

### **13.44 USING MICROWAVE LINK SIGNAL FLUCTUATIONS FOR RETRIEVAL OF RAINFALL RATES**

**E. SEAGER<sup>1,2</sup>, J. FRANK<sup>2</sup>, R. UIJLENHOET<sup>3</sup>, H. LEIJNSE<sup>1</sup>**

<sup>1</sup> Royal Netherlands Meteorological Institute, De Bilt the Netherlands

<sup>2</sup> University of Utrecht, Utrecht, the Netherlands

<sup>3</sup> Wageningen University, Wageningen, the Netherlands  
emily.seager@knmi.nl

It has recently been shown that microwave links can be used to measure rainfall by using the signal attenuation caused by the raindrops on the path between the link antennas. This is particularly promising as these links are abundant throughout the world as part of the infrastructure used for cellular communication. However, there are some known issues with this method of rainfall measurement such as attenuation caused by wet antennas, and proper determination of the signal level in dry weather. We present a method of rainfall retrieval from these links that is in principle insensitive to these issues, and could ultimately lead to much improved rainfall retrievals.

Instead of using existing rainfall retrieval techniques, we use high-frequency microwave link signal fluctuations for rainfall estimation. We use the fact that raindrops fall through the first Fresnel zone of the microwave link, and hence cause signal fluctuations. Because issues like base-line fluctuations and wetting of antennas occur at very low frequencies, their effect on resulting rainfall estimates are negligible.

We derive expressions for signal fluctuations as a function of link characteristics (length and frequency) and the raindrop size distribution. These relations are tested against data from an experiment with a 26-GHz microwave link carried out at the Chilbolton Observatory.