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Discrimination of cloud and rain liquid water path by groundbased polarized microwave radiometry

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Remote sensing of liquid water path by passive microwave radiometers is currently using unpolarized observations at two or more frequencies. Such methods are getting ambiguous in the presence of rain within the field of view since the emission efficiency for raindrops is different from cloud drops and depends on the specific drop size. Such drops also have a nonspherical shape and thus produce a polarization signal in the down-welling radiation which can be measured [1] and exploited to gather additional information about the amount of rain within the cloud. Based on radiative transfer model results a method is proposed to increase the accuracy of liquid water path measurements by using polarimetric passive microwave observations [2].

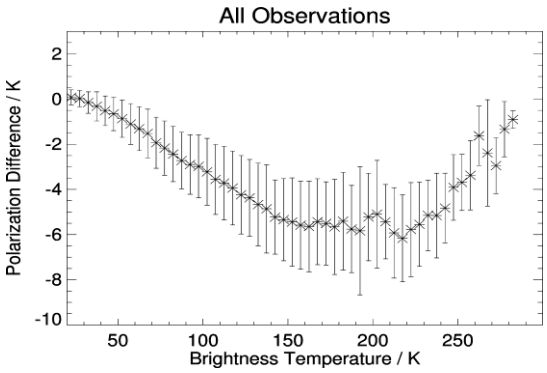

Figure 1: Brightness temperature and polarization difference (TB_v – TB_h) measurements at 19 GHz and 30 degree elevation show the polarization signal due to nonspherical rain drops. Error bars indicate the standard deviation of all measurements taken during a two year period. The total amount of liquid water is increasing from left to right, leading to a saturation in optical thickness and thus to less polarization of the microwave emission, but higher overall brightness temperature (which is approaching the ambient temperature close to 290 K).

Keywords: microwave; precipitation; polarization; new instruments;

References

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[2] H. Czekala, S. Crewell, C. Simmer, and A. Thiele: Discrimination of cloud and rain water path by ground based polarized microwave radiometry. *Geophys. Res. Lett.*, **28** (2), 267–270, (2001).