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Wet Antenna Attenuation Estimation by Monitoring the Reflection Coefficient

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Estimating near ground precipitation from permanent recordings of received signal fading in commercial microwave links (CMLs) is a promising and emerging technique in weather observation. It is particularly valuable for regions with sparse or even nonexistent weather radar and rain gauge coverage to support hydrological modeling and to enhance regional severe weather warning.

Wetness on the antenna cover due to rainfall or dew leads to signal attenuation that occurs in addition to the actual rain induced path attenuation of interest. Lack of knowledge of the wet antenna attenuation causes overestimation of the link attenuation derived rain rate. Hence, the wet antenna effect is a significant source of error in the processing of link attenuation data into rain rate. Identifying and estimating it improves the accuracy of CML based precipitation mapping.

We developed an approach to estimate the wet antenna attenuation by monitoring the connection-side reflection coefficient of the antenna. Using this information leads to a feasible procedure for correcting the wet antenna effect in path attenuation time series and consequently improving the quality of the rain rate data. To demonstrate the practicability of this approach we present wet antenna detection and correction based on data from a new atmospheric microwave transmission experiment where both the link's transmit-receive signal level (TRSL) and the reflection coefficient of customary CML reflector antennas are simultaneously measured.

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