Name of research institute or organization:

Climate and Environmental Physics, Universität Bern

Title of project:

Temporal variation of stable isotopes in Alpine precipitation

Project leader and team

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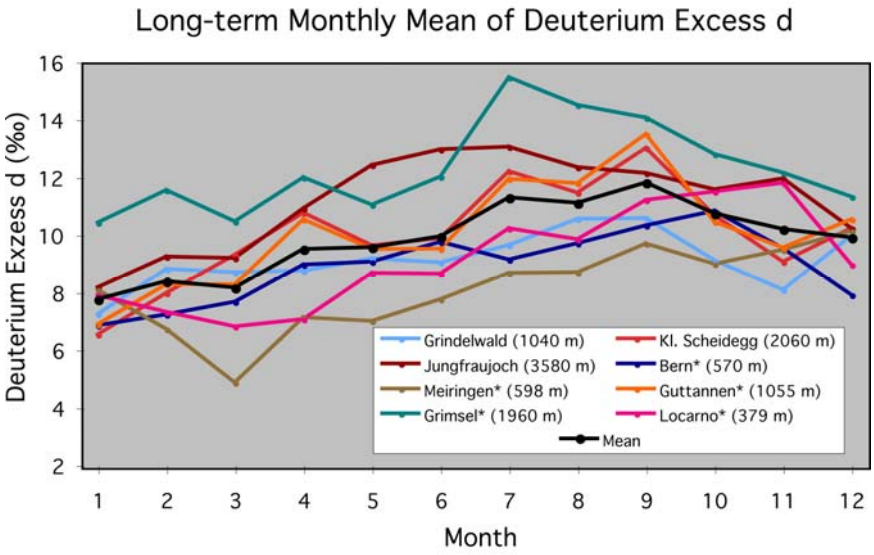
Project description:

During the last 20 years of the 20th century, Switzerland went through the most substantial climatic change since the national climate measurement and observation network was established in 1864. Summer and winter half-years experienced a sudden warming, the precipitation amounts temporarily increased and a higher frequency of heavy precipitation events during the summer half-year was recorded (1). Stable isotopes in precipitation (δD, δ^{18}O) are influenced by these changes and have already been proven to provide additional information to the understanding of changes in the water cycle (2). Of special interest is the deuterium excess d (the scaled difference of both isotopes), namely in relation to the condition at the origin of water vapour that forms precipitation. However, secondary effects such as cloud processes, evaporation from falling raindrops etc. cause local noise that overlies the original signal from the source region. The yearly averages of d recorded at NISOT, the Swiss network for the observation of isotopes in the water cycle (3), vary between 6 and 14‰ and no systematic trend with altitude can be observed. For example, the values at the Jungfraujoch research station (3580 m) are on the average 2‰ lower than at the Grimsel station (1960 m). Our ongoing research aims at a better understanding of the main processes influencing the stable isotope in precipitation (and thus the deuterium excess) on local to regional scales to extract the signal of climate variability from the data series of stable isotopes in precipitation. In this context, the data obtained from precipitation at the Jungfraujoch Research Station are of increasing importance.



The deuterium excess d in monthly composites of precipitation stations selected for differences in altitude. NISOT stations are denoted with a star. The influence of secondary processes (i.e. evaporation of falling raindrops) on the spread of the data is currently being investigated.

(1) Bader, S., Bantle, H., 2003: Das Schweizer Klima im Trend. Temperatur- und Niederschlagsentwicklung 1864-2001. Meteo Schweiz, Veröffentlichung Nr. 68.
(2) Rozanski, K., Araguas-Araguas, L.,Gonfiantini, R., 1993: Isotope patterns in modern global prcipitation, in Climate Change in Continental Isotopic Records, AGU, Washington DC 1-37.
(3) Schürch, M., Kozel, R., Schotterer, U., Tripet, J.P. 2003: Observations of isotopes in the water cycle – the Swiss National Network (NISOT), Environmental Geology, 45-1-11, DOI 10.1007/s00254-003-0843-9.

Key words:

Isotopes, precipitation, climate variability

Collaborating partners/networks:

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