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Development of the Phased Array Radar for Meteorological Application

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A new phased array radar system for meteorological application has been developed by Toshiba Corporation and Osaka University under the grant of NICT. It is now well known that the rapidly evolving severe weather phenomena (e.g., microbursts, severe thunderstorms, tornadoes) is a threat to our lives particularly in densely populated area and the number of the phenomena tends to increase as the result of the global warming. Over the past decade, mechanically rotating radar systems at C-band or S-band have been proved to be effective for weather surveillance especially in wide area more than 100 km in range. However, the rapidly evolving weather phenomena has the temporal and spatial scales comparable to the resolution limit (-10 min. and -500m) of the S-band or C-band radar systems, and cannot be fully resolved with these radar systems. In order to understand the fundamental process and dynamics of such fast changing weather phenomena, volumetric observation with both high temporal and spatial resolution are required.

The phased array radar system under developing has the unique capability of scanning the whole sky with 100m and 10 second resolution up to 30 km in a cost effective manner. To achieve this goal, the system adopts the digital beam forming technique for elevation scanning and mechanically rotates the array antenna in azimuth direction within 10 seconds. The radar transmits a broad beam of several degrees with 24 elements and receives the back scattered signal with 128 elements digitizing at each elements. Then by digitally forming the beam in signal processor, the fast scanning is realized. In this presentation, concept of the project, current status of the radar development, and some results of the signal processing will be presented.

Keywords: Radar, Thunderstorm