Geophysical Research Abstracts, Vol. 9, 08807, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08807

Uncertainties in microwave link rainfall estimates examined using high-resolution weather radar data

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Recent studies have shown that microwave links are suitable for the measurement of rainfall. The very dense network of such links used for cellular communication (e.g. 12,000 links in The Netherlands, i.e. 1 km km^{-2}) could potentially be used to complement operational radar rainfall estimates. Analyses of the uncertainties and errors related to issues raised in the recent literature for different link settings (e.g. frequency, link length, etc.) are presented here. These analyses can be used to better assess the uncertainties associated with rainfall estimates obtained using a single microwave link, and to determine the optimum settings for microwave links in a given climatology.

To assess the uncertainty in rainfall estimation associated with operational single frequency, single polarization links, we use rainfall intensities estimated by a high-resolution (120 m range resolution, 1.875° azimuth resolution and 16 s sampling time) scanning X-band radar (SOLIDAR). Time series of profiles of rainfall intensities are used to compute the path-integrated attenuation measured by a virtual microwave link and the path-average rainfall intensity over such a link. Uncertainties related to spatial and temporal sampling, power resolution and wet antenna attenuation are studied using these data for different link lengths and frequencies.