A33A-06 - The Horus All-Digital Phased Array Weather Radar – System Overview and First Results

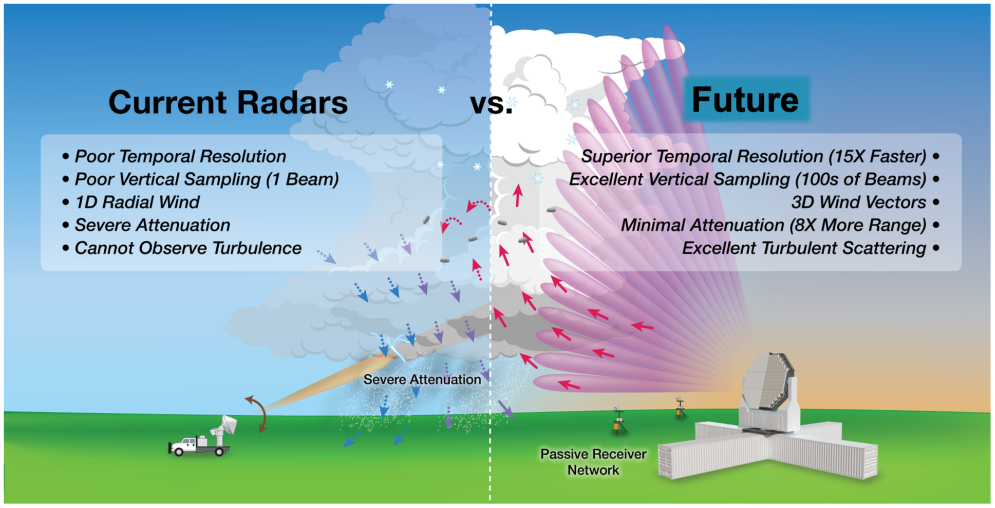
Wednesday, 14 December 2022

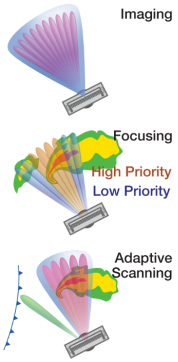
11:50 - 12:00

McCormick Place - E258 (Lakeside, Level 2)

Abstract

Temporal and spatial sampling of mechanically scanning weather radars is insufficient to capture the four-dimensional characteristics of atmospheric dynamics and microphysics. These systems are inherently limited by the need to continuously reposition a large/heavy dish antenna to provide coverage over a volume to monitor evolving processes with acceptable data quality. Therefore, both temporal and spatial (especially vertical) sampling is severely limited. This limited sampling of dish-based radars hampers the study of rapidly evolving and spatially inhomogeneous phenomena, such as severe thunderstorms, microphysical processes, microbursts, and the vertical structure of precipitating systems. The scientific and operational communities have shown consistent interest in rapid-scanning polarimetric radars, with phased array radar technology being the prime candidate. To meet the desired update times and polarimetric quality, it is expected that a highly reconfigurable fully digital phased array architecture will be necessary. The Advanced Radar Research Center (ARRC) at the University of Oklahoma (OU) is working with NOAA's National Severe Storms Laboratory (NSSL) on the development of a digital-at-every-element, S-band, dual-polarization phased array radar. With an aperture of approximately 1.63 m x 1.63 m, the mobile "Horus" radar has 1024 (32x32) dual-pol channels and is extremely flexible in terms array segmentation, channel-independent waveforms, adaptive beamforming, etc. Potential advantages of a digital phased array radar over conventional dish-based radars are illustrated in the figure, along with some possible advanced scanning techniques, which directly address current observational limitations. Given the importance of radar polarimetry to the weather community, arguably its most-important feature will be the capability of performing periodic, real-time array-level and polarimetric calibration as a routine part of the Horus scanning strategy. Encouraging initial field measurements occurred in the fall 2022. A system overview of the Horus radar will be discussed along with these initial weather observations and plans for future larger-scale systems exploiting the scalable design of Horus.





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