Development of a polarimetric phased array weather and adaptive beamforming technique

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Development of a polarimetric phased array weather radar as a subsequent project of the phased array weather radar (PAR) is under discussion. The design of a polarimetric phased array weather radar has been the object of several experimental development. The polarimetric phased array weather radar has significantly advanced the following points. 1) to classify types of precipitation, 2) to provide quantitative estimates of precipitation accumulation, 3) to obtain high spatial and temporal resolution volumetric radar data. 1) and 2) are contributed by a polarimetric sensing technique, and 3) is provided by the digital beam forming techniques in a phased array radar system. In this paper, precipitation radar signal simulations based on the under considering radar concept are carried out to discuss the estimation accuracy of polarimetric precipitation profiles (differential reflectivity, specific differential phase, and copolar correlation coefficient) with two DBF methods that are based on Fourier and minimum mean square error (MMSE) methods. The comparison of the performance of the two methods indicates that MMSE is superior in an observation accuracy because of the effect of a stable and robust main lobe and adaptively suppressed side lobes.

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