18–22 September 2017, Pula, Croatia
ECSS2017-66

The TWIRL (Tornado Winds from In-situ and Radars at Low-level) Project: Part 1: Project Overview and Combined Radar-in situ-damage analyses

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TWIRL has collected integrated rapid-scan multi-Doppler and in situ data in tornadoes during the spring of 2016. Three DOW radars, including the newly upgraded Rapid-Scan DOW, three Mobile Mesonets, and 15 rapidly deployable Tornado Pods have been deployed inside and around tornadoes. DOW6 and DOW7 have gating resolution of 12.5 m, and the Rapid-Scan DOW has resolution of 11.2 m. The Rapid-Scan DOW has 0.8x-0.9 degree beam width and 7 second volumetric resolution, permitting matched fine-scale 4D resolution of small and quickly evolving sub-tornadic features. Preliminary results from combined DOW radar, in situ 1-meter Tornado Pod, and damage data will be presented.

On 09 May 2016, a DOW, from <2 km range, observed a tornado near Sulphur, OK. A tornado pod was deployed in the path just north of the core flow region – well within the subsequent damage swath – and measured peak winds of about 45 m/s. Combined DOW-damage analyses indicated that the strongest winds and greatest damage occurred in association with multiple vortices.

On 24 May 2016, several tornadoes occurred near Dodge City, KS. The storm had a complex evolution – including an anticyclonic vortex of tornadic (delta-V > 40 m/s) intensity – before becoming a multi-vortex mesocyclone (MVMC). Peak Doppler winds during these tornadoes exceeded 80 m/s. Two Pods were deployed in the core regions of one of the tornadoes with contemporaneous DOW data at 40 m AGL.

Observations from both events indicated that the 1-meter AGL wind speeds were ∼60%-70% of the DOW-measured winds at 20-30 m AGL.

The wind-height-damage relationship as a function of tornado structure will be discussed on the context of these and past DOW-in situ observations. Additionally, new data obtained during the 2017 TWIRL project with be incorporated and presented.

This is part 1 of a two-part talk. Wurman will present the companion talk.