If Frisch is true - impacts of varying beam width, resolution, frequency combinations and beam overlap when retrieving liquid water content profiles

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Abstract

Cumulus and statocumulus clouds strongly affect the Earth's radiation budget and are a major uncertainty source in weather and climate prediction models. To improve and evaluate models, a comprehensive understanding of cloud processes is necessary and references are needed. Therefore active and passive microwave remote sensing of clouds can be used to derive cloud properties such as liquid water path and liquid water content (LWC), which can serve as a reference for model evaluation. However, both the measurements and the assumptions when retrieving physical quantities from the measurements invole uncertainty sources. Frisch et al. (1998) combined radar and radiometer observations to derive LWC profiles. Assuming their assumptions are correct, there will be still uncertainties regarding the measurement setup. We investigate how varying beam width, temporal and vertical resolutions, frequency combinations, and beam overlap of and between the two instruments influence the retrieval of LWC profiles. Especially, we discuss the benefit of combining vertically, high resolved radar and radiometer measurements using the same antenna, i.e. having ideal beam overlap.

Frisch, A. S., G. Feingold, C. W. Fairall, T. Uttal, and J. B. Snider, 1998: On cloud radar and microwave radiometer measurements of stratus cloud liquid water profiles. J. Geophys. Res.: Atmos., 103 (18), 23 195–23 197, doi:0148-0227/98/98JD-01827509.00.