

THE ATMOSPHERIC RESERVOIR

Examining the Atmosphere and Atmospheric Resource Management

"Radar Artifacts"

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Human artifacts from our rich cultural history are discovered routinely in North Dakota, unearthed from countless locations all across our state. Weather radar produces its own artifacts, which are sometimes "buried" or hidden within the images we observe. While all human artifacts have some value, radar artifacts usually don't, and they can make the proper interpretation of radar data challenging.

A radar sends out pulses of electromagnetic energy and then "listens" for its return after it has been scattered and sent back towards the radar. Sometimes this return energy is scattered by non-precipitation objects such as mountains, buildings, birds and insects. Other sources of energy can also be mistaken by the radar and misinterpreted by an inexperienced user. In Figure 1, the Bowman Radar in southwest North Dakota is

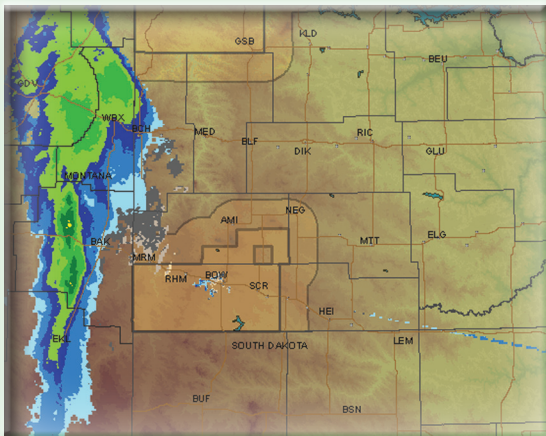


Fig 1. North Dakota Atmospheric Resource Board's Bowman Radar

detecting both real precipitation (along the Montana/North Dakota border) and a radar artifact known as a sun spike (extending out from the radar to the right-edge of the image). At sunrise or sunset, most radars briefly become aligned with the sun and its electromagnetic energy. The result is a "spike" signature on the radars' display that extends along a radial to the sun's position in the sky. The radar, not "knowing" it is the sun, displays the energy return as if it is precipitation.

Ground clutter, or objects such as buildings, wind turbines, and hills that block the path of a radar's beam, is often displayed as high reflectivity and can be mistaken for real precipitation. Since 2009, 80 wind turbines located between Minot and Max, North Dakota have shown up on the display of the WSR-88D Doppler weather radar in Deering. Figure 2 shows the high reflectivities associated with the wind farm (magenta circle) and actual precipitation to the north and east of the radar site. When radar images are looped, it becomes very obvious that these wind turbines, in addition to other forms of ground clutter, aren't actual precipitation targets.

What makes wind turbines unique from other forms of ground clutter is that they are

in motion and show up on radar velocity fields. Occasionally, wind farms are mistaken for low-level rotation, the type that occurs in thunderstorms that produce severe weather and tornadoes.

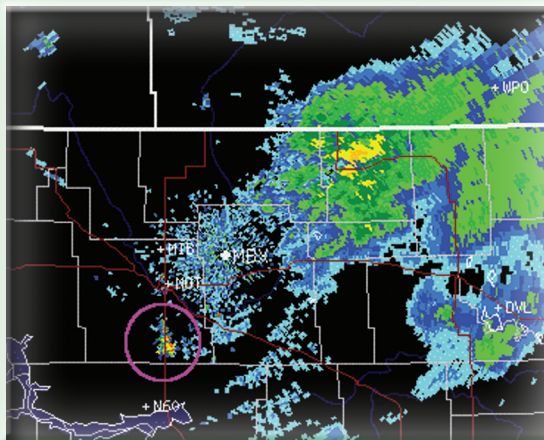


Fig 2. Department of Defense WSR-88D Doppler weather radar (Deering, ND).

Meteorologists are continually improving radar software programs to filter out artifacts such as ground clutter. Many have been dealt with successfully, while others, such as wind farms, pose a much greater challenge. Even in the age of ever more powerful computers, there is still no complete substitute for human interpretation.

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