

SPATIALLY-DISTRIBUTED HYDROGEOLOGICAL MEASUREMENTS IN AN ALPINE WATERSHED

Context and objectives

Mountain headwaters currently produce runoff that is both disproportionately high relative to their catchment areas and, being sustained largely by snow and ice melt during the summer months, is “well-timed” for anthropogenic users. Many studies projecting streamflow responses to climate-related changes in snow and ice have been conducted using relatively simple hydrological models. However, the responses of vegetation, geomorphology, soil and groundwater – which can also affect stream discharge – to climate change are likely to be more subtle, and so future predictions increasingly require complex, physically-based and spatially-distributed hydrogeological models. The main objective of this project is to develop datasets that can be used to develop a conceptual model of catchment behaviour; a crucial first step in any subsequent modelling exercise.

Research approach and methodology

The student will have the opportunity to apply a wide range of hydrogeological field methods, depending on their interests. Possible investigations could include: i) the spatial and temporal variability of stream discharge and how this relates weather conditions (current or antecedent), terrain characteristics and groundwater levels, ii) spatial variability of soil hydraulic properties (e.g. infiltration capacities) and how these might be represented in models, and iii) characterisation of groundwater ages via Radon measurements. The student will be expected to develop a detailed research strategy. There will ADD HERE. The study site, the Vallon de Nant, Vaud, has been a designated natural reserve since 1969 and is therefore relatively unaffected by anthropogenic activity. This, along with the beauty and diversity of the landscape (meadows, forests, moraines and a small glacier) and existing instrumentation (several weather stations, a gauging station and four piezometers) make it an ideal research site.

Partners and collaboration

The project will be supervised Prof. P. Brunner. The datasets developed shall feed into the development of the hydrogeological models that currently under construction as part of the IntegrAlp project (<http://wp.unil.ch/integralp/>); an interdisciplinary collaboration with the University of Lausanne. The student will have the opportunity to attend project meetings and interact with scientists beyond the discipline of hydrogeology. Particular insight will be gained into the coordination of large scientific projects, including the need to ensure that data collected delivers maximum benefit across multiple disciplines.

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