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Holocene environmental change in Kamchatka: a synthesis

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Abstract

We present a synthesis of the results of a multiproxy, multisite, palaeoecological study of Holocene environmental change in Kamchatka, Far East Russia, details of which are presented elsewhere in the volume. We summarise the results of the analyses of pollen, diatom, chironomid, and testate amoebae assemblages, together with stable isotopes of oxygen and carbon, and sediment characteristics from the sediments of five lakes and a peat succession on a latitudinal gradient of the Kamchatka Peninsula, to infer environmental change and establish the major climate forcers and climatic teleconnections. There are synchronous shifts in the assemblage composition of most of the biota and across most sites at 6.5-6.2 ka BP, 5.2 ka BP, 4.0 ka BP, and 3.5 ka BP, suggesting a response to strong regional climate forcing at these times. These dates correspond to the warmest part of the Holocene Thermal Maximum (HTM) (6.5-6.2 ka BP), the beginning of the Neoglacial cooling (5.2 ka BP), the coolest and wettest part of the Neoglacial (4.0 ka BP), and a switch to warmer and drier conditions at 3.5 ka BP. Our results provide evidence for the penetration and domination of different air masses at different periods during the Holocene. Cool and dry periods in winter (e.g. at 6.0 ka BP) were driven by a relatively weak pressure gradient between the Siberian High and the Aleutian Low, whereas cool, wet periods in winter (e.g. the Neoglacial and during the LIA) developed when these two systems increased in strength. Warm, dry, continental periods in summer (e.g. at 2.5 ka BP) were driven by a weakening of the Siberian High. We find that the timing of the HTM in Kamchatka is later than in the Eurasian arctic but similar to northern Europe and the sub-arctic part of eastern Siberia. This progressive onset of the HTM was due to the effects of postglacial ice-sheet decay that modulated the routes of westerly storm tracks in Eurasia.