Late Cretaceous climate change in the sub-Arctic region recorded by dinoflagellate cysts

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Arctic Late Cretaceous paleoclimate is poorly understood due to the limited number of available sections and their often discontinuous nature. We investigate a unique, composite section of core-samples from the Greenland-Norwegian Seaway, applying organic-walled dinoflagellate cysts as sensitive proxies of palaeoenvironmental conditions. The Late Cretaceous climate, often referred to as a greenhouse world, likely experienced significant cooling towards its end. Some studies even suggest a concern about glacial conditions in the high latitudes. The sea-surface temperatures estimated by different methods indicate temperature range from below freezing up to 15°C in high latitudes during the latest Cretaceous. According to our study, distinct variations in the assemblage composition recorded from Albian to Maastrichtian provide indirect evidence for climate changes, indicating sea-level fall and gradual cooling towards the end of the Cretaceous. High numbers of peridinioid cysts in the Coniacian, Santonian and ?lower Campanian succession are possibly associated with high-productivity connected to shallow marine conditions, strong terrigenous influx and warm sea-surface temperature. Initial decrease of low-latitude dinoflagellate cysts in the sediment from the Greenland-Norwegian Seaway is recorded in the Campanian, and an influx of high-latitude dinoflagellate cysts in the late Maastrichtian. This is interpreted as a possible change in water mass circulation that could have been caused by reconfiguration of marine gateways between Tethys and the Arctic, and/or cooling that was most likely triggered by lowering concentration of carbon dioxide. The interpretation is partially supported by Earth system models that indicate Campanian and Maastrichtian sea-surface temperatures of 10–14°C and 4–7°C in the Greenland-Norwegian Seaway and central Arctic, respectively.