Abstract

Radar signatures of rain over the ocean have a complex structure since they receive contributions from surface scattering and volume scattering and attenuation by hydrometeors in the atmosphere. These contributions overlap and are often difficult to detangle. While most of the mechanisms contributing to radar signatures of rain over the ocean are well understood, there is one remaining issue that has been discussed controversially in the literature for a long time: It is the question what scattering mechanism causes the areas of strongly enhanced radar backscatter, also called “bright blobs” or “bright patches”, which are o frequently observed on spaceborne C-band SAR images of the ocean in the presence of convective rain. Recently, papers have been published in which it is hypothesized that they are caused by radar backscattering at hydrometeors in the melting layer (M L). Although many observational facts seem to support this hypothesis, there exists one strong argument against this hypothesis: It is the observation that the position of the ML radar signatures (bright blob) in the SAR image is not shifted in anti-range from the position, where the rain column hits the sea surface. This absence of a shift is observed when 1) comparing Sentinel-1 SAR images on which rain cells are visible with quasi-concurrently acquired weather radar images and 2) when inter-comparing of SAR images of rain cells acquired concurrently at different frequencies and polarizations (during the SIR-C/X-SAR mission in 1994). Based on these observations, we discard the hypothesis that the bright blobs are due to volume scattering at hydrometeors in the ML and hypothesize instead, that they are due to scattering at splash products at the sea surface. This hypothesis is supported by radar backscattering measurements carried out in the laboratory and from a shore-based platform, which show that, at C-and X-band, strong rain can give rise to strong radar returns also at cross-polarization.