Geophysical Research Abstracts, Vol. 9, 08123, 2007
SRef-ID:

Two medium size experimental river basins for testing flood forecasting systems

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Hydrologists from the Styria government (Austria) have promoted, since 2004, the setup of two flood forecasting systems for large river basins (Mur River: around 10000 km^2 in Styria and the Enns River: around 4000 km^2 in Styria). These two systems are based on hydrological modelling at the sub-catchment scale where the largest gauged hydrological unit is around 300 km^2. Even that modelling results are available for each sub-catchment, it is necessary to build up particular systems for small river basins. This is due to the fact that the two forecasting systems operate with an automatic forecast correction (data assimilation) using data from gauging stations installed on the main rivers only. Consequently, errors made at the sub-catchment scale are of relatively minor importance for forecasts quality in these two systems.

Forecasting systems for smaller units face the major problems that the concentration time is short and that generally, hydro-meteorological stations are sparse so that it is nearly impossible to adapt or correct the simulated values to measured ones in a real time or quasi real time manner. For example, in most cases only one gauging station exits at the catchment outlet. Thus, the forecast quality depends primarily on the rainfall-runoff model performances and therefore on the input data quality (precipitation, air temperature, potential evapotranspiration). In mountainous areas it is known that these parameters vary significantly in time and space and there is an evident need to develop specific forecasting systems for medium size mountainous watersheds.

Such a topic requires research inputs and especially well instrumented and observed areas where methods can be developed and compared. It was therefore decided to

setup in Styria two experimental basins for these specific researches. Because flood forecasting setups are complex systems, research topics must be limited and three specific areas have been retained: (1) data transmission, (2) hydrological modelling and (3) warning.

The present paper illustrates the structure of the experimental river basin chosen to enhance flood forecasting system quality for medium size units as well as preliminary modelling results. Two neighbouring watersheds with similar structural conditions (land-use, geology, topography, morphometry…) have been retained for this research work: Sulm River (1100 km^2) Kainach River (760 km^2).

All in all 8 gauging stations are installed whereas 5 only are online. This permits to delimitate 6 sub-cachments and to obtain a nested structure that is very important to understand and simulate the flood wave formation and propagation. Furthermore precipitations are measured at 44 stations (24 are online) and finally air temperature is measured at 25 stations (14 are online). This dense measurement network allows a good estimation of (1) the sub-catchments precipitation and (2) the distribution of snowfall versus rainfall that is also very important to simulate flooding due to snowmelt processes and model the correct water balance distribution in time.