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Late Pleistocene to Holocene climate changes on Kamchatka, Russian Far East, inferred from pollen records

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The paleoclimates and paleoenvironments of the North Pacific Beringia, which has provided a bridge for biotic interchange between Asia and North America, and a route of human migration in the past, are recently of special interest. Despite this, Kamchatka peninsula as a part of the Beringia remains still poorly studied in terms of its late Pleistocene-Holocene history. Few previous pollen records are rather discrepant because of poor age control; furthermore, the most of these records is available only in Russian that prevents from their wider international discussion. To cover this gap, we overviewed the most of published paleoclimate records including our latest pollen data, which have been obtained from the sites with negligible volcanic influence, and synthesized the late Pleistocene-Holocene climate changes on Kamchatka. Chronologies of poor radiocarbon dated and earliest undated records have been revised based on newly available tephrochronological data that allowed relevant records correlation over the peninsula. The data synthesis suggest that the climate during ca. 12-6 ka (all ages are given as14C kyr BP) was generally mild and very wet under strong maritime influence of the Pacific air masses, and therefore, Younger Dryas cold event was not pronounced on Kamchatka. First expansion of stone birch forest, which occurred overall the peninsula, indicates a warming trend since ca. 8 ka and maximal warmth between ca. 5 and 4.5 ka. Since ca. 6 ka, climate continentality tended to increase that caused by weakening of the Pacific influence while the impact of Siberian High strengthened progressively. During ca. 4.5-3.5 ka a degree of continentality decreased, the climate was cold and wet that is in good agreement with Neoglacial cooling event,

which is widely reported from the Asian mainland and other parts of Northern Pacific. From ca. 3.5 ka to the present, a newly strengthened climate continentality accompanied by general warming trend with minor cool excursions led to spatial heterogeneity of climatic patterns. During that time, second maximum of stone birch forest spreading recorded at both coasts of the peninsula while coniferous started to advance in Central Kamchatka Depression: from ca. 3-2.5 ka - larch and then, during a wetter interval ca. 2-1 ka - spruce. The highest rates of coniferous expansion since ca. 900 yrs BP resulted in “Coniferous Island” formation. A prominent spruce forest advance during last 300 yrs coincides well with Little Ice Age cooling event. Pollen records derived from volcanic-affected areas on Kamchatka suggest more complicate environmental response to regional climate change due to local volcanic impact. The results obtained could be useful within the framework of the North Pacific climate models, which simulate the late PleistoceneHolocene evolution of regional climatic patterns. Meanwhile, contributions of well-dated and higher-resolution climate proxies for Kamchatka are still welcome.