

The MU radar --- Twenty years of its challenge to frontiers of the atmospheric sciences

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The MU (Middle and Upper atmosphere) radar celebrated the twentieth anniversary of its inauguration in November 2004. It features an active phased-array antenna system, where each antenna is driven by a solid-state transmitter-receiver (TR) module and the whole TR modules are electronically controlled by computer. This unique system configuration enables very fast and continuous antenna beam steering that has never been realized by other atmospheric radars. Also, a variety of sophisticated operations are made feasible by dividing the antenna array into four independent subarrays. These excellent capabilities of the MU radar have been utilized in various observations and experiments, and significantly advanced knowledges of dynamical and electrodynamical coupling processes from the near-surface region to the upper atmosphere. The MU radar technique has been applied to portable radars developed for observations of the lower part of the Earth's atmosphere. The latest model has been adopted for the operational network of wind-profiling radars of the Meteorological Agency of Japan since 2001. Also, a MU-like radar called the Equatorial Atmosphere Radar (EAR) was established at the equator on Sumatra Island, Indonesia, and has been operated to reveal a number of mysteries of the equatorial atmosphere since July 2001. This paper reviews the past, present, and future prospect of the MU radar and MU radar-related research.