

Bachelor or Master Thesis: Reconstructing historical changes in atmospheric mercury in Switzerland using tree rings.

Background and research question: Mercury (Hg) is a potent neurotoxin present in all environmental compartments (atmosphere, oceans, soils, rivers ect.). Due to anthropogenic emissions, the Hg levels in the earth's surface have drastically increased in the past century. In Europe, Hg was and still is emitted into the atmosphere by coal combustion and production of chemical compounds. Its long residence time in the atmosphere let it travel over far distances. Tree leaves and needles may sorb and bind atmospheric Hg which can be seen in their year rings. Recently it was shown that tree rings from coniferous trees (e.g. larch) can be used to reconstruct historical atmospheric mercury levels.

Can tree rings be used to reconstruct local emissions of Hg in Switzerland? Are there regional differences in the alpine region (e.g. swiss plateau vs. remote mountain valleys)?

Project: The student will sample tree rings of European larch (*Larix decidua*) and soil from both remote alpine valleys and industrial regions in Switzerland. The samples will be analyzed for Hg using state-of-the-art techniques (thermal desorption - atomic fluorescence spectroscopy). The aim of the project is to 1.) assess Hg levels in larch tree rings in the alpine region, 2.) study the influence of Hg local emissions (chemical plant) on Hg levels in tree rings vs. global emissions 3.) reconstruct historical atmospheric Hg levels in the alpine region. Our study site is located close to Visp (VS) and in remote mountain valleys in the cantons Bern and Wallis. Depending on the student's level (BSc/MSc) the project scope will be adjusted. Starting date: flexible.

Learning goals: The candidate will be taught laboratory and sampling techniques (Hg analyses, tree ring sampling, basic soil parameters, trace metal analyses). She/he will learn how to manage her/his own Thesis project (sampling campaign, laboratory work, data analysis, interpretation, writing and presenting).

Prerequisite: The candidates have attended the Bachelor course "Introductory laboratory techniques in physical geography". For master students "Soils and sediments as environmental archive" (MSc) are recommended courses.

Supervision: Prof. Adrien Mestrot, Lorenz Gfeller, Prof. Martin Grosjean

Contact: Prof. Adrien Mestrot



Lonza Factory in Visp 1937
(commons.wikimedia.org)



Tree rings record atmospheric Hg concentrations.
(commons.wikimedia.org)



European Larch in Graubünden.
(commons.wikimedia.org)