

EGU2020-4886

<https://doi.org/10.5194/egusphere-egu2020-4886>

EGU General Assembly 2020

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



## Towards a Continuous Cenozoic Arctic Climate Record - A Challenge for IODP Expedition 377 in 2021

Ruediger Stein<sup>1,2</sup>, Estella Weigelt<sup>1</sup>, Frank Niessen<sup>1</sup>, and Kristen St. John

<sup>1</sup>Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

(ruediger.stein@awi.de)

<sup>2</sup>MARUM and Faculty of Geosciences, University of Bremen, Bremen, Germany

Although the Arctic Ocean is a major player in the global climate/earth system, this region is one of the last major physiographic provinces on Earth where the short- and long-term geological history is still poorly known. This lack in knowledge is mainly due to the major technological/logistical problems in operating within the permanently ice-covered Arctic region which makes it difficult to retrieve long and undisturbed sediment cores. Continuous central Arctic Ocean sedimentary records, allowing a development of chronologic sequences of climate and environmental change through Cenozoic times and a comparison with global climate records, however, were missing prior to the IODP Expedition 302 (Arctic Ocean Coring Expedition – ACEX), the first scientific drilling in the central Arctic Ocean in 2004. By studying the unique ACEX sequence, a large number of scientific discoveries that describe previously unknown Arctic paleo-environments, were obtained during the last 15 years (for most recent review and references see Stein, 2019a). While these results from ACEX were unprecedented, key questions related to the climate history of the Arctic Ocean remain unanswered, in part because of poor core recovery, and in part because of the possible presence of a major mid-Cenozoic hiatus or interval of starved sedimentation within the ACEX record. Following-up ACEX and its cutting-edge science, a second scientific drilling on Lomonosov Ridge with a focus on the reconstruction of the continuous and complete Cenozoic Arctic Ocean climate history, has been proposed and now scheduled as IODP Expedition 377 "Arctic Ocean Paleoceanography - ArcOP") for late summer/early autumn 2021. Based on new seismic and coring data obtained during Polarstern Expedition PS87 in 2014 (Stein, 2015) and Polarstern Expedition PS115/2 in 2018 (Stein, 2019b), several locations for potential drill sites have been proposed and further optimized. At the primary drill site location, about 230 m of Plio-Pleistocene, 460 m of Miocene, and >200 m of Oligocene-Eocene may be recovered. These new detailed climate records spanning time intervals from the Paleogene Greenhouse world to the Neogene-Quaternary Icehouse world will give new insights into our understanding of the Arctic Ocean within the global climate system and provide an opportunity to test the performance of climate models used to predict future climate change. Within this presentation an update of the primary objectives and the drilling strategy of ArcOP Expedition 377 will be outlined. For further details as well as the drilling proposal we refer to <http://www.ecord.org/expedition377/> .

Reference:

Stein, R. (Ed.), 2015. Cruise Report of Expedition PS115/2 of the Research Vessel POLARSTERN to the Arctic Ocean in 2014 ([http://epic.awi.de/37728/1/BzPM\\_0688\\_2015.pdf](http://epic.awi.de/37728/1/BzPM_0688_2015.pdf)).

Stein, R. (Ed.), 2019b. Cruise Report of Expedition PS115/2 of the Research Vessel POLARSTERN to the Arctic Ocean in 2018. ([https://epic.awi.de/id/eprint/49226/1/BzPM\\_0728\\_2019.pdf](https://epic.awi.de/id/eprint/49226/1/BzPM_0728_2019.pdf)).

Stein, R., 2019a. The late Mesozoic-Cenozoic Arctic Ocean climate and sea ice history: A challenge for past and future scientific ocean drilling. *Paleoceanography & Paleoclimatology*, , <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2018PA003433>