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Lateglacial and Holocene palaeoceanographic events in the Iceland Sea: Tephrochronology and AMS ^{14}C dating resolving temporal changes in marine reservoir ages in the northern North Atlantic

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One of the issues of absolute dating and correlation of marine palaeo-archives with ice-core and other terrestrial climate data archives is the need for independent dating control of marine radiocarbon-based age models. This problem relates to the lack of information about the reservoir age variability of the world's oceans. The modern (pre-bomb) reservoir age of the waters off Iceland is generally assumed to be c. 400 yrs, and this correction is conventionally applied to marine ^{14}C ages from Iceland. At present there is no surface ^{14}C gradient between 40° and 70°N in the North Atlantic surface waters. The coastal and shelf surface waters around Iceland are dominated by the Irminger Current, which is derived form the North Atlantic Current. Modern reservoir age values around Iceland are very similar to those off the west coast of Norway and Scotland. The oceanographic Polar Front separates the Irminger Current from the East Greenland Current to the west and north of Iceland. The modern reservoir age of the East Greenland Current north of the Polar Front is higher, about 550 yrs, indicating that the recent, pre-bomb apparent age difference across the Polar Front is about 150 yrs.

The presence of Lateglacial and Holocene tephra markers from Icelandic source vol-

canoes in sedimentary deposits on the North Icelandic shelf, and the correlation of these with tephra layers from dated volcanic events in reference soil and ice-core sections around the North Atlantic, offers a dating tool which is independent of 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 14C dates of marine molluscs on the other, display major deviations, both during the Lateglacial and the Holocene. It is suggested that discrepancies between the two age models are partly related to palaeoceanographic changes in the region and resulting changes in the reservoir age of the water masses on the North Icelandic shelf. During Lateglacial conditions, Polar and Arctic water masses prevailed, and a reservoir correction of 750-800 yrs is required at the level of the Lateglacial Vedde Ash in this region. Our data suggest that the reservoir age was even higher at the end of the pre-Bølling, presumably at least 1000 yrs. The Holocene Climatic Optimum on the North Icelandic shelf is reflected by several palaeoceanographic proxies, showing a pronounced influence of Atlantic waters of the Irminger Current. A reservoir age close to 400 yrs is found both at the level of the Saksunarvatn ash as well as during the warmest interval between 8000 and 7000 cal BP. There is, however, a gradual change to higher reservoir ages, coinciding with increased influence of Polar waters, after 7000 cal BP. Particularly high reservoir ages (about 600-800 yrs) are observed during Late Holocene cold events with a strong contribution of Polar waters to the area, i.e. around 4300 cal BP, just after 3000 cal BP, and during the Little Ice Age.