COMMENTS ON "STATISTICAL GUIDANCE METHODS FOR PREDICTING SNOWFALL ACCUMULATION IN THE NORTHEAST UNITED STATES" BY McCANDLESS ET AL. (2012)

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Abstract

McCandless et al. (2012) examine eight statistical methods for predicting the snowfall accumulation from the output of the Global Ensemble Forecast System. Some of these results have been previously tested by others, but were not discussed within their article. These comments demonstrate the importance of a thorough literature synthesis that accurately reflects the content of the paper.

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McCandless et al. (2012) test eight different statistical methods for forecasting snowfall amount from the output of the Global Ensemble Forecast System. They discuss ensemble methods and statistical postprocessing techniques, in general and with specific examples, yet, they do not cite much of the previous work that has been done on predicting snow density and snowfall accumulation with statistical approaches. Indeed, they only cite one conference preprint on statistical methods of snowfall prediction (Cosgrove and Sfanos 2004). The purpose of these comments is to point out the breadth and depth of previously published research on this topic.

Roebber et al. (2003) provide an overview of the snowfall-forecasting problem, raising awareness about the snow-to-liquid ratio (hereafter, snow ratio) as a possible source of error in forecasts. They also employ an ensemble of ten artificial neural networks to predict snow ratio within one of three categories (light, average, or heavy). This artificial neural network is now implemented operationally (http://sanders.math.uwm.edu/cgi-bin-snowratio/sr_intro.pl; Roebber et al. 2007).

Roebber et al. (2003) and Ware et al. (2006) identified the inverse relationship between snow ratio and liquid equivalent. Roebber et al. (2007) showed that errors in the prediction of liquid water from numerical models in the ensemble of artificial neural networks were partially offset by the compression effect, so that the predicted snow accumulation error was less than it could have been. McCandless et al. (2012) did not discuss whether they found a similar offset in their dataset.

McCandless et al. (2012) obtain their snow data from the network of cooperative observers, but Baxter et al. (2005, 2006) discuss the quality of data from the network, using the resulting quality-controlled data to calculate the ratio of snow to liquid water from climatological observer data. Other uncited studies that examine the climatology of snow density include Huntington (2005) and Steenburgh and Alcott (2008).

Various forms of linear regression have been employed in the past for snow-density forecasting. For example, Wetzel et al. (2004) show a negative correlation between snow density and air temperature that explains 52% of the variance. Also, logistic regression is used to predict the snow ratio from numerical model output in Byun et al. (2008). Finally, step-wise multiple linear regression is used to predict the snow ratio from a dataset of high-quality daily snowfall measurements at Alta, Utah, in Alcott and Steenburgh (2010).

To conclude, McCandless et al. (2012) apply eight statistical methods to calculate the predicted snow depth. Artificial neural networks and linear regression are two of the methods used. Yet, previous papers studying these methods to make predictions of snow density or snow accumulation are not presented, nor is there a general discussion of the snow density forecasting problem or climatology. We believe that the authors failed in a basic aspect of scientific scholarship: demonstrating who has done similar work, learning from it, and incorporating it into their own research (e.g., Schultz 2009, pp. 39 and 143–144).

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