Distributed Collaborative Adaptive Radar Network: The CASA IP-1 Network and relevance to the Mediterranean region.

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Current weather radar observation networks are based upon conventional sensing paradigm of widely-separated, standalone radar systems. These radar systems, such as the WSR-88D Next Generation Doppler Radar (NEXRAD) system in the USA, sample the atmosphere in “sit-and-spin” mode over the same regions according to predefined volume coverage patterns (VCP). NEXRAD radars are neither adaptive nor collaborative by design and suffer from ‘earth curvature problem’ – namely, the inability to see low at far off distances from the radar.

The Center for Collaborative Adaptive Sensing of the Atmosphere (CASA) is founded on the transforming paradigm of Distributed Collaborative Adaptive Sensing (DCAS) networks designed to overcome these fundamental scientific, technological, and organizational limitations of current approaches to observing, understanding, predicting, and responding to atmospheric hazards. CASA paradigm of short range radar networks provide observations at better resolution compared to the state of the art while at the same time mitigating the Earth curvature problem of long range radars. The CASA enterprise designs, develops, and deploys system-level test beds to integrate underlying scientific and technical breakthroughs and demonstrate the potential to observe, understand, predict and respond to hazardous atmospheric phenomena – with end users involved from the outset. The IP-1 test bed is the first one of such test beds that was completed in 2006, designed for adaptively sampling severe convective storms.

The IP1 radar network consists of four radar nodes and a cluster of computers known as System Operation and Control Center (SOCC) for processing and disseminating data in real-time to a pilot group of National Weather Service forecasters and emergency managers with jurisdictional authority in the IP1 network; and Meteorological Command and Control (MC&C) algorithms that determine the optimal scanning strategy for the radar network based on user needs for data. The radar nodes are installed in Southwest Oklahoma, and are under the coverage of the KFDR and KTLX WSR-88D radar units. The four radar nodes are located in or near the towns of Chickasha, Rush

Springs, Cyril and Lawton, OK, and each radar node is approximately 30 km apart with overlapping coverage. Redundant radio links provide Internet connectivity to the radar node sites with a maximum guaranteed bandwidth of 4 MBps.

The IP-1 network of radars operate at X band and make measurements close to the ground. This poses whole set of technical challenges to clutter suppression, range/velocity ambiguity mitigation and attenuation correction. The CASA solution to all these problems is discussed.

This paper presents some of the early examples of the implementation of the observations from CASA radar network, using data collected over the Spring experiment period. In addition, observations from the CASA spring experiment are used to highlight the need and relevance of this concept for the Mediterranean flood monitoring.