ABSTRACT

THESIS: An Evaluation of the Storm Prediction Center Day One Probabilistic Convection Outlook Using Diagnostic Parameters

STUDENT: Guy Flynt

DEGREE: Master of Science in Geography

COLLEGE: Science and Humanities

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The Storm Prediction Center issues daily probabilistic convective outlooks forecasting the intensity and probability of severe weather hazards (tornadoes, hail, and wind). There is limited literature on wind and hailstorm environments, and the probabilistic convective outlooks environmental characteristics. To address these gaps, this research paper verifies the Storm Prediction Centers Day One 1200 UTC probabilistic outlook from March 26, 2008, through the year 2019. Bias and the Heidke skill score were used to evaluate the forecasts that had at least 10 observed reports to create three categories: overforecast, good skill, and poor skill. The archived surface object analysis from the Storm Prediction Center was used to collect parameter data of the max value within an 11.1 by 11.1 km box centered on the first report of day for each hazard's category to nearest hour to create a climatological dataset.

Analyzing verification statistics in the nearly 12-year period found there was a change in forecast ideology when marginal and enhanced risk were introduced in late 2014. The number of skillful forecasts for both wind and hail nearly doubled from 2014–2019, and in the same period there was a drastic drop in forecasts with an overforecast bias for both hail and wind. The mixed-layer lifting condensation level was the only tornado parameter skillful in differentiating the

mean between tornado overforecast and good skill. Skillful tornado forecasts were associated with higher heights accompanied by low mixed-layer convective inhibition and high effective significant tornado parameter values. Skillful hail forecasts were characterized by drier environments (low precipitable water amounts), moderate convective available potential energy, strong deep-layer shear, and moderate significant severe parameter values. Skillful wind forecasts environments were portrayed by high derecho composite parameter values, high probability of a mesoscale complex system parameter values, and strong wind shear between 0-1 km.