
 RECENT RESEARCH ACTIVITIES

Development of 1.3-GHz range imaging wind profiler radar
(Laboratory of Radar Atmospheric Science, RISH, Kyoto University)

 Masayuki K. Yamamoto, Toshiyuki Fujita, Noor Hafizah Binti Abdul Aziz,
 Hiroyuki Hashiguchi, and Mamoru Yamamoto

Radar wind profiler (WPR) is a useful means to measure altitude profiles of vertical and horizontal wind velocities in the clear air. Because WPR receives echoes from Bragg-scale refractive index perturbations caused by turbulence, WPR is able to be used for measuring atmospheric turbulence. However, vertical resolution of WPR (typically 100 m or more) is not sufficient for measuring atmospheric turbulence quantitatively. Range imaging (RIM), which is useful for resolving fine-scale structure of atmospheric turbulence such as Kelvin-Helmholtz billows, has developed recently. RIM improves range resolution down to several ten meters by using frequency diversity and adaptive signal processing. At Shigaraki MU Observatory Japan, we are developing a 1.3-GHz range imaging WPR (RIM-WPR) in order to realize turbulence measurement in the lower troposphere. Antenna, transmitter, and receiver of the existing WPR (named as LQ7) are used for RIM-WPR. To transmit multiple frequencies, five local oscillators (1357.0-1358.0 MHz with 250 kHz intervals) are installed. Further, for collecting received time series every transmitted frequency, we newly developed a radar software receiver using Universal Software Radio Peripheral 2 (USRP2). In addition to the functions necessary for performing the multi-frequency data collection, the new radar software receiver is able to execute oversampling with a maximum sampling rate of 10 MHz. Combining RIM and oversampling provides a sufficient capability to detect small-scale turbulence with a scale 100 m or less.

Antenna



PC


 Software receiver
 (USRP2)

Figure 1. Components of the 1.3-GHz range imaging wind profiler radar.

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