P77 The climatological distribution of extreme Arctic winds, and implications for ocean and sea ice processes

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Some of the strongest near-surface winds on Earth form in the Arctic due to mesoscale processes such as polar lows and barrier jets. The strong surface winds in the arctic have important impacts on ocean and sea ice circulation. We examine the climatological distribution of over-ocean, near-surface wind speeds within a pan-Arctic domain in five gridded datasets: the ECMWF Interim reanalysis (ERA-I), the Climate Forecast System Reanalysis (CFSR), version 2 of the common ocean-ice reference experiment dataset (COREv2), and two regional climate simulations generated using the Weather, Research, and Forecast (WRF) model run at 50 km (WRF50) and 10 km (WRF10) horizontal resolutions with ERA Interim as lateral boundary conditions. To examine the influence of spatial resolution on near surface wind speeds, we estimate probability density functions of the four lower-resolution (i.e., ERA-I, CFSR, COREv2, and WRF50) dataset's 10m wind speed for an 18-year (1990-2007) period. We also show the annual cycle and long-term maps of the 90th, 95th, and 99th percentiles and maximum wind speeds. Despite having lateral boundary conditions from ERA-I, WRF50's wind statistics are more similar to CFSR, suggesting that the similar horizontal resolution of the two datasets is playing a strong role in determining wind statistics.

We then perform the same statistical analysis of winds on all five datasets for two years when 10km data are available (June 2005 to May 2007); despite the much shorter time period, the Pan-Arctic statistics are very similar to those from the 18-year analysis. WRF10 differs from WRF50 in only the most extreme percentiles, which are hypothesized to be near coastal Greenland during strong downslope wind events. We repeat the wind speed statistical analysis within a subdomain surrounding Greenland and find that WRF10 has consistently larger maximum wind speeds, but this difference only appears at wind speed percentiles higher than 99 percent, and further differences in the 99th percentile wind speeds are spatially heterogeneous.

To tie these results to their implications for ocean and sea ice processes, we perform a similar analysis on surface fluxes within the Greenland subdomain using the WRF50 and WRF10 datasets. We find unrealistically large sensible heat fluxes along the sea ice edge, and the geographic distribution and magnitude of these fluxes is shown to be sensitive to sea ice representation in WRF. The results from these atmospheric-only WRF simulations will be useful for estimating the sensitivity of coupled models to atmospheric resolution.