multidisciplinary drifting Observatory of Arctic Climate), managed to shed light on polar conditions with the collection of a huge variety of highly resolved data.

The SynopSys Project (Synoptic events during MOSAiC and their Forecast Reliability in the Troposhere-Stratosphere System) is a collaboration of the German Weather Service (DWD) with the Alfred-Wegener Institute (AWI) and the University of Bremen. The project aims to combine the state-of-the-art weather observations from the MOSAiC Expedition together with remote sensing products and meteorological forecast in order to identify and study synoptic events in the Arctic.

The current work focuses on the evaluation and improvement of the weather forecasting capabilities of ICON-NWP model in Arctic. In this frame, the latest version of the global model ICON is employed to assimilate the different kind MOSAiC data – from synoptic station data to ascending and descending radiosondes. On the one hand, a series of sensitivity studies has taken place to evaluate the different observation systems and identify the ones with the highest influence on the arctic model forecast. The improvement of the weather forecast itself and the weather analysis because of the assimilation of the project data is studied on the other hand, as well as their influence on the weather forecast of the mid-latitudes. The experiment period covers March and April 2020, which is of high meteorological interest, due to the observed day-to-day variability – a cold period at the beginning of the month was followed by strong warm air intrusion, challenging the model forecast and analysis performance.

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