



A sea-ice free Arctic Ocean?

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The coasts of North Greenland, the northernmost in the world, are presently beleaguered by year-round sea-ice. The area borders on the Arctic Ocean and the Fram Strait, and drifting ice travels along the coasts towards the Nordic Seas, and these coasts are also predicted to be among the last strongholds for the rapidly diminishing sea ice cover. However, flights of raised beach ridges along the outer coasts show that waves once washed the shores, implying that this extreme area in the past has seen periods when sea-ice was absent for some time every summer.

These results have emerged from field work in the summer of 2006. The preservation of the beach ridges is conditioned by isostatic emergence, which raised the land, and after a short period of exposure to coastal processes moved the shore features above the reach of waves or sea ice. We are in the process of assessing the age and duration of these events by C14 dating of mollusc shells in the sediments, OSL dating of sediments, and – as an experiment – exposure dating of pebbles in wave generated sediments. In addition to this, we construct digital terrain models to precisely differentiate zones of wave action from those produced by sea ice.

Preliminary results indicate that the period of wave action in the southern areas lasted for several millennia, from c. 9000 to c. 5000 years ago, while in the extreme north it was limited to a short period around 7000 years ago. In all areas the present day pattern of year-round sea ice seems to have become established around 5000 years ago.

Implications of this are that the Arctic Ocean in the Early Holocene experienced a situation similar to the predicted green-house scenario, and we are studying the effect this had on local environments and glacier dynamics. Incidentally, the first invasion of humans to the area came shortly after the establishment of year-round sea ice, indicating that it was a climatic “deterioration”, not “amelioration” that made life possible in

this hostile area.