Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

MIS01-08 Room:202 Time:May 23 16:15-16:30

High resolution experiment for thunderstorm and lightning

Tomoo Ushio[1*], Shigeharu Shimamura[1], Hiroshi Kikuchi[1], Ting Wu[1], Yoshitaka Nakamura[2], Satoru Yoshida[1], Takeshi Morimoto[3], Zen-Ichiro Kawasaki[1]

[1]Osaka University, [2]Kobe National College of Technology, [3]Kinki University

A new phased array radar system and high resolution lightning location system have been developed for thunderstorm and lightning studies. It is now well known that rapidly evolving severe weather phenomena (e.g., microbursts, severe thunderstorms, tornadoes, and lightning) are a threat to our lives particularly in a densely populated area. Over the past decade, mechanically rotating radar systems at the C-band or S-band have been proved to be effective for weather surveillance especially in a wide area more than 100 km in range. However, rapidly evolving weather phenomena have temporal and spatial scales comparable to the resolution limit (-10 min. and -500m) of typical 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 observations with both high temporal and spatial resolution are required. The phased array radar system developed has the unique capability of scanning the whole sky with 100m and 10 second resolution up to 30 km in a cost effective manner. 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 antenna elements and receives the back scattered signal with 128 elements digitizing at each elements. Then by digitally forming the beam in the signal processor, the fast scanning is realized. Additionally, electrical aspect of thunderstorm can be obtained by detecting the lightning flash rate. In Osaka University, a new lightning location system which covers the area of phased array radar was developed and locates the sources of the impulses from lightning in 3 dimensions. In this presentation, the new phased array radar and lightning location system for high resolution thunderstorm studies are introduced.

Keywords: Lightning, Thunderstorm, RADAR