WSL Institute for Snow and Avalanche Research SLF

The WSL Institute for Snow and Avalanche Research SLF is part of the Swiss Federal Institute for Forest, Snow and Landscape Research WSL and forms a part of the ETH Domain. WSL focuses on the sustainable use and protection of landscapes and habitats, and a responsible approach to natural hazards. WSL employs approximately 500 people, of whom 130 works at SLF in Davos.

The SLF research group “Snow Processes” links research with snow cover and atmosphere. The subjects range from analysing of the snow cover, atmosphere measurements, Antarctic expeditions to numerical modelling of the snow and atmosphere interactions. As a part of an R&D project in collaboration with the group of the ‘Geophysical Institute’ at the University of Bergen, Norway, we are offering a:

**Master Thesis: “Interaction of stable water isotopes between snow and atmosphere.”**

Since the 1960s, stable water isotopes in polar snow and ice have been used as proxies for both local and global temperature records. The interpretation of ice core data and the comparison with atmospheric model results implicitly rely on the assumption that the snowfall precipitation signal is perfectly preserved in the snow-ice matrix ignoring snow-vapor exchanges between surface snow and atmospheric water vapor. However, a recent study carried out on top of the Greenland Ice Sheet combining continuous atmospheric water vapor isotope observations with daily snow surface sampling documented a clear day-to-day variation of surface snow isotopic composition in-between precipitation events. This effect was interpreted as being caused by uptake of the synoptic driven atmospheric water vapor isotope signal by individual snow crystals undergoing snow metamorphism. However, the impact of this process on the isotope-temperature reconstruction is not yet sufficiently understood, but crucial, compared to interstitial diffusion, and will alter the isotope mean value. In order to understand the basic mechanism governing the interaction between snow and atmosphere, the physical complexity of experiments have to reduce. Therefore, the goal of this Master Thesis is to perform **defined experimental runs in the cold laboratory and wind channel** at SLF Davos. You will work in an innovative interdisciplinary project and make significant contributions to the advancement of stable water isotope research in snow and ice. During your stay at Davos you will work in close collaboration with the scientific and technical staff on the following tasks:

- Literature study on stable water isotope interaction between snow and atmosphere.
- Experimental setup to analyse the effect of snow metamorphism and wind drift on the stable water isotope composition of snow and air.
- Temperature gradient snow metamorphism without airflow
- Temperature gradient snow metamorphism with airflow

- Upscaling of the experiments for wind tunnel test in the winter.
  - Running first experiments.
  - Writing report and presentation.

Individuals who are available from November 2018 and hold a bachelor's degree in mechanical engineering, material science or civil and environmental engineering are encouraged to apply. The candidate should have experience in design, construction and handling measurement devices and laboratory equipment. You are a good team player, communicative and highly motivated. You enjoy taking responsibility of tasks and executing them in an autonomous and careful manner.

We offer you an attractive working environment in the Swiss Alps and free accommodation during your stay in Davos in one of our shared SLF apartment.

Please send your complete application to Prof. Michael Lehning (lehning@slf.ch), phone +41 (0)81 417 01 58, and he will be happy to answer any questions or offer further information.

**Literature:**


