



## PhD position Offered

Within the framework of the National Research Project 61 (Sustainable Water Management) of the Swiss National Research Foundation (SNF) ISSKA will lead a project named:

### SWISSKARST:

#### Towards a sustainable management of karst waters in Switzerland

#### Project Background

With a reserve of about 120 km<sup>3</sup> and 6 to 8 km<sup>3</sup>/yr of resources karst aquifers represent nearly 80% of groundwater reserve in Switzerland and 50% of groundwater resources. However, Swiss karst aquifers are poorly known, as illustrated by the lack of general map and documents describing those systems in a systematic way.

Climate change induces adjustments of our drinking-water supply system. In parallel boring of tunnels, of drillholes (such as for heat exploitation of the underground), search for groundwater for hydropower production, or problems related to the evacuation of “clear waters” (e.g. in the La Chaux-de-Fonds town), as well as all problems related water quality issues represent an increasing stress on karst water resources.

The sustainable management of karst systems is only possible if equilibrium can be found between the various stresses and the natural behaviour of the system.

#### Project description

The aim of the present project is to prepare an inventory of Swiss karst aquifers. The goal is to build a concept for a comprehensive and applied description, i.e. which can be really useful for the management of karst aquifers, and to apply this concept in order to cover most of Swiss karst aquifers.

Four work packages (WP) have been defined:

- 1) Concept and scientific background for the characterization of karst aquifers
- 2) Documentation of all main swiss karst aquifer-systems
- 3) Adjustments according to regional conditions
- 4) Technical issues

The offered position mainly focuses on WP 1 and will include the following topics:

- A. Formulation of an existing (unpublished) approach for producing applicable maps, 3D views and applied characterization of karst systems. Application (validation) on a series of typical case studies (about 10-20 cases in various contexts), typically in collaboration with other karst-related project of NRP61 and well known test-sites.
- B. Tool selection and tool development for the application of the proposed approach.
- C. Synthetic work on typical applied problems related to karst systems in order to define meaningful descriptors of karst systems.

- D. Hydrological modelling of some selected karst systems. Numerical tools will be applied, tested and criticized. The way to apply such tools to karst areas will be discussed.
- E. Evaluation of climate change on karst aquifers: One or two case studies investigated within points A and D will be used for assessing the effect of future climate change according to various scenarios.

This part of the project will provide the necessary concepts and tools for documenting all karst systems in Switzerland.

### **Project significance**

Results obtained will be available to administrations, privates (e.g. a hydropower company) and public on a web-site. These results will form a directly useful and usable basis for most problems related to the management of karst waters.

### **Project team**

The project will be carried out at ISSKA in a team of three people: the PhD student, one post-doc and one technician. The three people will closely work together.

The project will be supervised by Dr. Jeannin (ISSKA) and Prof. E. Reynard (Uni-Lausanne).

Collaborations with the Federal Office of the Environment (Hydrogeology Section), Swisstopo (Geology section) and several canton administrations will take place too.

### **Description of the offered position**

The work of the PhD student will be to participate to the formulation of a scientifically meaningful and applicable method for characterizing karst aquifers. This will be based on regional syntheses of the geological background in order to visualize the aquifer geometry in 3D, and on karst specific characteristics. A good geological background of Swiss geology and strong interest for karst system are therefore expected from the candidate. Because 3D modelling will be involved the candidate has to be interested and if possible experienced in this topic too.

Hydrological modelling applied to karst, including its application to the assessment of the effect of climate change on karst aquifers (water quantity and some quality issues) will be part of the work too.

Most of the regional syntheses will be based on available data on the geological and hydrogeological context. However some field work is expected in order to verify if interpretations from the literature are valid.

The PhD student has to be able to work in a team and has to be able to understand written French and German, to write one of these as well as English.

**Work location:** La Chaux-de-Fonds, + Universities of Bern, Lausanne and Neuchâtel

**Work start:** January 4<sup>th</sup> 2010, **Work end:** December 2012.

**Salary:** usual SNF PhD conditions ([www.snf.ch](http://www.snf.ch))

**Submission deadline:** November 20<sup>th</sup> 2009

**Information about ISSKA:** [www.isska.ch](http://www.isska.ch)

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