Development mechanism of a cumulonimbus observed by Ka-band Doppler radar on 18 August 2011 in the Kanto region, Japan

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The National Research Institute for Earth Science and Disaster Prevention (NIED) of Japan conducted intensive observations of cumulonimbi with a Ka-band Doppler radar (KaDR) and an X-band polarimetric Doppler radar (MP-X) in the western Kanto region, Japan during the summer of 2011-2013 in order to develop early detection techniques of cumulonimbi. Using the KaDR, with its high sensitivity and high spatial resolution, we could observe the initiation and development of a cumulonimbus on 18 August 2011. The echo top height and maximum reflectivity developed in three steps: in the beginning of the developing stage (DS), convection was shallow and reflectivity was weak. The MP-X could not detect any cumulonimbus echo in the beginning of the DS. In the middle of the DS, the echo top height and reflectivity increased, and the MP-X first detected an echo. In the end of the DS, echo top height and reflectivity became higher than those in the middle of the DS. The maximum echo top height exceeded 12 km ASL in the end of the DS. To understand the development mechanism of the cumulonimbus, we tried to simulate the cumulonimbus using the Cloud-Resolving Storm Simulator (CReSS).