

## **Palaeoclimatic research based on marine Lateglacial and Holocene shelf records from the North Icelandic shelf: Antiphase Lateglacial but in-phase Holocene oceanographic conditions across the northern North Atlantic**

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A high resolution study of foraminifera, diatoms and stable isotopes in marine shelf sediments off North Iceland reveals major changes in sea-surface conditions since about 15,000 cal. years (yr) BP. Data have been obtained from sediment cores obtained at about 400 m water depth from sedimentary basins on both sides of the submarine Kolbeinsey Ridge. The chronology of the sedimentary record is based on tephrochronology supported by AMS  $^{14}\text{C}$  dates.

During the Lateglacial, the planktonic foraminiferal assemblages are characterised by consistently high percentages of sinistrally coiled *Neogloboquadrina pachyderma*, which is a polar species. However, major environmental variability is reflected by changes in stable isotope values and diatom assemblages. Low  $\delta^{18}\text{O}$  values indicate a strong freshwater peak as well as brine formation by sea-ice freezing during a pre-Bølling interval (Greenland Stadial 2). The benthic foraminifera suggest a strong concurrent subsurface influence of relatively warm and saline Atlantic water, and mixing of cold and warm water masses is indicated. Similar environmental signals are observed during the Younger Dryas (Greenland Stadial 1) around the level of the Vedde Ash. Each freshwater peak is succeeded by an interval of severe cooling both at the beginning of the Bølling-Allerød Interstadial (Greenland Interstadial 1) and in the initial part of the Preboreal, presumably associated with the onset of intense deep water formation in the Nordic Seas. This indicates an east-west antiphase relationship in oceanographic conditions across the northern North Atlantic during at least parts of the Lateglacial and early Preboreal.

The Holocene and modern current system in the area appears to have been established at around 10,200 cal. yr BP. The Holocene thermal optimum, between 10,200 and about 7000 cal. yr BP, is interrupted by a marked cooling of the surface waters around 8200 cal. yr BP. This cold event is clearly expressed by a pronounced increase in the percentages of sinistrally coiled *N. pachyderma*, corresponding to a temperature decrease of about 3°C. A general cooling in the area is indicated after 7000-6000 cal. yr BP, both by diatom data and by the planktonic foraminiferal data. The long term trend and major Holocene fluctuations correspond to the trends in the Greenland ice cores and in records from the eastern part of the Nordic Seas.

Icelandic tephras of Lateglacial and Holocene age in sediment cores and the correlation of these with tephra layers in terrestrial soil or ice core sections offers reliable dating independent of reservoir age variability. Land-sea correlation of tephra markers, that have been radiocarbon dated with terrestrial material or dated by documentary evidence provides a tool for monitoring reservoir age variability in the region. Age models developed for the shelf sediments north of Iceland, based on offshore tephrochronology on one hand and on calibrated AMS  $^{14}\text{C}$  dates of marine molluscs on the other, display major deviations, both during the Lateglacial and during the last 4500 years. Observed reservoir ages are generally considerably higher, by up to 450 years, than the standard model ocean. It is postulated that the intervals with increased and variable marine reservoir age reflect incursions of Polar and Arctic water masses derived from the East Greenland Current to the Iceland Sea and the North Icelandic shelf.