Preliminary result of MIMO observation with the MU radar

*Tomoya Matsuda[1], Hiroyuki Hashiguchi[1]

1. Research Institute for Sustainable Humanosphere,Kyoto University

A phased array technique has been mainly utilized for the atmospheric radar and the wind profiler radar, and also applied to the weather radar for research in recent years.
As a further development of phased array technology, “Multiple-input multiple-output (MIMO) technique”, developed in the communication systems, has been applied to the radar.
One of the effects is that it is possible to create the virtual antenna aperture plane beyond the actual antenna, and we can also say that it is possible to make the actual antenna size smaller compared to the conventional antenna while keeping the angular resolution. This effect is expected to reduce costs which is the most serious problem to expand phased array radars instead of parabolic antenna systems.
In order to confirm the effect, an experimental observation was done using the MU radar and the preliminary result will be introduced.
MIMO technique requires orthogonal waveforms on each transmitter to identify the transmitted signals with multiple receivers, and several methods are known to realize their orthogonalities.
In this presentation, we focus on “Slow-time MIMO technique”, which can be realized that slightly different frequencies are selected as transmission waveforms, and transmitted signals are separated in the Doppler frequency domain in each receiver to achieve MIMO operation.
We will explain its availability along with experimental results obtained by the MU radar.
The MU radar, which is a VHF-band phased array atmospheric radar with multi-channel receivers, can be set up easily for some MIMO operations.
At present, there is few meteorological radar that can function as a MIMO radar, therefore the MU radar will be an important role on the feasibility study of the “MIMO weather phased array radar”.

Keywords: Phased array radar, MIMO radar, antenna aperture expansion