



## Ground clutter mitigation of the Phased Array Weather Radar with digital beam forming technique

Tomoo Ushio<sup>1</sup>, H. Kikuchi<sup>2</sup>, T. Mega<sup>1</sup>, E. Yoshikawa<sup>3</sup>, D. Kim<sup>1</sup>

<sup>1</sup> Osaka University, Osaka, Japan

<sup>2</sup> The University of Electrocommunications, Tokyo, Japan

<sup>3</sup> JAXA, Tokyo, Japan

Recent progress of information and communication technologies has been enabling us to realize a rapid scanning weather radar system. A single polarimetric Phased Array Radar (PAR) system at X band [1][2] was developed and installed in Suita Campus, Osaka University in 2012, and then dual polarimetric PAR was also developed in 2017. These PAR systems can scan the whole sky within 30 seconds up to 80 km in radius over 100 elevation angles with digital beam forming technique, and the initial observation results demonstrate the unique capability of the new PAR system. However, the observation is sometimes seriously contaminated by strong ground clutter through relatively high sidelobes at transmitting stage. In this study, a new clutter mitigation algorithm from adaptive beam forming technique on Minimum Mean Square Error (MMSE) formulation was investigated, and succeeded in suppressing not only the ground clutter but also ghost echo from strong precipitation echo nearby. And also the adaptive algorithm was applied to the doppler spectrum estimation, which makes easier to identify the ground clutter at 0 m/s in the doppler spectrum. In this presentation, the advantages and disadvantages of the PAR will be discussed based on the observation results focusing on the ground clutter problem.

### References

- [1] Mizutani, F., T. Ushio, E. Yoshikawa, S. Shimamura, H. Kikuchi, M. Wada, S. Satoh, and T. Iguchi, Fast-Scanning Phased Array Weather Radar with Angular Imaging Technique, *IEEE Trans. Geosci. Remote Sens.*, Vol. 56, 5, pp. 2664-2673, DOI: 10.1109/TGRS.2017.2780847, 2018.5
- [2] Yoshikawa, E., T. Ushio, Z-I. Kawasaki, S. Yoshida, T. Morimoto, F. Mizutani, and M. Wada, MMSE Beam Forming on Fast-Scanning Phased Array Weather Radar, *IEEE Trans. Geosci. Remote Sens.*, Vol. 51, Issue 5, pp. 3077-3088, 2013