Onboard Calibration of Spaceborne Radar Parameters Using Sea Surface Echo

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The continuity of spaceborne radar observations by the Tropical Rainfall Measuring Mission’s (TRMM’s) precipitation radar (PR) and the Global Precipitation Measurement (GPM) mission’s dual-frequency precipitation radar (DPR), which comprises the Ku-band precipitation radar (KuPR) and the Ka-band precipitation radar (KaPR), is important to develop the spaceborne radar record for utilizing the climate analysis of the precipitation variability. Then, the strict intercalibration between PR and DPR is required to ensure the calibration consistency between those. The normalized surface cross section (NRCS) over the oceans is a good calibration target to compare those, but the incident angle dependence of the NRCS difference relies on the radar parameters for the NRCS calculation from the received power. This study aims to accurately derive parameters of the spaceborne radar using the sea surface echo (SSE). Since the SSE is closely related with the received pulse width and the two-way antenna beam width, these parameters are individually estimated from the SSE shape reconstructed by the operational radar data. The radar parameters estimated by the SSE is accurately obtained by comparing pre-launch results and, its variability is stable over the entire missions. The reconstructed SSE shapes are also used to correct the bias missing the surface due to the discrete sampling time.

Keywords: Calibration, Sea surface echo, Precipitation Radar, Dual-frequency Precipitation Radar