

PI's:

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Arctic Ocean Paleoceanography of the Past 55 Million Years



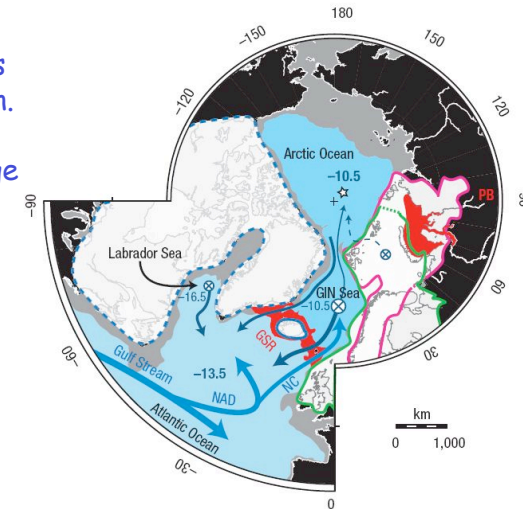
Our knowledge on the oceanographic evolution of the Arctic Ocean was until recently limited the past 1 million years. Information prior to this time was not accessible to the researchers because it was not possible to drill several 100 m long sediment cores in an ice-covered ocean. In summer 2004 an ambitious expedition (Integrated Ocean Drilling Program (IODP) Leg 302, ACEX) succeeded to drill the entire 428 m thick sediment cover of the Lomonosov Ridge near the North Pole with the help of a drilling platform and 2 ice breakers and recovered sediment cores reaching back into the Cretaceous.

Major Results so far:

While 55 million years ago surface temperatures of the Arctic Ocean were apparently as high as 24°C, the first occurrence of dropstones 45 million years ago clearly indicate the presence of sea ice, 35 million years earlier than previously believed (Moran et al., 2006).

Above a hiatus between 43 and 18 million years ago, a pronounced change between organic-rich layers and brownish well-oxidized sediments documents that the Fram Strait between the Arctic and North Atlantic Oceans opened already at about 17.5 million years ago and thus allowed ventilation of the deep Arctic Ocean (Jakobsson et al., 2007)

The neodymium isotope composition of seawater extracted from the sediments of the past 15 million years, which were dated using the cosmogenic isotope ¹⁰Be (Frank et al., 2008), shows that exchange with the North Atlantic was weaker than today with the exception of the warm periods of the past 400,000 years. Deep water circulation in the Arctic Ocean was strongly influenced by formation of sea ice and the related production of highly saline brines in the Kara Sea area (Haley et al., 2008a,b).



Publikationen:

Frank, M., Backman, J., Jakobsson, M., Moran, K., O'Regan, M., King, J., Haley, B.A., Kubik, P.W., Garbe-Schönberg, D. (2008): Beryllium isotopes in central Arctic Ocean sediments over the past 12.3 million years: Stratigraphic and paleoclimatic implications.- *Paleoceanography*, in press.

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Haley, B.A., Frank, M., Spielhagen, R.F., and Fietzke, J. (2008): The radiogenic isotope record of Arctic Ocean circulation and weathering inputs of the past 15 million years.- *Paleoceanography*, in press.

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Moran, K., Backman, J., Brinkhuis, H., Clemens, S.C., Cronin, T., Dickens, G.R., Eynaud, F., Gattacceca, J., Jakobsson, M., Jordan, R.W., Kaminski, M., King, J., Koc, N., Krylov, A., Martinez, N., Matthiessen, J., McInroy, D., Moore, T.C., Onodera, J., O'Regan, A.M., Pälike, H., Rea, B., Rio, D., Sakamoto, T., Smith, D.C., Stein, R., St. John, K., Suto, I., Suzuki, N., Takahashi, K., Watanabe, M., Yamamoto, M., Farrell, J., Frank, M., Kubik, P., Jokat, W. and Kristoffersen, Y. (2006): The Cenozoic palaeoenvironment of the Arctic Ocean.- *Nature* **441**, 601-605.