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Holocene sea surface and deepwater conditions in the Iceland Basin derived from microfossil assemblages

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Holocene ocean conditions in the Iceland Basin were studied at a multi-decadal to centennial resolution with the help of dinoflagellate cyst and foraminiferal assemblages. The studied core, located at ∼2120 m water depth at about 200 km south of Iceland, contains 4 distinct tephra layers of several centimeters thick. The ash layers are basaltic-rhyolitic bimodal and shown by major and trace element to have geochemical signatures corresponding to volcanism from the Katla volcano. The rich dinoflagellate cyst assemblages reveal 3 major phases. A first phase, from the end of the Younger Dryas to about ∼5.6 ka BP, shows fairly diverse assemblages, suggesting a pronounced seasonality with optimal growing conditions for several species occurring at different times throughout the year. This interval also features the highest relative abundances of the most thermophilic species, Spiniferites mirabilis, indicating high summer sea surface temperatures in line with high summer insolation. Assemblages from the second interval, spanning from ∼5.6 to ∼2.2 ka BP, have a strong "North Atlantic Drift" signature, which points to strong activity in the Icelandic branch of the latter. High shares of heterotrophic species in the first half of this interval suggest significant primary productivity in the surface waters during that time. Finally, present-day conditions installed around 2.2 ka BP. In addition to these long-term trends, the assemblages show a pronounced variability on a multi-decadal to centennial scale. Preliminary foraminiferal data show a strong but varying influx of North Atlantic Deep Water. A number of forcings can be invoked for these short-term fluctuations, albeit that the volcanoclastic events appear to have no obvious effect on the dinoflagellate cyst assemblages.