# Recent progresses in dealiasing Doppler velocities collected by new scan modes with small Nyquist velocities to increase clear-air data coverage for wind analysis

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By using long pulses with extended dwelling time, the radar measurement capability can be enhanced to detect weak echoes in the absence of precipitation. Such an enhanced capability can not only increase clear-air data coverage beneficial to radar wind data assimilation but also provide useful information for detecting the lower-level wind convergence conducive for convective initiation in a pre-storm environment. To explore this potential capability and related benefits, the existing operational clear-air scan mode is modified into a new scan mode by using long pulses and low antenna rotation rate but with the Nyquist velocity reduced to nearly 12 m/s. Doppler velocities collected by using this new scan mode are significantly enhanced in clear-air data coverage but often severely aliased (due to the reduced Nyquist velocity) and thus very difficult to dealias. To overcome the difficulties in dealiasing, progresses are made recently in two following aspects. (i) The new scan is paired with an unmodified scan into an dual-PRF scan mode, so the velocities from the unmodified scan can provide the first-guess field for the reference check applied to raw aliased velocities from the new scan. (ii) The previously developed alias-robust variational method for analyzing severely aliased radar velocity observations with small Nyquist velocities is further developed adaptively, so the first-guess field provided by the velocities from the unmodified scan can be extended recursively to range circles beyond those covered by the unmodified scan (to large range circles covered by the new scan).

Keywords: velocity dealiasing, small Nyquist velocities, long-pulse and low antenna rate, increase clear-air data coverage