

**Summer Field School [Online] on  
MOUNTAIN ECOSYSTEMS AND RESOURCE MANAGEMENT  
19-28 September, 2021**

*Lecture Outline (Deadline for Submission: 10 August 2021)*

Name of Faculty Member (Facilitator)	Hans Peter NACHTNEBEL
Technical Session Group No.	3
Technical Session Group Name	Participatory Resource Management; Watershed Management; River Basin Management
Topic	Human Impacts on the Hydrological Cycle in Mountain Environments
Sub-Topics	
Synopsis (if any) (max. 100 words)	<p>The hydrological characteristics of high mountain basins is subjected to several different influences originating from direct human intervention and also from climate change. The human interventions refer to the development of large storage schemes for hydropower together with water abstractions and diversions from many small creeks. Also, winter tourism changed the water balance in small catchments where numerous ponds have been developed to serve water demands for artificial snow production. The decrease of mountain pastures followed by an increase of forested areas contributed also to changes in the runoff regime. Further impacts on the hydrological cycle are due extension of housing areas, channelisation of rivers and other infra-structural development.</p> <p>The objective of this paper is to give an overview of the observed hydrological changes in the Alpine region and to identify the types of intervention into the water cycle. Some modelling approaches are described to quantify these impacts although this approach is limited by the fact that the regular hydro-meteorological network is rather sparse and only few observations are available for high mountain environments. Also, the spatial resolution of climate models is a critical issue in analyzing potential future climate change impact studies in an Alpine environment.</p> <p>In this paper an overview over recent hydrological investigations in central Europe with the emphasis on Austria will be given and conclusions will be drawn with respect to changes in the last decades.</p>
List of Learning Material (Files to be availed to	<ul style="list-style-type: none"> <li>▪ PPT/Presentation</li> <li>▪ Papers related to hydrology in mountain environments <ul style="list-style-type: none"> <li>▪ 2016_Adjustment of spatio_temporal patterns in a high Alpine environment_Herrnegger_Senoner_Nachtnebel_J_Hydrology.pdf</li> <li>▪ 2015_Performance of the COSERO model_Kling_H_etal_HSJ.pdf</li> </ul> </li> </ul>

us before 31 August 2021)	<ul style="list-style-type: none"><li>▪ 2012_Evapotranspiration in high alpine catchments Herrnegger_et_al_2012_Hydrology_Research.pdf</li><li>▪ 2009_Possible Consequences of Global Change on Water Management and Hydraulic Structures Nachtnebel_HP_Macedonia.pdf</li><li>▪ 2005_HP_N_Mountain Hydrology in a Changing Environment_VI_Headwater 2005_Bergen_paper.pdf</li><li>▪</li></ul>
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\*Please read the Guidelines for Lecture Preparation before filling in this chart.