

Development of Ka-band Doppler Radar for Cloud and Fog Observation

T. Wakayama¹, S. Watanabe¹, K. Hamazu¹, H. Hashiguchi², S. Fukao²

1. Mitsubishi Electric Corporation, 2. Kyoto University

We have developed a Ka-band Doppler radar to observe clouds and fogs. Since wavelength of the transmitted wave is 8.6mm, the radar can detect smaller particles than those which the conventional centimeter-wave meteorological radars can.

The antenna diameter is 2m, and hence the antenna beam width is 0.3° . To reduce the radar cost, a magnetron is used for the transmitter. Although frequency stability of a magnetron is poor, the received signal can be coherently processed; the phase of the transmitted wave is recorded in each transmission with the digital technique, and hence the received signal phase is corrected with the recorded phase by the signal processor. Since several antenna scan modes, such as PPI, CAPPI, and RHI, are available, optimum mode associated with meteorological environment is selectable.

The radar has been located in the Shigaraki MU Observatory of Kyoto University since June 1997, and several types of phenomena, such as growth of cumulonimbus and vertical profiles of stratiform precipitation, have been observed. Further quantitative data analysis is expected to give useful information to reveal mechanism of various types of precipitation processes.

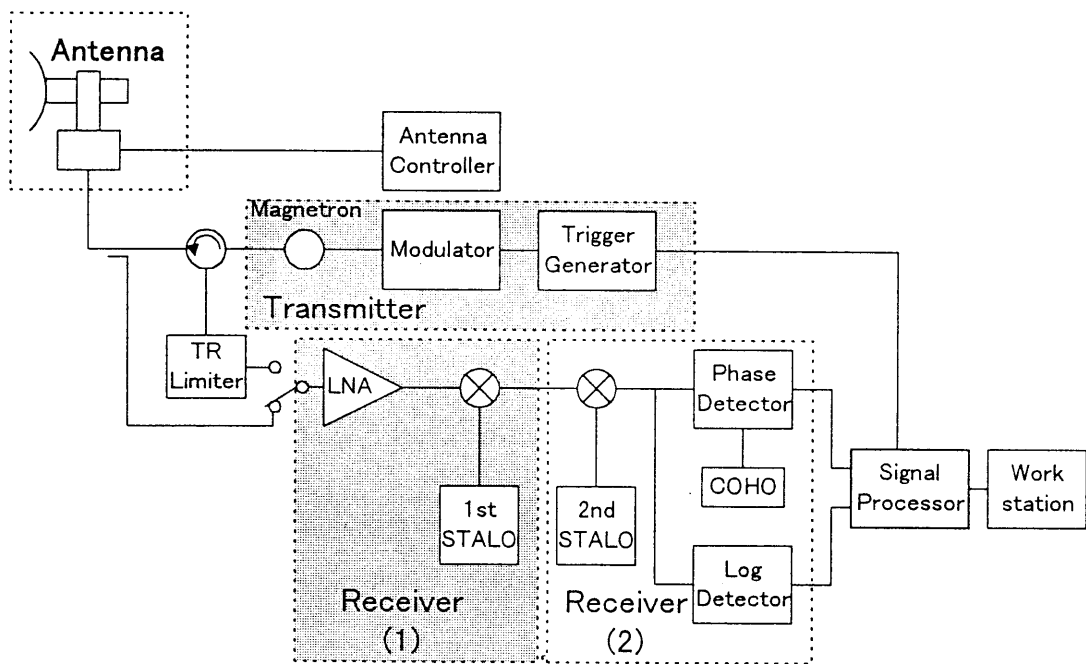


Fig. 1 Block diagram of the Ka-band Doppler radar.

Tab. 1 Major specification of the Ka-band Doppler radar.

Frequency	35GHz band
Antenna Type	Casegren
Beam Width	0.3deg.
Transmitter Tube	Magnetron
Peak Power	100kW
Pulse Repetition Frequency (Double Pulse)	500/5000Hz
Pulse Length	0.5 μ s
Dynamic Range	70dB(Log) 40dB(Linear)
Polarization	horizontal

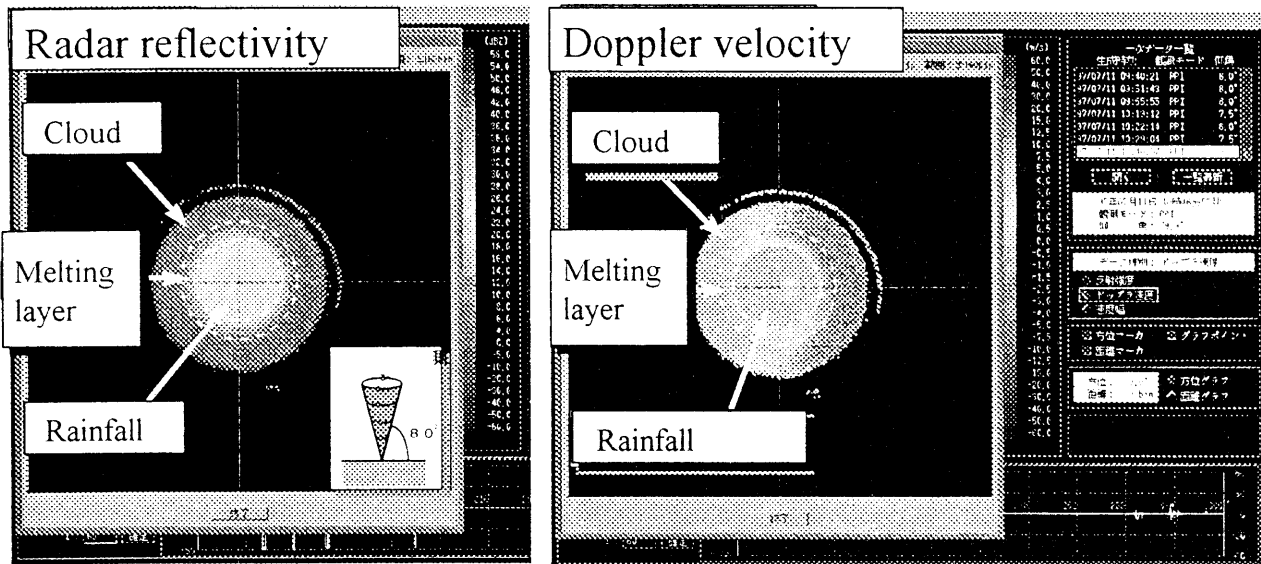


Fig. 2 Observation of stratiform rain.

