

A Preliminary Assessment of the Predictability of Winter Storm Tracks and Related Precipitation in North America in the NCEP Climate Forecast System

The week 2-4 outlook of Northern Hemisphere (NH) winter storm tracks and storm-related precipitation in North America for 1983-2010 is evaluated for the purpose of advancing subseasonal-to-seasonal weather prediction. The storm tracks are described by isentropic potential vorticity (PV) maxima within a Lagrangian framework using NCEP Climate Forecast System Reanalysis and Reforecast (CFSRR) data. Reforecasts, or retrospective forecasts, are historical predictions of past events used to calibrate operational forecast models. The reforecast storm track densities (i.e., number of tracks per unit area) correspond well with those from the reanalysis; however, the reforecast mean PV intensity exhibits a large overestimation in the mid-latitude storm track regions. It is found that the removal of this intensity bias improves general features of the storm tracks in the reforecasts, including representation of the cyclogenesis and cyclolysis regions over eastern North America as well as in the eastern North Pacific and western North Atlantic Oceans.

A similar evaluation is performed for the reforecast storm-related precipitation. Corresponding with the storm track PV intensity bias, a large overestimation in the storm precipitation intensity is also found. The removal of the precipitation bias reduces the error in the estimation of storm-related precipitation over the North Atlantic and the western and central North Pacific Oceans for the week 2-4 lead times. Still, overestimations in the bias-corrected reforecast mean PV intensity and precipitation remain in regions where the standard deviations are highest, i.e., in the lower latitudes toward the eastern North Pacific Ocean and over the Gulf of Mexico and the southeastern United States.

These findings set the basis for the potential use of storm track statistics to improve winter week 2-4 outlooks. For applications in real time, a similar approach is being followed to determine the new statistics and model biases with the extended reanalysis and forecasts of the operational Climate Forecast System version 2 (CFSv2) model. The need for recalculation is due to changes brought in effect to the operational CFS model.