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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Field experiments on air-sea-ice interaction in the Arctic

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There is a strong demand for in situ measurements in Arctic regions, because, on the one hand, atmospheric data are rare in the Arctic, and, on the other hand, the Arctic is considered to play a key role concerning climate change, however, with high uncertainty of the models. Within this context, the Meteorological Institute of the University of Hamburg performed a series of in total eight field experiments in the Arctic between 2000 and 2010. An overview of these field experiments, the scientific aims, and results is presented. The presentation is also meant to announce to the scientific community the existence and availability of a comprehensive Arctic data set.

The experiments were conducted in the area of the ice-covered Arctic Ocean, in the marginal ice zone in the Fram Strait between Greenland and Spitsbergen, in the Norwegian Sea and Baltic Sea. Aircraft, ship, radiosondes, and drift buoys were applied in the field experiments each of which lasted a few weeks. Research aircraft was applied to assess the vertical and horizontal structure of the atmospheric boundary layer includung the turbulent and radiation fluxes, and thus, the atmospheric forcing on the underlying ice or sea surface. Aircraft missions (up to 10 during each experiment) were placed above an array of autonomously measuring ice and/or water buoys which monitored the ice drift and/or near-surface ocean current, respectively, and in addition near-surface meteorological information. Most field experiments were supported by one or two research vessels performing continuous meteorological measurements and radio soundings. Satellite-based remote sensing delivered information about conditions of clouds and ice.

The main aims were (a) to improve knowledge concerning the atmospheric features impacting the physical processes of air-sea-ice interaction, and (b) to validate operational weather prediction models, and to test and improve flux-parameterizations applied in the models.
Measurements were performed over closed and fractured ice including leads, in situations of off-ice and on-ice air flows, within organized convection (cloud rolls and cells), in cyclones, troughs, fronts, and during strong wind events. Results are presented which mainly focus on the impact of cyclones (including polar lows) and strong wind events on sea ice and/or the near-surface ocean.