SCAN OPTIMIZATION FOR DUAL DOPPLER RETRIEVAL IN COLLABORATIVE RADAR NETWORKS

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The NSF engineering research center for Collaborative and Adaptive Sensing of the Atmosphere (CASA) is founded to develop a novel weather sensing paradigm, known as Distributed Collaborative Adaptive Sensing (DCAS), using a dense network of low-cost radars. Radars are traditionally operated in the 'site-and-spin' mode in a weather surveillance network according to a set of predefined coverage patterns. Storms can exhibit widely varying characteristics and evolve very fast and a static scan pattern is not able to guarantee the optimal sampling for all storm scenarios. In the DCAS paradigm, a dense radar network will be operated in the 'close-loop' mode in which multiple radar nodes can be rapidly reconfigured in response to changing storm variability. This will improve our ability to observe and monitor weather hazards but also pose a new challenge in data analysis. Radar observations need to be processed in real time to detect the features of interest and live scanning rules need to be optimized to drive the DCAS system. CASA has developed a networked weather radar test-bed to monitor and respond to severe thunderstorms and severe wind. For acquisition of wind velocity, pairs or triplets of radar need to be considered as units and the perspective angles are of primary concern, besides the constraint in range. Multiple candidate pairs exist for most of the test-bed coverage and choice has to be made in scan strategy. In addition, the whole network is required to update the observations within a finite time period. This further limits the number of sweeps depending on the sector width to be scanned. All these constraints are consolidated together in generating dual-Doppler scans, including the best pair to execute the task, the specification of target sector, and the tilt angles of PPI sweeps. In this paper, the method to generate dual Doppler scan strategy is presented. The method is tested in field experiments for scan evaluation and the results are presented.