Direct evidence for changes in the hydrological cycle inferred from speleothem fluid inclusions for the last 14'000 years in Milandre Cave (Switzerland)

STÉPHANE AFFOLTER[1,2,3], ANAMARIA HÄUSELMANN[2,4], DOMINIK FLEITMANN[2,5], MARKUS LEUENBERGER[1,2]

[1]Physics Institute, University of Bern, Bern, Switzerland, affolter@climate.unibe.ch

[2]Oeschger Centre for Climate Change Research, University of Bern, Bern, Switzerland

[3]now at: International Foundation High Altitude Research Stations Jungfraujoch and Gornergrat, Bern, Switzerland

[4]Geological Institute, University of Bern, Bern, Switzerland

[5]Department of Archaeology and Centre for Past Climate Change, Geography and Environmental Science, University of Reading, UK

Speleothems are able to provide direct information for the water cycle in the past, i. e. past precipitation for low to middle latitudes to complement the data obtained from ice cores in the polar regions. Among speleothems, stalagmites contain fluid inclusions traped in the calcite matrix that are a relic of past precipitation falling above the cave which subsequently feed the karst aquifer and the drip point at the time the inclusions were formed. Using a recently developed technique based on laser spectroscopy that allows a simultaneous monitoring of hydrogen (δD) and oxygen ($\delta^{18}O$ and $\delta^{17}O$) isotopes in fluid inclusions, we reconstructed for the first time, high resolution water content and water isotope records from speleothem fluid inclusions dating from present to 14'000 years B.P. (i.e. Allerod, Younger Dryas and Holocene) originating from Milandre cave (Jura mountains, NW Switzerland). The time resolution presented here vary from decadal to multi-decadal intervals, mainly depending on the water concentration enclosed in speleothems and their growth rate. For the cave region, several studies show a strong isotope-temperature dependency for recent precipitation. Furthermore, it has been shown that recent fluid inclusions mirror today's drip water, which allows us to directly reconstruct paleo-temperatures fo the region. Linking fluid inclusion data with available oxygen isotopes in calcite may significantly increase the temporal resolution of reconstructed temperatures.