

# **Simulating the 12 February 2020 North Dakota Blizzard: An Application of a Blowing Snow Algorithm Coupled with the Polar Weather Research and Forecasting Model**

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On 12 February 2020, a severe ground blizzard impacted North Dakota, driven by a strong Arctic cold front that swept southward through the eastern Dakotas and western Minnesota. This event brought frontal snow, strong winds, and sub-zero temperatures, leading to significant blowing snow (BLSN) conditions in the Red River Valley and causing widespread disruption. This research provides a detailed analysis of the meteorological phenomena on 12 February, with a focus on BLSN dynamics. We employed a BLSN algorithm based on the PIEKTUK-D model, coupled with the PWRF model. Simulations were conducted using lateral boundary conditions from the 0.25° Global Forecast System analysis data. We evaluated basic meteorological parameters, such as temperature, wind, and relative humidity, alongside specialized parameters like snow depth. Analysis revealed that the BLSN transport rate and number concentration from the simulations showed strong agreement with observations from the GOES-16. The most significant impact of incorporating the BLSN algorithm in PWRF is observed in the vertical distribution of relative humidity. A notable outcome of this research is the successful implementation of the BLSN code to calculate visibility, which can prove to be particularly useful during blizzard conditions.