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UHF
Development of Signal Processing Software for New Turbulence Profiler Radar

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Radar wind profiler is a useful means to measure altitude profiles of vertical and horizontal wind velocities with high time and vertical resolutions. Range imaging (RIM) is a technique that improves range resolution down to several ten meters by using frequency diversity and adaptive signal processing. RIM is useful for resolving fine-scale structure of atmospheric instability such as Kelvin-Helmholtz billows. Therefore RIM can be used for realizing new turbulence profiler radar. Further, oversampling capability is necessary to avoid the range weighting effects caused by finite transmitted pulse width. In order to develop an algorithm that detects small-scale turbulence automatically, we are developing a software using Python with SciPy and NumPy libraries.

Data collected by USRP2 (Universal Software Radio Peripheral 2) and LQ7 transmission system will get through the online signal processing which executes ranging, pulse decoding and coherent integration. In offline signal processing, clutter signal is removed using DC removal (using scipy.fftshift and scipy.fftpack) and high-pass filtering by running mean (using numpy.mean). In spectral parameter estimation, the following procedures are taken. (i) Noise level calculation, (ii) 5 points running mean to the Doppler spectra, (iii) peak search, (iv) determination of continuous Doppler velocity range where received power is greater than threshold, and (v) spectral parameter estimation using the moment method. In the all procedures, numpy.where and numpy.max are used. In the presentation, we show detailed measurement results.

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