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The Haute-Mentue catchment (Switzerland) - over 20 years of hydrological field experience

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The Hydram Laboratory of the Swiss Federal Institute of Technology in Lausanne fixed some 20 years ago its priorities in terms of water research and it has chosen the Haute-Mentue catchment, located in the western part of Switzerland as its experimental basin. Presently the catchment disposes of different permanent (6 runoff gages, 6 rainfall gages, 1 meteorological station and several piezometers) and temporary equipment (rainfall simulators, TDR equipment, environmental tracing devices, geophysical devices for 3D electrical resistivity monitoring). Several research projects (ECUME, VAMPHIRE, ESPACE) have been conducted on this catchment in both national and international frames. One of the main aims of the research carried out at the HYDRAM Laboratory was to improve the comprehension of the hydrological behaviour of the Haute-Mentue catchment by an interdisciplinary approach and by associating different types of field measurements:

- isotopic and environmental tracing were used to study the hydrological behaviour at the catchment scale.
- different hillslope measurements campaigns were conducted to identify the hydrological processes responsible for the runoff generation.

In the years 80´ and 90´, the isotopic tracing showed that a two component isotope mixing model was not able to describe accurately the behaviour observed during storm

events. In the late 90´and 2000, the flood hydrographs on the Haute-Mentue catchment have been decomposed by the application of a three-component chemical mixing model based on the silica and calcium tracers. During the 1997-2000 period, based on the tracing approach and on the use of a TDR system, of a rainfall simulator and of a dye tracing experiment, a first hydrological conceptual model of the Haute-Mentue catchment was developed that highlighted the extension of the contributing areas and the role of preferential flows to explain the observed hydrological behaviour. To complete this knowledge, field experiments continued during 2001-2004 at both catchment and local scales. TDR equipments have been installed on two hillslopes with different geological characteristics, which allowed monitoring of the soil moisture at different depths along the hillslope. Association of the environmental tracing and this new configuration of the TDR has finally allowed precising the conceptual model of two other head sub-catchments of the Haute–Mentue catchment. In order to further investigate the hydro-geological characteristics of the Haute-Mentue catchment, a 3D electrical resisitivity monitoring started in 2003 and continues until today under the supervision of the Institute of Geophysics of the University of Lausanne, Switzerland. Two distinct sites have been chosen for their geological and morphological characteristics that cover a surface of about 2 x 400 m^2. Beyond the experimental hydrology, the field data have served as input for different hydrological conceptual (TOPMODEL) or physically based models (SHETRAN). The data collected over more than 20 years on the Haute-Mentue catchment has been organised in a web driven data-base and is available for download to the interested scientific community to the following address: http://hydram.epfl.ch/mentue/.