**Forcing mechanisms behind the time-transgressive Younger Dryas cooling across the North Atlantic realm**

Igor Obreht1*, Lars Wörmer1, Jenny Wendt1, Susanne Alfken1, Marcus Elvert1, Achim Brauer2, Kai-Uwe Hinrichs1

1MARUM – Center for Marine Environmental Sciences and Department of Geosciences, University of Bremen, Germany (*iobreht@marum.de)

2GFZ – German Research Centre for Geosciences, Section 5.2 Climate Dynamics and Landscape Evolution, Potsdam, Germany

The Younger Dryas (YD) was the final cold phase during the last deglaciation that started with an abrupt cooling in the Northern Hemisphere within just a few years. However, the regional patterns of YD cooling in the North Atlantic realm were rather complex, where an initial abrupt reorganization of atmospheric circulation in Greenland happened almost two centuries before the onset of the YD cooling in Western Europe. To reveal and explain hydroclimate teleconnections and forcing mechanisms behind such time-transgressive regional cooling, we applied mass spectrometry imaging on an intact sediment section from the Meerfelder Maar covering the Allerød-YD transition to obtain lipid biomarker data in unprecedented resolution. Our subannually resolved fatty acid data, as an indicator of the local vegetation response to climate change at Meerfelder Maar, indicate a corresponding trend to deuterium excess in Greenland ice core during the observed time-transgressive cooling, revealing a coherent atmospheric forcing across the North Atlantic realm despite different climatic responses. A suppressed abrupt change of Western Europe climate was imposed through the transition of the westerlies to southwest-northeastern track due to amplified sea-ice formation west of Greenland, forcing lower latitude milder air masses to reach Western Europe and prevent it from abrupt cooling. Initiation of Western Europe climate deterioration started ~150 years after the onset of Greenland cooling due to southwards shift of the westerlies forced by the increased spreading of the sea-ice over the eastern North Atlantic.