



Analysis of the atmospheric water cycle components for Southern Germany during the COPS experiment

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The precipitation of a region is supplied by advective transport of water vapour from neighbouring areas and evapotranspiration within that region. The partition of the regional atmospheric water budget is highly variable and not routinely known. In this study, we use the COPS experiment which took place in summer 2007 to examine the water budget and its dependence on topography, land use and atmospheric conditions over Southwest Germany.

Using regional model simulations and observations, atmospheric water budgets can be established for a control volume comprising the region of interest. In this context GPS (Global Positioning System) measurements offer the possibility to determine the water vapour content of an air column at high temporal and spatial resolution. For the simulations, the COSMO 4.2 model with a resolution of 7 km is used. To formulate the water budgets, the three phases of water must be taken into account. Up to now modifications were incorporated into the COSMO model code to allow the calculation of the budget components for the gaseous and liquid phase. For some episodes of the COPS field campaign variability and partition of the components and the contributions of the budget components to the precipitation amount are studied. The recycling ratio is applied to characterize the atmospheric water cycle. A small recycling ratio implies the dominance of advective processes whereas a major value refers to precipitation mainly supplied by local processes. By varying the size and the location of the control volume the dependence of the partitioning of the water budget for different topographies and their corresponding land uses is assessed. Comparisons of the model results with GPS measurements are used to evaluate the simulated water vapour content.

The findings of such studies are helpful to identify weaknesses in precipitation forecasts and thus can contribute to improve the models. Since water budgets are quite sensitive to land use changes such research is also important from the climatic point of view.