International team starts on drilling expedition

January 7 2020

The cruise is led by Ursula Röhl of MARUM (left) and Debbie Thomas of Texas A&M University (right). They are supported by the Expedition Project Manager Laurel Childress. Photo: SIEM offshore

The Earth's Cenozoic Era began 66 million years ago with a bang—and with the last mass extinction event on Earth until now. The meteorite impact that marked the end of the Cretaceous Period and the beginning of the Cenozoic Era was followed by a number of dramatic global events, including a heat pulse 56 million years ago. Only after this remarkable boundary did mammals develop the diversity that we know today. The climate had cooled continuously over a long period of time. During this time the environmental conditions, ocean temperatures, ocean circulation, and wind patterns also changed fundamentally. In order to better understand each of these climatic events and the overall development of climate, it is necessary to have records of the Earth's climate that are as complete and high-resolving as possible. It is especially important that these records include locations that play a key role in understanding the environmental conditions, ocean circulation and wind patterns at higher latitudes.

Zooming in on climate development

This is where the objectives of the upcoming Expedition 378 in the Southwest Pacific by the drilling vessel JOIDES RESOLUTION within the framework of the International Ocean Discovery Program (IODP) will have a significant impact. Using the deposits on the seafloor, the expedition team will produce detailed reconstructions of how the climate changed during the Cenozoic. This will include, for example, how the elevated global temperatures and the heat transport to the polar regions could be sustained 56 million years ago. It was warm all over the Earth; compared to the situation today, there was practically no temperature difference between the polar regions and the tropics, even though the solar radiation was no more intense than it is today.

The cruise is being led by Dr. Ursula Röhl of MARUM, the Center for Marine Environmental Sciences of the University of Bremen and Dr. Debbie Thomas of Texas A&M University (USA). It begins in January, will last almost five weeks, and ends in Papeete on Tahiti in February.

Return to the source of the first temperature curve

The primary goal, according to the expedition plan, is to drill several holes at a site from the predecessor program of IODP that was drilled in March 1973 at a water depth of 1,200 meters, but which only retrieved spot cores. "The temperature curve that was produced from this hole was one of the first ever constructed and, despite the sparse sampling, was able to illustrate for the first time characteristic climate fluctuations in the Cenozoic," explains Ursula Röhl. Over the past 47 years, however, both the drilling techniques and the analytic methods have improved. "Returning to this location means that we can link to the source of this very first temperature curve for the Cenozoic Era." This time there will be contiguous coring in an even deeper hole. A depth of up to 670 meters into the seafloor has been approved. By this depth the scientists hope to be able to verify all of the climatic events of the Cenozoic. Says Ursula Röhl, "We want to obtain as complete and high-quality a record as possible."

Precise ages of the sediment deposits will be determined directly on board based on microfossils. This allows researchers to identify the meteorite impact at the Cretaceous-Paleogene boundary as well as the transitions from the Paleocene to the Eocene (Paleocene-Eocene Thermal Maximum—PETM) with an age of 56 million years and from the Eocene to Oligocene at 33.9 million years ago. The PETM is characterized by an abrupt release of large amounts of carbon that triggered a rapid temperature rise—a massive global heat pulse. The transition from the Eocene to Oligocene reflects strong global cooling and initiation of the permanent ice cover in Antarctica, and is therefore another important time interval in the Earth's climate history.

The drill cores should improve our understanding of the climate events of the Cenozoic, especially in the subpolar region, including the structure of the ocean and the biogeochemical cycle. The shells of microfossils in the sediments contain chemical signatures of past climate conditions that are as unique as fingerprints. Based on the new information, researchers will be able to draw conclusions about the strength of oceanic upwelling and winds throughout millions of years, and make more precise statements about atmospheric and oceanic subsystems of the Earth's climate.

"The sediments that we obtain will provide crucial data on ocean temperatures and the carbon cycle for the vast region of the southwestern Pacific. This new knowledge will lead to great advances in our understanding of climate dynamics during the warm periods," adds co-chief scientist Debbie Thomas.

Due to a last-minute mechanical issue that developed shortly before departure, the expedition duration was shortened from nine to five weeks. This means that it will not be possible to drill at Point Nemo, the Pacific pole of inaccessibility, as originally planned. But at the same time, this will provide the team of researchers from twelve countries with the possibility to retrieve a complete sequence of sediments through the drilling of additional holes.

Provided by MARUM - Center for Marine Environmental Sciences, University of Bremen

Citation: International team starts on drilling expedition (2020, January 7) retrieved 6 May 2024 from https://phys.org/news/2020-01-international-team-drilling.html