naturhistorisches museum wien

presse.info

Vienna, May 18th, 2021

Lake Hallstatt´s paleo-environmental archive accessed by successful completion of a depth-record-braking scientific lake-drilling campaign

The early history of Stone Age settlement and salt mining in the Alpine region is still not yet fully understood. Also, there is a lack of reliable observational data on past environmental and climatic conditions, and frequencies and impacts of meteorological and geological extreme events of that time, that are needed to holistically understand past environmental-human-environmental interactions. A team of researchers from the University of Innsbruck, the Natural History Museum Vienna, the Geoforschungszentrum Potsdam and the University of Bern has now, for the first time, used an innovative hydraulic coring system to recover over 50 long sediment cores from Lake Hallstatt, gaining unprecedented scientific samples, that will provide unique insights into the early development of one of the oldest cultural landscapes in the world. The 6-week drilling campaign was successfully completed today.

The project "Hipercorig Hallstatt History" (H3) aims at recovering Lake Hallstatt´s complete sedimentary succession, which has been deposited in the lake since the retreat of the Traun glacier more than 15.000 years ago. With the newly-developed hydraulic coring system Hipercorig, the longest continuous sedimentary sequence to date recovered from an inner-alpine lake, now can give researchers unprecedented insights into the prehistoric past of the UNESCO World Heritage region Hallstatt - Dachstein - Salzkammergut. Scientific analyses on these cores aim at precisely determining when humans first settled in the interior of the Salzkammergut, began to influence its environment and produce salt. 400 metres above Lake Hallstatt lies one of the most important archaeological sites in Europe. More than 3,500 years ago, miners were already extracting rock salt from the Hallstatt salt mountain on an almost industrial scale. The Hallstatt site in Upper Austria is famous in the archaeological world above all for finds from a burial ground of the Early Iron Age, which gave Hallstatt its name for an epoch throughout Europe. "In addition to the cemetery with its extraordinarily rich grave goods, the finds from the prehistoric mines are now also known worldwide and, thanks to the preservation conditions in the Salzberg, they cover an extraordinarily broad spectrum," says archaeologist Hans Reschreiter from the Prehistoric Department of the Natural History Museum Vienna. Through at least 7,000 years of salt production, from the Stone Age until today, the oldest cultural landscape in the world was created around the Hallstätter Salzberg, where production is still going on. This unique history of salt has been researched and conveyed by the NHM Vienna in cooperation with Salinen Austria AG and Salzwelten GmbH for over 100 years.

"When exactly and under what environmental conditions humans first settled in the Inner Salzkammergut, began to influence their environment and produce salt is not fully understood," says Dr. Kerstin Kowarik from NHM Vienna. Over the last several years, she has been leading interdisciplinary research such as the Facealps project funded by ÖAW, and Friends of the NHM, in which, among others, the natural environmental archive of the sedimentary deposits of Lake Hallstatt were investigated for the first time. “This research has reveals the occurrence of several large historic mass-movements into the lake” explains project partner Prof. Achim Braun from the Deutschen GeoForschungsZentrum in Potsdam. "However, the cores obtained so far with the conventionally available coring methods are max. 15 m long and only cover a period of 2350 years," adds the archaeologist and human-environment researcher Kowarik.

Archives underwater: sediments as a window into the past

"The findings from these earlier coring campaigns have also shown that the individual sediment layers that have been deposited year after year at the bottom of Lake Hallstatt build up an almost continuous sedimentary sequence. Due to its high sedimentation rate, it thus contains an extremely high-resolution archive of past climatic and ecological conditions, human-environment relationships and natural extreme events, which is unique for the inner-Alpine region," says the project's leader Prof. Michael Strasser. The geologist heads the Sedimentary Geology Group at the Department of Geology and the Austrian Core Facility for scientific core analysis, where the cores will be analysed over the next few weeks. Thanks to Strasser's international network, and given the fascinating interdisciplinary scientific context as confirmed by the previous studies, it was possible to bring the latest state-of-the-art coring system to Lake Hallstatt. This new type of drilling rig "Hipercorig", by the Fraunhofer IEG from Bochum, which was developed by the Austrian company Uwitec, that also operated the system on Lake Hallstatt, now enables the necessary technical possibilities to take long continuous sediment samples - i.e. high-quality, continuous cores - from the deeper and older depositional sequences, "The heart of this new drilling platform is a hydraulic hammer drill on a long pressure tube, which generates the propulsive force in the drill hole itself via around 70 hammer strokes per second and does not have to develop it via a long and heavy drill pipe," explains drilling expert Volker Wittig from Fraunhofer IEG. The drilling system tested in Lake Mondsee and Lake Constance is now being used for its first purely scientific project deployment in Lake Hallstatt as part of the Hipercorig Hallstatt History Project.

