P11 MPAS-DART ensemble data assimilation system in polar regions.

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In recent decades, there has been a steady increase in the length of skillful forecasts in global models. Much of the improvement can be attributed to the development of higher resolution models, improvements in data assimilation techniques, and advances in physical parametrization schemes. Despite the overall improvement in global forecast skill, skill in polar regions remains relatively low. One potential way to extend forecast skill is to identify specific features that may inhibit medium- to extended-range skill and better represent their associated processes in the Arctic region. Large analysis uncertainty derives in part to the lack of conventional observations that can be assimilated, placing more weight to derived products from satellite remote sensing observations over the Arctic. Additionally, atmospheric features are inherently smaller in the Arctic due to the Earth's rotation, which means higher resolution, more computationally expensive NWP model grids are needed to resolve features of equal geographic size in the midlatitudes.

This study focuses on the development of a new research tool called Model for Prediction Across Scales (MPAS) with ensemble Kalman Filter (EnKF) data assimilation from the Data Assimilation Research Testbed (DART). An overview of the MPAS-DART configuration and an initial evaluation of modeling system is presented. MPAS-DART assimilates roughly 350,000 observations ranging from radiosonde profiles to satellite derived temperature and moisture profiles. These observations serve as comparison data for evaluation of the modeling system with the goal of identifying further improvements that are needed to the system. Initial evaluation of MPAS-DART reveals systematic model biases in the Arctic, which are sensitive to moisture perturbations used to initialize the MPAS-DART ensemble. However, reduction of initialization sensitivities reveals bias originating in the model, particularly in the upper troposphere and lower stratosphere.