Testing Polar WRF Over Sea Ice

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A polar-optimized version of the state-of-the-art Weather Research and Forecasting model (WRF) was recently developed by the Polar Meteorology Group of Ohio State University's Byrd Polar Research Center. Testing of "Polar WRF" began with simulations representing conditions over the large land-based ice sheets using Greenland as a test bed, and lead to optimizations for the Noah land surface model (LSM). This work was designed to coincide and support the WRF simulations at National Center for Atmospheric Research (NCAR) for the operational Antarctic Mesoscale Prediction System (AMPS) forecasts. More recent work has tested Polar WRF for ice-covered ocean surfaces. The detailed observations of the Surface Heat Budget of the Arctic Ocean (SHEBA) during 1997/98 provide an excellent opportunity to test Polar WRF for polar sea ice. For these simulations, the polar optimizations are added to WRF version 2.2 Furthermore, a new treatment for grid points containing both open water and sea ice is included in Polar WRF, similar to the fractional sea ice treatment included in Polar MM5. Additionally, Hugh Morrison's fully 2-moment microphysics scheme, now included in the just-released WRF version 3, is added as a physics option in Polar WRF based upon WRF version 2.2. As sea ice extent and surface conditions show large seasonal variations, simulations are performed for 3 months: (1) January 1998 representing winter conditions, (2) June 1998 representing early summer conditions, and (3) August 1998 representing late summer conditions. Sea ice albedo is specified as a function of time and latitude for June, and as a function of time August. The Polar WRF simulations show good agreement with SHEBA observations for all three months. Some differences between the simulations and observation arise from apparent errors in the synoptic forecasts and the representation of clouds. Nevertheless, the biases in the simulated fields appear to be small, and Polar WRF appears to be a good tool for studies of polar ocean meteorology.