Development of a high-resolution 1.3 GHz wind profiler radar

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By receiving radio waves scattered by radio refractive index irregularities (clear-air echo), wind profiler radar (WPR) measures height profiles of vertical and horizontal wind velocity in the clear air. Recent development of measurement techniques enables WPRs to increase their capability. Range imaging (RIM), which utilizes multiple frequencies and adaptive signal processing, enables WPR to enhance its range resolution. Adaptive clutter suppression (ACS), which controls sidelobes by using subarrays and adaptive signal processing, provides a mean for mitigating clutter contamination. Therefore, it is expected that WPR with RIM and ACS capability is able to resolve small-scale turbulence.
In order to develop high-resolution 1.3 GHz WPR, a 1.3 GHz WPR operated by National Institute of Information and Communications Technology has been utilized. The WPR is referred to as LQ-13. Capability of RIM and oversampling (OS) were implemented to LQ-13. In order to implement ACS capability, auxiliary subarrays for receiving clutters were installed to LQ-13. ACS system developed aims at implementing ACS capability to existing WPRs. In 2017, new 1.3 GHz boundary layer radar, which is operated by Disaster Prevention Research Institute, Kyoto University and is referred to as LQ-7, was installed in Kobe, Japan. LQ-7 has capability of RIM and OS. An ACS system similar to that for LQ-13 was installed to LQ-7.
We expect that measurements using high-resolution 1.3 GHz WPR and other instruments contribute to clarify dynamical processes in the atmosphere. At the meeting, details of high-resolution 1.3 GHz WPR are presented.

Keywords: wind profiler radar, radar, wind velocity, turbulence, signal processing, measurement technique

