Expedition 377 Co-chief Scientists

Prof. Ruediger Stein



Ruediger (Rudy) Stein is senior scientist at the MARUM – Center for Marine Environmental Sciences and has a professorship "Paleoceanography of the Arctic Ocean" at the University of Bremen. His scientific expertise is sedimentology, organic geochemistry, and paleoceanography. The major focus of his research is related to the long- and short-term climate evolution of the Arctic Ocean during Cenozoic times with special emphasis on the history of Arctic sea-ice cover, Siberian river discharge and circum-Arctic ice sheets. Stein has participated in 24 major research cruises in the Arctic, Atlantic, and Pacific Oceans (including seven DSDP/ODP/IODP expeditions). He was member of the IODP Expedition 302 (ACEX) Science Party, the first scientific drilling in the Arctic Ocean in 2004, and Co-chief Scientist of IODP Expedition 306 devoted to North Atlantic paleoceanography studies. In 2014 and 2018, he led the Polarstern Arctic expeditions PS87 and PS115/2, respectively, and collected the basic site survey data for selecting and optimizing the drill locations of IODP Expedition 377 (ArcOP).

Prof. Kristen St. John



Kristen St. John is a Professor of Geology at James Madison University. Her research focuses on reconstructing Cenozoic glacial and sea-ice histories based on ice-rafted sands recovered from the Arctic, North Atlantic, and North Pacific Oceans. St. John has participated in several research expeditions with the IODP program, including serving as a sedimentologist for IODP Expedition 302, the Arctic Coring Expedition (ACEX). Her expedition-related research demonstrated that Northern Hemisphere ice-rafting began at least 30 million years earlier than previously understood, which supports the hypothesis of a more bipolar Greenhouse to Icehouse transition in the Cenozoic. St. John is also a leader in undergraduate geoscience education research and helped develop the IODP School of Rock program for educators.

Expedition Operator

Mission-specific platform expeditions are conducted for IODP by the European Consortium for Ocean Research Drilling (ECORD), which represents the ocean-drilling community of 14 European countries and Canada. Operations are undertaken by the ECORD Science Operator (ESO) comprising the British Geological Survey (BGS), the University of Bremen and the European Petrophysics Consortium, made up of the universities of Leicester (UK) and Montpellier (France). ArcOP Expedition is a joint international initiative conducted by ESO, Swedish Polar Research Secretariat (SPRS), Arctic Marine Solutions (AMS) and their sub-contractors.

ECORD Science Operator

SWEDISH POLAR RESEARCH SECRETARIAT
POLARFORSKNINGSSEKRETARIATET

arctic marine solutions

Expedition updates: www.ecord.org/expedition377

International Ocean Discovery Program

The International Ocean Discovery Program (IODP) is an international marine research programme supported by 23 countries, which explores Earth's history and structure recorded in seafloor sediments and rocks, monitors sub-seafloor environments and research the deep biosphere and microbial life.

IODP INTERNATIONAL OCEAN DISCOVERY PROGRAM

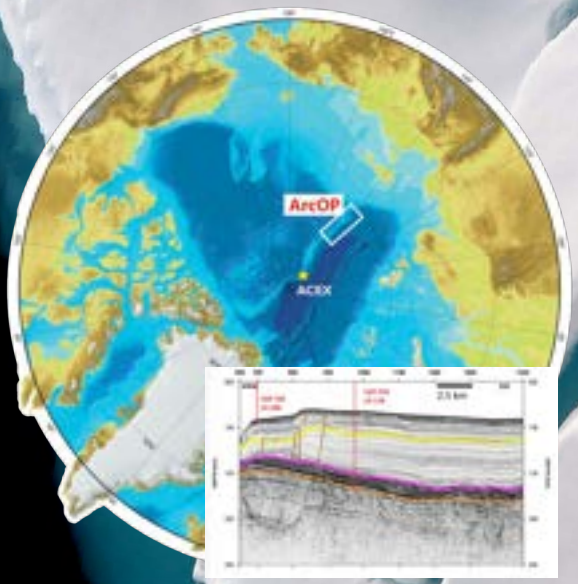
http://iodp.org

Credits: front cover: ice on Arctic Ocean (credits: Patrick Kelley, U.S. Coast Guard), seismic profile of Arctic sediments, Lomonossov ridge, with location of the drillsites of the ArcOP expedition, map (by IBCAO) with ArcOp working area (ECORD/IODP). Inside: map and logo (ECORD/IODP).

This brochure is produced by the by the ECORD Outreach Task Force.

IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

The Arctic Ocean Paleoceanography ArcOP Expedition



IODP Expedition 377

Tracking Arctic climate change

from a Greenhouse to an Icehouse

ECORD
EUROPEAN CONSORTIUM FOR OCEAN RESEARCH DRILLING

www.ecord.org www.iodp.org

ArcOP

Arctic Ocean — a key player in global climate change and the Earth system

During the last few decades, the importance of the remote Arctic Ocean in global climate and the Earth system has become clear. Key records are now needed to provide scientists the next puzzle pieces to reconstruct climate history.

Due to complex feedback processes (collectively known as “Arctic amplification”), the Arctic is both a contributor of climate change and a region that is most affected by global warming. Although the Arctic Ocean was and is a key player in the past, present and future global climate/earth system, the marine geoscience and paleoclimate research in the Arctic lags behind other world oceans. In this context, especially long and detailed records of the earlier Earth history characterized by a much warmer global ("Greenhouse") climate with elevated atmospheric CO_2 concentrations, are of overall importance. However, with the successful completion of the Arctic Coring Expedition - **ACEX** (IODP Expedition 302) in 2004, a new era in Arctic research began.

While the ACEX results were unprecedented, key questions related to the Cenozoic Arctic climate history remain unanswered, largely due to a major mid-Cenozoic hiatus (or condensed interval) and partly to the poor recovery of the ACEX record. Following-up ACEX and its cutting-edge science, the **ArcOP** drilling campaign aims to recover a continuous and complete stratigraphic record of the Cenozoic climate history of the central Arctic Ocean.

IODP Expedition 377 main themes

- Complete and detailed characterization of the Cenozoic climate **transition from Greenhouse to Icehouse** in the Arctic and its relationship to the Antarctic and global climate records.
- Special focus on **warm climate extremes:** Paleocene-Eocene Thermal Maximum, Early Eocene Climate Optimum, Middle Miocene Climate Optimum, Early Pliocene Warm Period.
- **History of Arctic Bottom and Surface-Water** characteristics with special focus on the exchange of water masses between the Arctic Ocean and the Atlantic and Pacific oceans.
- **History of Eurasian ice sheets and Arctic sea ice cover** onset and variability.
- **History of Siberian River Discharge** and its influence on sea-ice formation, water mass circulation and climate change.
- **Correlation of the marine ArcOP records with terrestrial records** from the ICDP Siberian Lake El’gygytgyn drilling.



Operations

Expedition 377 is planned and conducted by the European Consortium for Ocean Research Drilling (ECORD) as part of the International Ocean Discovery Program (IODP).

The offshore coring phase will involve coring at two primary sites using a drillship, supported by icebreaker(s). Scientists from around the world will participate in the expedition Science Party.

Due to the facilities available offshore, only a minimum number of measurements will be made on the vessel.

Soon after the offshore phase the team will meet for an "Onshore Science Party" (held at the IODP Bremen Core Repository and MARUM laboratories in Germany) for opening, describing and sampling of the sediment cores. After a period of one year (following completion of the onshore phase), the cores may be used by any scientific researcher who wishes to study them. In addition, all "shipboard data" acquired during the offshore and onshore phases will be available as legacy datasets for any researcher to use.