The field programs COPS and GOP 2007: Possibilies for model improvement

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Within the German priority program on Quantitative Precipitation Forecast (QPF) two field programs were designed in order two provide a sophisticated data set for improving QPF. The General Observation Period (GOP) [Crewell et al., 2008] was performed by optimizing the use of existing in-situ and remote-sensing instruments with special focus on water cycle variables over the full year cycle of 2007. The area of interest covered central Europe with increasing focus towards the Black Forest where the Convective and Orographically-induced Precipitation Study (COPS) took place from June to August 2007. Thus the GOP includes a variety of precipitation systems in order to relate the COPS results to a larger spatial scale. For a timely use of the data, forecasts of the numerical weather prediction models COSMO-EU and COSMO-DE of the German Meteorological Service were tailored to match the observations and perform model evaluation in a near real-time environment (http://gop.meteo.uni-koeln.de/). Since COSMO-DE is run as a lagged-ensemble where new forecasts are started every 3 h it is possible to investigate systematically model behaviour. First analyses using GPS network data could reveal that the dry bias evident in daytime RS92 radiosondes leads to drier forecasts when model runs are started at noon and afternoon compared to those started at other times. Interestingly, the drier model runs gain moisture with time as can be seen from GPS and nighttime radiosonde observations. The influence of this effect on cloud and precipitation development is currently under investigation using ceilometer, radar and satellite data.

In summer 2007 COPS was performed in a region covering southwestern Germany/eastern France. The overarching goal of this experiment is the improvement of quantitative precipitation forecasting in low-mountain regions. For this purpose, a unique synergy of in-situ and passive and active remote sensing systems was operated for a duration of three months in order to capture the whole chain of processes leading to the development, organization, and decay of precipitation systems. Observations were provided by densified networks, a transect of so-called supersites, as well as by airborne and spaceborne platforms. Through international cooperation with British, French, Dutch, Austrian and Italian colleagues the instrumental program grew substantially leading in total to nine aircraft operated during the field phase. COPS itself was endorsed as Research and Development Project (RDP) of the World Weather Research Program (WWRP).

A special highlight was the operation of the Atmospheric Radiation Measurement (ARM) Program's Mobile Facility (AMF) from April to December 2007 in the Murg Valley, Black Forest, which is an integral part of GOP and COPS. The combination of active and passive remote sensing instruments for various wavelengths offers the unique opportunity to derive the atmospheric state as complete as possible. In particular, the Integrated Profiling Technique (IPT, Löhnert et al., 2008) will be used to derive profiles of temperature, humidity and liquid water content and corresponding error estimates at the AMF and possible also at the supersites Rhine Valley and Hornisgrinde. The longterm continuous dataset will be used to investigate cloud vertical structure and to test radiative transfer schemes of atmospheric models.

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