

## Mountain Ecohydrology: Issues and Challenges<sup>1</sup>

H. JANG

Department of Geography, Hydrology Section, Swiss Federal Institute of Technology Zurich, Winterthurerstrasse 190, CH-8057 Zurich, Switzerland

### The Global Perspective of Mountain Hydrology

In the interaction of the earth's land surfaces with the atmosphere, high mountain areas play a most decisive role in the areal distribution of precipitation and hence of water resources on the continents. As a result of the forced orographic lifting of advective air masses or of the enhanced convective activity in the elevated source areas of sensible heat and water vapour, most of the earth's mountain regions are extraordinarily rich in water resources, and in many of the world's large river systems the water is derived mainly from high mountain areas which provide a reliable source of water for our societies. Moreover, in the high mountain elevations an increasing amount of precipitation is accumulated as temporary snow cover or, above the climatic snow-line, forms perennial snowfields and glaciers. This naturally stored water feeds the river flow with meltwater, often during the same season that purely rainfed rivers are at minimum flow.

### The Challenge of Mountain Research

In spite of the scientific and practical importance of mountain hydrology, our scientific knowledge of mountain hydrology is still very limited. In particular, for example, our ignorance of the real quantities of precipitation and evaporation in the high mountain areas is still very high. The hydrological conditions in the high mountain areas are very complex and difficult to study.

Climate and topography are the main factors which influence mountain hydrology. The great spatial variability, including altitudinal gradients of terrain, vegetation and rock surfaces, soil, underground water, snow and ice conditions, and all meteorological variables, altogether pose numerous problems to be solved in hydrological modelling of mountain river basins.

It is worthwhile to remind ourselves here that in spite of the difficult general conditions in high mountain areas, remarkable efforts have been made in various regions and on various topics. The strong development of hydropower and irrigation schemes in some high mountain areas has promoted hydrological networks and investigations in those regions since before the middle of this century (Langsbach 1926, Jang 1988). In the context of these activities, an increasing interest in snow-water accumulation and melt evolved which stimulated hydrological research work, particularly in North America and in the European Alps

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