Long-term water vapour comparison at the ARM Mobile Facility

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The nine month deployment of the ARM Mobile Facility (AMF) in the Black Forest 2007 allows the statistical assessment of long-term assessment of humidity observations by microwave radiometers, radiosondes and GPS. For that purpose we use AMF observations by Vaisala RS-92 radiosondes performed four times a day together with the 20/30 GHz dual channel microwave radiometer, the microwave profiler and the newly acquired 90/150 GHz radiometer. The observations were supplemented by two microwave radiometers, e.g. the Humidity and Temperature PROfiler (HATPRO) including full hemispheric scanning capability and the Dual Polarization Radiometer (DPR) at 90 and 150 GHz operated by the University of Cologne and a GPS receiver by GFZ Potsdam. First comparisons have identified a daytime dry bias in the radiosondes which is about 5 % in integrated water vapour at noon and reduces roughly by a factor of two at 6 and 18 UTC while the midnight soundings are more or less bias free. Further work will distinguish cloudy and cloud free situations as well as a selection of situations without strong spatial variability identified from the azimuth scanning observations. The simultaneous operation of five microwave radiometers observing at 33 frequency channels in total enables a thorough assessment of radiometer quality. Further the comparison with corresponding clear sky radio soundings allows us to assess the performance of current water vapour absorption models since at the frequencies above ~70 GHz, state-of-the-art absorption models show large differences which must be resolved in near future.

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