The PX-10k: A polarimetric X-band transportable radar for rapid-scan weather observations

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A new polarimetric X-band transportable radar, called the PX-10k, was recently developed at the ARRC (Advanced Radar Research Center) of the University of Oklahoma (OU), through a partnership with Nanowave Technologies. Since the development the PX-1000 a decade ago, we have accumulated numerous field experience, which led to a simpler and highly integrated system design. The PX-10k is a transportable system with a built-in power generator and auxiliary fuel tanks that allows for continuous operation without grid power for weeks. This makes the system deployable to remote locations where power may not be readily accessible. The radar system features a 1.4-degree dual-pol reflector antenna, two 800-W solid-state RF transceivers (independent up-down conversion chains), two direct-drive motors as the positioner, and a digital transceiver with arbitrary waveform generator. With a self-contained direct-drive design, the radar needs no gear replacements or routine grease maintenance, which promises less down time and longer lifespan. The system operates on software based on an open-source framework RadarKit, which has been used for the other ARRC radar systems, i.e., the PX-1000 and RaXPol. As such, all waveform capabilities, antenna positioning, and signal processing methods available to these systems are also available to the PX-10k.

The system began its operation in the spring of 2019. A field experiment, along with the PX-1000 and the EAGLE radar (in another presentation), is currently being conducted in Norman, Oklahoma to evaluate the system performance and gather datasets for meteorological analyses. With the 800-W transmitters and a more focused beam (compared to the PX-1000), we expect signal extinction to be less likely, even during events with a squall line or hail core. We hope to assess this potential through the datasets collected during the field campaign. The PX-10k system is also capable of rapid scanning, up to 360 degrees per second, which is important for observing fast evolving weather phenomena. Such rapid-scan data will be used to document the evolution of severe thunderstorms, including the formation of tornadoes, damaging winds, and large hail. During the presentation, a system overview, initial datasets from the field campaign, and data comparisons to other systems will be presented.

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