



## **A great success for Beyond EPICA third drilling campaign: reached 1836 meters of depth in the Antarctic ice sheet**

*The international research project Beyond EPICA - Oldest Ice funded by the European Commission with 11 million euros and coordinated by the Institute of Polar Sciences of the National Research Council of Italy (CNR), aims to obtain data on the evolution of temperatures, the composition of the atmosphere and the carbon cycle, by going back in time 1.5 million years through analyzing an ice core extracted from the depths of the Antarctic ice sheet. By taking the legacy of last year's achievement, the complex deep ice drilling system worked days and nights, reaching a depth of 1836.18 meters by the end of this 23/24 campaign. In parallel with drilling activities, in the new processing trench at Little Dome C almost 1367 m of ice cores have been processed this season and sent to Mario Zucchelli Station to reach Europe*

In Antarctica, the third drilling campaign of the Beyond EPICA (European Project for Ice Coring in Antarctica) - Oldest Ice project, at the remote field site Little Dome C, has been successfully completed. The goal to go back 1.5 million years in time to reconstruct past temperatures and greenhouse gas concentrations, through the analysis of an ice core extracted from the depths of the ice sheet, becomes each year more real.

Funded by the European Commission with 11 million euros and with significant financial contributions from participating nations, the project will last seven years (starting in 2019) and is coordinated by Carlo Barbante, director of the Institute of Polar Sciences of the National Research Council of Italy (CNR-ISP) and a professor at Ca' Foscari University of Venice. For this project there are twelve research centers as partners, from ten European and non-European countries. For Italy, in addition to the CNR and Ca' Foscari University, there is the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), which is in charge together with the French Polar Institute (IPEV) of the logistics-related work module.

From the mid of November 2023 to the mid of January 2024, in almost eight weeks of work, the international team reached a depth of 1836.18 meters: at this depth the ice preserves information about the climate and the atmosphere of the last 195.000 years.

After a few days spent for the camp reopening operations, the team consisting of European scientists and technicians from 6 nations reunited in LDC and organized the work in two shifts, continuing the drilling operations for 16 hours a day without stopping. The ice core drill was provided by the Alfred-Wegener-Institute in Germany and the University of Copenhagen in Denmark. “The ice core drill produced consistent 4,5 m long ice cores and we drilled over 1000 m of high-quality ice cores in 6 weeks, reaching a final depth of 1836.18 m,” says Matthias Hüther, chief driller from the Alfred-Wegener-Institute. The project's final goal is to reach a depth of about 2,700 meters, which represents the thickness of the ice sheet underneath Little Dome C, a 10-square-kilometer area located at 3,233 meters above sea level, 34 kilometers from the French-Italian station Concordia, one of the most extreme places on Earth.

“This season was quite smooth: we had a slow set up at the beginning of the season, but then the team worked intensely and achieved amazing results, working tirelessly for two months at the Little Dome C camp. The processing also went really well: in just two months, the team was able to complete the processing operation on the ice cores extracted during last season and to catch up with this year's drilling depth,” says Carlo Barbante.

During this 23/24 drilling season, 1367 meters of the Beyond EPICA ice core were processed at the scientific trench installed at Little Dome C, making observations on the cores and measuring its conductivity parameters as well as performing the first cuts.

This season, some preliminary analyses have been carried out at Concordia Station: the determination of the hydrogen and oxygen isotope composition, made with a laser spectrometer on freshly extracted ice cores, allows the Beyond EPICA team to have some preliminary data to observe. “This in field analyses permit us to match the Beyond EPICA ice core records to the previous EPICA ice core drilled at Dome C. The obtained data are important to provide a preliminary dating of the ice cores so far extracted and to investigate the preservation of the climate signal,” says Amaelle Landais, research director at the Laboratory of Climate and Environmental Sciences of the French National Centre for Scientific Research.

Soon, the boxes with the Beyond EPICA ice core samples will reach the European continent with the Laura Bassi icebreaker, equipped with two refrigerated containers which will ensure the best cold conditions, at -50°C, for the precious samples during the long journey across the hemispheres.

### **A precious ‘ice core’**

The climate and the environmental history of our planet is archived in the ice, which can therefore reveal information from centuries and even hundreds of millennia ago on the evolution of temperature and on the composition of the atmosphere. Researchers will thus be able to assess the content of greenhouse gases, such as methane and carbon dioxide, in the atmosphere of the past. Then, they will be able to link these findings with the evolution of temperature.

“We believe this ice core will give us information on the past's climate and the greenhouse gases in the atmosphere during the Mid-Pleistocene Transition (MPT), which happened between 900,000 and 1.2 million years ago,” concludes Carlo Barbante. “During this transition, climate periodicity between ice ages changed from 41,000 to 100,000 years: the reason why this happened is the mystery we hope to solve.”

The activities of the Beyond EPICA - Oldest Ice project benefit from synergy with those carried out under the Italian PNRA, the National Program of Research in Antarctica, funded by the MUR and coordinated by the CNR for scientific activities, by ENEA for the operational implementation of the expeditions and by the National Institute of Oceanography and Applied Geophysics (OGS) for the Laura Bassi icebreaker activities.

### The 23/24 field season team

Here are the members of the 2023/2024 team:

Olivier Alemany (PI in the field) and Philippe Possenti from Centre national de la recherche scientifique, Rémi Dallmayr, Matthias Hüther (Chief Driller), Gunther Lawer, Johannes Lemburg from Alfred Wegener Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Andrea Ceinini and Saverio Panichi (Camp Manager) from ENEA, Ines Gay from IPEV, James Veale from British Antarctic Survey, Federico Scoto from CNR Institute for Atmospheric and Climate Science, Fortunat Joos and Michaela Mühl from University of Bern, Tamara Gerber, Iben Koldtoft and Julien Westhoff (Chief Scientist) from University of Copenhagen.

To learn more about Beyond EPICA - Oldest Ice: [https://linktr.ee/BeyondEpica\\_OldestIce](https://linktr.ee/BeyondEpica_OldestIce)

Photos and videos: <https://www.beyondepica.eu/en/gallery/field-seasons/202324/>

### In brief

**What:** conclusion of the third ice core drilling campaign for the European project Beyond EPICA - Oldest Ice

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