



Performance of high-resolution X-band radar for rainfall measurement in The Netherlands

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This study presents an analysis of 195 rainfall events gathered with the X-band weather radar SOLIDAR and a tipping bucket rain gauge network near Delft, The Netherlands, between May 1993 and April 1994. The aim of this paper is to present a thorough analysis of a climatological dataset using a high spatial (120 m) and temporal (16 s) resolution X-band radar. This makes it a study of the potential for high-resolution rainfall measurements with non-polarimetric X-band radar over flat terrain. An appropriate radar reflectivity - rain rate relation is derived from measurements of raindrop size distributions and compared with radar - rain gauge data. The radar calibration is assessed using a long-term comparison of rain gauge measurements with corresponding radar reflectivities as well as by analyzing the evolution of the stability of ground clutter areas over time. Three different methods for ground clutter correction as well as the effectiveness of forward and backward attenuation correction algorithms have been studied. Five individual rainfall events are discussed in detail to illustrate the strengths and weaknesses of high-resolution X-band radar and the effectiveness of the presented correction methods. X-band radar is found to be able to measure the space-time variation of rainfall at high resolution, far greater than what can be achieved by rain gauge networks or a typical operational C-band weather radar. On the other hand, SOLIDAR can suffer from receiver saturation, wet radome attenuation as well as signal loss along the path. During very strong convective situations the signal can even be lost completely. In combination with several rain gauges for quality control, high resolution X-band radar is considered to be suitable for rainfall monitoring over relatively small (urban) catchments. These results offer great prospects for the new high resolution polarimetric doppler X-band radar IDRA.