# Modeling North Dakota's Thunderstorms

By Mark D. Schneider

The North Dakota Cloud Modification Project (NDCMP) relies on accurate weather forecasts to predict where thunderstorms will develop, when they will develop, and how strong and widespread they may be. This isn't an easy task for the North Dakota Atmospheric Resource Board's (NDARB) forecast team each summer. Fortunately, new weather models are constantly being developed and improved and the University of North Dakota (UND) has been instrumental in working with the NDARB to meet these forecasting challenges.

Sounding like something from the Star Trek series, UND began providing a Weather Research and Forecasting, or WRF Model during the summer of 2012. To date, these ongoing agreements between the NDARB and UND include support for an undergraduate research assistant to provide real-time forecast support and produce a statistical assessment of forecast skill. UND Professor Dr. Gretchen Mullendore oversees the development of the WRF model for use in North Dakota. Dr. Mullendore commented that, "Partnering with NDARB on the North Dakota Cloud Modification Project has been very valuable for UND. We get frequent feedback from NDCMP forecasters about model performance in North Dakota. Having strong communication between researchers and operational forecasters is needed to make WRF a better model."

A multitude of computer processors, called clusters, are needed to make all the weather data computations from the UND WRF. Imagine hooking several computers together so that they could work on the same job. This is a similar design to the "supercomputers" you hear about that can accomplish tasks such as world climate modelling. There are four forecasts run each day for the NDCMP and each forecast requires at least 93 billion calculations! That's more than 370 billion calculations per day that UND provides to help accurately forecast thunderstorms in western North Dakota between June and August.
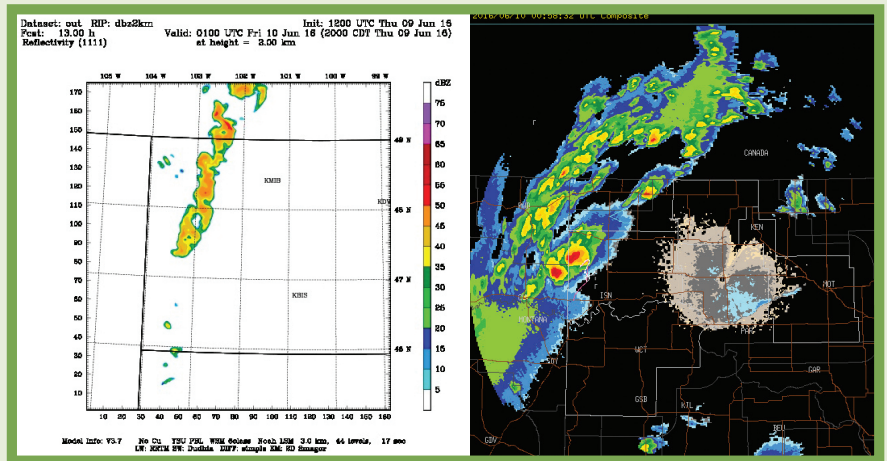
One of the more popular products that the UND WRF and other weather models produce is called simulated reflectivity. The models try to predict what the thunderstorms will look like on a weather radar display during their lifecycles. An easy way to verify whether a model performed well is simply to compare the time, intensity, and areal coverage it predicted to the actual radar images. The above images show a comparison from the 2016 season of the NDCMP where the image on the left is what the model predicted and the image on the right is what actually appeared on the radar display. Both images show a southwest to northeast oriented line of thunderstorms in the northwest corner of North Dakota.

NDCMP radar meteorologists conduct around-the-clock weather watch to track thunderstorms for potential hail suppression and rain enhancement operations. Effective cloud seeding requires that aircraft be alerted, launched, and on-station as the new cumulus clouds are towering to become mature thunderstorms. With the aid of UND's WRF model, seeding opportunities are more easily predicted, leading to more successful NDCMP seasons.