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Attenuation Correction in Heavy Rainfall Using Emission

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Radar provides a vital measurement tool, providing high resolution rainfall estimates over wide areas. However, the C-band networks of Europe suffer from severe attenuation in heavy rainfall which leads to large underestimates of rainfall rates. We present a technique to estimate the total attenuation along the radar path by measuring the microwave emission of the attenuating rain. The noise level of empty gates, at long ranges, is recorded. Any increases in this noise are related to the total attenuation along the radar beam, due to both the attenuation by distant rainfall and from wetting of the protective radome. The technique provides, for the first time, a direct measurement of the radome attenuation and its azimuthal variation. The total attenuation through the storm provides a robust constraint to other attenuation techniques using differential phase shift or instability prone gate-by-gate correction techniques.

This technique is being implemented on the UK operational radar network which is undergoing upgrade to dual-polarisation. We present measurements showing that the effect of radome attenuation may be significant even for light rainfalls at the radar site and have significant impacts on radar calibration and rainfall estimation accuracy.