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Plio-Pleistocene biostratigraphy and surface water masses in the Bering Sea: planktonic foraminiferal evidence from IODP Site U1340 and Site U1343

Katrine Husum
Norwegian Polar Institute, Tromso, Norway (katrine.husum@npolar.no)

The Pliocene - Pleistocene evolution of surface water masses in the Bering Sea is not well understood, and the aim of this study is to establish a Plio-Pleistocene planktonic foraminiferal biostratigraphy for the Bering Sea and investigate changes of the surface water circulation. The Bering Sea is a marginal sea of the North Pacific connected to the Arctic Ocean through the Bering Strait providing the only connection and exchange of waters between the Pacific and Atlantic Oceans in the Northern Hemisphere. IODP Site U1340 and Site U1343 in the Bering Sea have been investigated with regard to planktonic foraminifers and fragmentation. The base of Site U1340 dates back to the Early Pliocene and the base of Site U1343 to the Early Pleistocene. Site U1340 is situated at Bowers Ridge, southern Bering Sea, under the axis of the Alaskan Stream transporting warm water into the Bering Sea. Site U1343, is situated near to the gateway to the Arctic Ocean in the northern Bering Sea. At both sites there are none or very few planktonic foraminifers during the Pliocene and early Pleistocene. After 1.3-1.4 Ma the planktonic foraminifers are continuously present for most of the samples examined. Three stratigraphic events have been identified in this study: 1) the first occurrence (FO) of *Neogloboquadrina inglei* is observed at 1.4 - 1.5 Ma, 2) the change in the coiling ratio of *Neogloboquadrina pachyderma* from right to left at 1.2 Ma, and 3) the last occurrence (LO) of *N. inglei* at 0.7 Ma. The oldest event may be affected by poor preservation of foraminifers in older sediments. However, the ages of the latter two events seem to agree with the dating of the same events at the Californian margin observed by Kucera and Kennett (2000) implying that these events are robust regional events for the entire northern Pacific. Multivariate analyses of the quantitative planktonic foraminifer data show three main faunal assemblages. The oldest assemblage from 1.3 - 1.4 Ma to 1.2 Ma is dominated by the subpolar *N pachyderma* s.l. (dex) together with *Globigerina bulloides*. Other species in this fauna are *N. inglei*, *N. pachyderma* s.l. (sin), *Globigerina umbilicata* and *Turborotalita quinqueloba.* After 1.2 Ma the faunal assemblage is dominated by the polar *N. pachyderma* s.l. (sin), but the remaining species are the same as before. At 0.7 Ma *N. inglei* disappears, whilst the remaining fauna assemblage stays the same, with *N. pachyderma* s.l. (sin) still dominating, reflecting cool Pleistocene conditions. Prior to 1.4 – 1.3 Ma there are very few or no planktonic foraminifers. Low shell fragmentation and lower TOC suggest that the lack of planktonic foraminifers in these sediments cannot be explained either by a shoaling of the carbonate compensation depth or by enhanced supralysoclinal dissolution. Instead, we argue that the appearance of abundant foraminifers in the sediment reflects the same evolutionary adaption of *N. pachyderma* (sin) to cold conditions to have occurred after 1.1-1.0 Ma as in the North Atlantic (Huber et al., 2000).