PREFACE

An October 2003 workshop on "short- to medium-range numerical weather prediction in the Arctic and Antarctic" took place at the International Arctic Research Center (IARC) at the University of Alaska Fairbanks (Tilley and Bromwich 2005). Workshop funding and logistical support was provided by IARC. The goals were to build on recent advances in numerical weather prediction (NWP) in high southern latitudes (e.g., Bromwich 2003) and on the successes of the Antarctic Mesoscale Prediction System (AMPS; Powers et al. 2003) that supports the extensive aircraft operations of the U.S. Antarctic Program. The emphasis was on Arctic NWP, although Antarctic applications were represented as well. The nine papers in this collection were either presented at the workshop or developed subsequently by attendees.

Serreze et al. and Bromwich and Wang examine the issue of how well the contemporary atmospheric circulation can be described, that is, implicitly how accurate initial conditions for NWP models could be. Serreze et al. evaluate the precipitation predictions from atmospheric reanalyses [40-yr European Centre for Medium-Range Weather Forecasts (ECMWF) Re-Analysis (ERA-40), 15-yr ERA (ERA-15), and National Centers for Environmental Prediction−National Center for Atmospheric Research (NCEP−NCAR)] primarily over Arctic land areas and show that they are superior to satellite-baesd observational estimates. Bromwich and Wang reexamine the tropospheric winds resolved by the same reanalyses from the periphery of the Arctic Ocean in relation to independent rawinsonde observations and conclude that they are realistic, contradicting an earlier study. It appears that global reanalyses have generally good skill in representing the contemporary atmospheric behavior in high northern latitudes.

Improved initial conditions for forecast models via data assimilation is tackled by Barker and Fan and Tilley. Barker discusses the Antarctic development of ensemble data assimilation in the context of AMPS. Fan and Tilley examine the assimilation of satellite cloud and humidity profile information from the the Moderate Resolution Imaging Spectroradiometer (MODIS) and demonstrate improved 6−12-h forecasts of precipitation frequency and amount for Alaska.

Better treatment of the lower boundary condition in atmospheric models is the topic of Hutchings et al. and Mölders. Hutchings et al. model the formation of linear fractures that are critical to describing the upward fluxes of sensible and latent heat from the ice-covered polar oceans. Mölders shows how the vegetation cover and soil characteristics govern the surface energy fluxes over Arctic land areas.

Forecast skill is the subject of contributions by Stuefer et al., Bromwich et al., and Adams. Stuefer et al. investigate the ability of the fifth-generation Pennsylvania State University−NCAR Mesoscale Model (MM5) to forecast aircraft condensation trails over Alaska and good skill is found for forecasts up to 36 h. Bromwich et al. evaluate the performance of 6−30-h forecasts by Polar MM5 (e.g., Cassano et al. 2001) over Iceland and find substantial skill in this strongly synoptically forced environment. A 10-yr composite of these short-term forecasts is exploited to explore the spatial and temporal variations of Iceland climate. Adams employs the Antarctic Limited Area Prediction System (ALAPS) to study strong southerly surface wind events at Casey Station in Antarctica. The skillful forecasts demonstrate that pronounced southerly geostrophic winds are required for the katabatic flow to cross the coast and propagate northward to Casey.

In general, steady progress is being made to improve high-latitude NWP. Many obstacles remain, including the accurate representation of key atmospheric pro-

cesses (e.g., the highly stable planetary boundary layer) and effective exploitation of the vast range and quantity of satellite remote sensing data (e.g., Key et al. 2003) to improve NWP initial conditions for these data-sparse regions. Only when these topics are satisfactorily addressed will polar forecast skill approach that in the midlatitudes.

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