Water masses in Kangerlussuaq, a large fjord in West Greenland: the processes of formation and the associated foraminiferal fauna

The water masses in Kangerlussuaq (Søndre Strømfjord) in West Greenland were studied during both a summer and a winter field survey. In order to obtain an improved understanding of the relationship between the physical oceanography and modern foraminiferal assemblage distributions, conductivity–temperature–density measurements were carried out in connection with sediment surface sampling along a transect through the 180 km long fjord. The exchange between the inner part of Kangerlussuaq (275 m deep) and the ocean is restricted by an almost 100 km long outer, shallow part. Our study shows that the water mass in this inner part is almost decoupled from the open ocean, and that in winter the inner part of the fjord is ice covered and convection occurs as a result of brine release. These processes are reflected in the foraminiferal assemblage, which consists of a sparse agglutinated fauna, indicative of carbonate dissolution. A monospecific, calcareous assemblage (Elphidium excavatum forma clavata) occurs in the innermost, shallow part, which is strongly influenced by sediment-loaded meltwater during the summer. The outer, shallow part of the fjord is dominated by strong tidal mixing, and in summer the density of the incoming water does not exceed the bottom water density in the inner fjord. The foraminiferal assemblage here reflects high bottom water current velocity and an influence of water with relatively high salinity. Kangerlussuaq can be regarded as a modern analogue for ice-proximal environments in the Quaternary, with a strong seasonal forcing caused by freshwater run-off and sea-ice formation.

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