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Investigating bacterial habitat transition in response to past primary productivity in Arctic sediments

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Six surface sediment cores were recovered from the western Arctic Ocean (Chukchi Sea) through IBRV ARON expeditions. Of these cores, sedimentary datasets were constructed from color indices, grain size and profiles of elemental and mineral composition. The sedimentary properties provide distinguishable patterns among sediment cores. Vertical distribution of sediment grain size revealed a regional difference between East Siberian and North America. In particular, the elemental pattern responded to the color change of the sediment cores near the Chukchi margin. For example, dark brown layers in the upper parts of the cores were indicated by the color indices and showed elevated Mn/Al ratios, suggesting the influence of regional variation in terrestrial input since the deglacial period. Furthermore, grain size distribution and contents of detrital dolomite and organic carbon, as well as elemental composition, were considered to determine sediment provenance and sedimentation environments during the Holocene. On the other hand, we found that sedimentary patterns projected by NMDS (Non-metric multidimensional scaling) are comparable with that of bacterial profile. Our findings have important implications for the availability of microbial biogeography in the sedimentary conditions, suggesting that the bacterial profile integrated with sedimentary properties seem to be useful for tracking bacterial habitat transition, which reflects climate-triggered changes from the paleodepositional environment. In the present study, the multidisciplinary approach, based on microbiology, geology, and geochemistry, was applied to survey the bacterial assemblages in Arctic sediments and help further integrate the bacterial biogeography and biogeochemical patterns in the Arctic Ocean. Over geological timescale, the climate change may provide putative evidence for an ecological niche for the Arctic bacterial assemblages as well as sedimentary conditions in response to the paleoclimate change.