"In deep drilling projects of this kind, however, the lake´s subbottom first must be geophysically imaged down to the predicted target depth before drilling, in order to be able to soundly and safely plan the drilling," says Flavio Anselmetti, University of Bern, expert in scientific deep drilling in lakes. Thus, in the run-up to the drilling in March 2021, reflection seismic surveys were conducted. "We were able to image the lake´s subsurface to a depth of about 50-70m, and thus could identify the best possible and safest drilling site," says Stefano Fabbri from the University of Bern, who led geophysical survey .
The 6-week drilling campaign started in April 2021 and was just successfully completed at a depth of 51 meter below the lake floor. Now, there is also going to be a geophysical borehole logging experiment being conducted by the GFZ Potsdam. Here, too, the H3 project is breaking innovative new ground at the research front of scientific drilling of lake sediments. "The logging tools developed within the framework of the International Continental Deep Drilling Programme (ICDP), will continuously record in situ physical sediment properties, such as magnetic susceptibility and natural gamma radiation, while the the entire assembly will be pulled out of the borehole. This will enable correlation and integration of the data from the cores and the borehole with the reflection seismic to ultimately infer the spatial sediment distribution patterns throughout the entire lake," says Uli Harms from GFZ Potsdam.

With the completion of the drilling, the scientific analyses now start in Innsbruck: The cores are now being analysed at the Austrian Core Facility of the University of Innsbruck by scientific core scanning and logging methods. Afterwards, the entire scientific team will meet in Innsbruck to open and sample the sediment cores for the different analytical methods and to date small leaf remains embedded in the sediment layers by radiocarbon dating analyses. The resulting data will enable the researchers to decipher the unique environmental archive of Lake Hallstatt towards addressing the archaeological, human-environment interactions paleoclimatic and geological scientific objectives.

Interdisciplinary and international research

Such a complex and scientifically and technically demanding project is only possible with the cooperation of different disciplines and institutions. The six-member principal investigator team with experts from leading scientific institutions in Austria, Germany and Switzerland brings together expertise from archaeology to palaeoclimatology:

M. Strasser (overall management, sedimentary geology and natural hazards, University of Innsbruck); K. Kowarik (Human Impact & Archaeology, NHM Vienna), H. Reschreiter (Archaeology, NHM Vienna), A. Brauer (Climate Dynamics and Landscape Evolution, GFZ Potsdam), F. Anselmetti and S. Fabbri (Quaternary Geology and Palaeoclimatology, University of Bern).
The project is supported financially and infrastructurally by a number of institutions: The Austrian Federal Forests, which own Lake Hallstatt, the Austrian Academy of Sciences, the University of Innsbruck, the Friends of the NHM Vienna, the Salinen Austria AG, the Salzwelten GmbH, the municipalities of Hallstatt and Obertraun, as well as the GFZ Potsdam, Fraunhofer IEG and Uwitec GmbH.

To download press material please click on the following link:
https://www.nhm-wien.ac.at/presse/pressemitteilungen2021/pressefahrt_hallstatt

Press contact:
Mag. Irina Kubadinow
Head of Press & Marketing
Spokesperson
Tel.: +43 (1) 521 77- 410
Mail: irina.kubadinow@nhm-wien.ac.at

Mag. Magdalena Reuss
Press & Marketing
Tel.: + 43 (1) 521 77 - 626
magdalena.reuss@nhm-wien.ac.at

Mag. Nikolett Kertész, Bakk. BA
Press & Marketing
Tel.: + 43 (1) 521 77- 411
Mail: nikolett.kertesz@nhm-wien.ac.at

Mag. Melanie Bartos
Pressereferentin
Universität Innsbruck
Tel.: +43 512 507-32021
melanie.bartos@uibk.ac.at

Mag. Harald Pernkopf
Marketing / Presse
Salzwelten GmbH
Tel.: +43 6132 200 2489
Mobil: +43 676 8781 2489
Harald.Pernkopf@salzwelten.at