



Rainfall estimation using spectral analysis of microwave link signals

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It is well-known that microwave-link signal attenuation can be used to estimate path-average rainfall intensities. Such rainfall data is a valuable addition to radar and rain gauge data because these measurements are close to the ground, the retrieval relation is close to linear, and the measurement paths are of the order of several kilometers. However, there are several sources of error that affect these rainfall estimates. The most important of these are 1) signal attenuation due to wet antennas, 2) correct estimation of signal baseline, and 3) correct definition of wet and dry periods.

We propose a novel method for microwave-link rainfall estimation based on spectral analysis of the microwave link signals. This method is based on the fact that individual raindrops falling through the beam of the microwave link cause the received signal to fluctuate. These signal fluctuations have a different frequency spectrum than those caused by turbulent fluxes. The major advantage of this method is that it does not suffer from the sources of error mentioned above. The method is tested on a dataset collected at the Chilbolton Facility for Atmospheric and Radio Research with a 500-m microwave link and several rain gauges.