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Watermass evolution and ice-drift patterns in the subarctic Norwegian Sea during the Holocene

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Holocene climate records from the polar North show a strong tie to changes in insolation in general and, on the regional scale, to the particular post-glacial environmental development. Because the eastern Nordic seas act as through road for the oceanic heat into the Arctic Ocean we have investigated two crucial oceanographic components in the southern Norwegian Sea, the Arctic Front (AF) and the Norwegian Atlantic Current (NAC). Using deep-sea sediment records we analyzed different foraminiferal species for O-isotopes and interpreted the planktic foraminiferal assemblage variations in combination with records of ice-rafted detritus (IRD). It is shown that after adjacent ice shelves and glaciers had retreated inland and away from the coastlines highest surface temperatures occurred between 10.5 and 8.5 ka. An intermittent cold phase around 8 ka is associated with both IRD and increased abundance of polar species N. pachyderma (s). Afterwards, high surface temperature were regained but started to decrease at the AF after 6 ka, concomitant with a persistent occurrence of IRD. This cooling trend continued into the latest Holocene when highest IRD input is noted. Within the NAC, relatively stable and warm conditions are still found between 2.5 and 1 ka, in both planktic and benthic O-isotopes. Although variability among certain foraminiferal species would indicate some surface changes, the abundance of N. pachyderma (s) increased from 30 % to 70 % during the last 1ka (Little Ice Age). This increase is associated with highly variable O-isotope values throughout the entire water column. We interpet the records of the past 10.5 ka, and in particular the times when rather cold surface conditions prevailed, to be the result of changes in overall atmospheric circulation. These caused an intensification of the gyre system in the Greenland and Iceland seas thereby rerouting polar water masses, and probably winter sea ice, far into the eastern Nordic seas.