

Microwave radiometry and sensor synergy at the AMF during COPS

During the deployment of the ARM Mobile Facility (AMF) in the Black Forest 2007 the observations were further supplemented by two microwave radiometers, e.g. the Humidity and Temperature PROfiler (HATPRO) including full hemispheric scanning capability and the Dual Polarization Radiometer (DPR) with channels at 90 and 150 GHz. The microwave brightness temperatures observed at 33 frequency channels in total were compared to corresponding clear sky radio soundings in order to assess the performance of current absorption models in the microwave region. Differences to radiosoundings can be partly attributed to the strong variability of the humidity field which we studied using scanning microwave measurements and simultaneous local flights by the “Metair” Dimona motor glider (see Figure). The observed mixing ratios in the convective boundary layer varied up to a factor of two on a scale of a few kilometers and could be resolved by both aircraft and microwave radiometer measurements. Furthermore, multi-spectral microwave and infrared observations by HATPRO and the Atmospheric Emitted Radiance Interferometer (AERI) were combined within an optimal estimation framework to retrieve improved temperature and humidity vertical profiles in clear sky cases. Here the AERI measurements contain more information than the microwave measurements; however the latter provide a sufficiently accurate first guess for the AERI retrievals. For future cloudy case retrievals, we expect both instruments to be equally valuable. Finally, we applied the Integrated Profiling Technique (IPT) to derive the thermodynamic state including the cloud liquid water profiles from a combination of microwave radiometer, cloud radar, ceilometer and radiosonde data. The resulting profiles will be used to assess the quality of the 1D-radiation code used in the regional climate model CLM by systematically comparing simulated surface radiative fluxes with the ones observed at the AMF over the full 9 month deployment.