Jul 17 12:30:11-12:30:40 1997
 RHI
 Azimuth 225.1
 Elevation 0.5 - 84.9

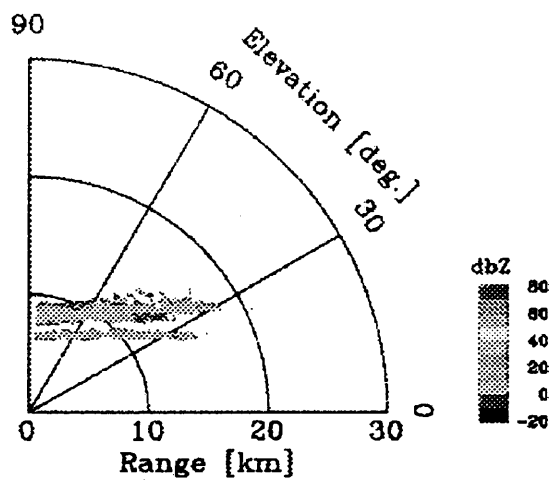


Fig. 3 Observation of stratified cloud

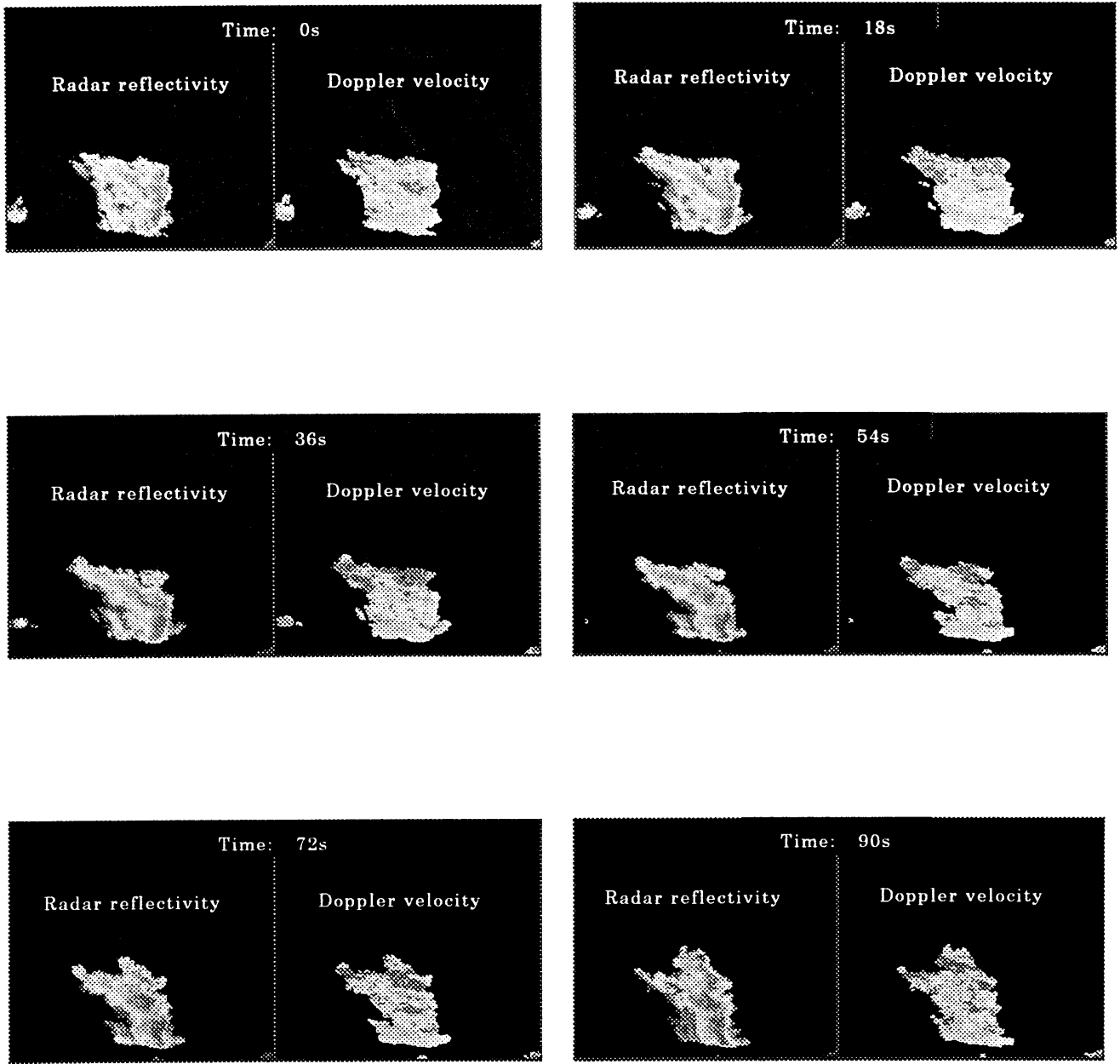


Fig. 4 Observation of growth of cumulonimbus.