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Globally warmer, but colder Nordic Seas

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Global Pliocene temperatures was 2-3°C warmer than present, and the strongest warming occurred at high latitudes, in line with polar amplification seen as a characteristic of past, present and future warming scenarios. Hence, we expected to see warm ocean temperatures when we initiated the investigation of Pliocene conditions in the eastern Nordic Seas (ODP Site 642B, 67°13.5′N, 2°55.7′E, 1286 m water depth). What we do see is a more complex history. Our results show that the Pliocene should not be considered as one stable warm period. Rather, the Pliocene is characterized by a series of climate states with distinctly different climate conditions. The warmest of these climate states shows SSTs warmer than Holocene values, the coldest shows SSTs comparable to the coldest recorded Holocene values. Subsurface (ca. 50-200 m water depth), the warmest Pliocene temperatures never exceeds maximum Holocene values, and for most of the Pliocene the subsurface temperatures are towards the cold end of the Holocene range, or colder. Benthic conditions are in the warmest cases comparable to Holocene conditions, but most of the time, cold bottom water is indicated. At the same time, sources of information related to Pliocene high latitude atmospheric temperatures indicate significant warming. The warm atmospheric temperatures, and warm SSTs can reflect a response to stronger radiative forcing. The colder subsurface and bottom waters, at times also cold SSTs, and evidence for a well ventilated upper water column and less ventilated bottom water, emphasize that ocean circulation may have been very different from modern conditions through large parts of the Pliocene. The characteristics of the water column, and potential causes behind the differing oceanography will be discussed.