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An improved bistatic experiment with Okinawa polarimetric weather radar COBRA

Seiji Kawamura[1*], Shigeo Sugitani[1], Hiroshi Hanado[1], Katsuhiro Nakagawa[1]

[1]NICT

The bistatic Doppler velocity measurement, with one traditional transmitting radar associated with one or more passive radar receivers, is a useful way to retrieve the 2D wind field with low costs. On the other hand, the sidelobe contamination of the bistatic Doppler velocity measurement is the serious problem because low-gain wide beamwidth receiving antennas are usually used. In this study, we propose a new measurement system by which the sidelobe itself is reduced with an array receiving antenna.
We are planning to use grating lobes. In case of usual array antenna, the spacing between elements is selected short (less than one wavelength) to form only one strong main lobe and to avoid forming grating lobes. But it is difficult to form a narrow beam enough to reduce the sidelobe contamination with limited number of elements. In this study, we dare to select long spacing (e.g. 10 wavelengths) and to form many sharp grating robes (beams) simultaneously. Sidelobe contaminations near around the strong echoes are expected to be reduced with these sharp beams. Once the number of elements and their positions are determined, the directions of receiving beams (namely observable area) are also fixed. To extend the observable area, we introduce the digital beam forming (DBF) technique. By shifting phases of receiving signals from each element, we can change the directions of receiving beams and extend the observable area.
We, National Institute of Information and Communications Technology (NICT), have a full polarimetric Doppler weather radar named COBRA in Okinawa. We are plannning to perform actual experiments with this radar system. Simulated results, an experimental system, and preliminary observational results will be presented.

Keywords: weather radar, COBRA, bistatic