

PP53A-1115: First identification of cryptotephra from Kamchatka in a Greenland ice core and new tephra links between distal climate records from Greenland and the northwest Pacific

Friday, 15 December 2017

13:40 - 18:00

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Our work presents new correlations between cryptotephra deposits found in Greenland ice cores and widespread tephra layers found in terrestrial and marine records in the northern Pacific, providing: 1) a unique opportunity to examine climate records in distal locations and 2) an independent assessment of radiocarbon dates and marine reservoir calculations, using ages derived from Greenland Ice Core Chronology 2005 (GICC05).

Low concentrations of tephra grains from two well-known eruptions from northern Pacific Arc volcanoes have been traced in the NGRIP and NEEM ice cores; the first from a Holocene eruption from Khangar volcano in the Kamchatka Peninsula (eastern Russia), and the second from an eruption during the late glacial/interglacial transition (LGIT) from Towada in Japan. Correlations were based on the chronological position of layers and geochemical characterisation by EPMA and LA-ICP-MS to derive major oxide and trace element concentrations.

In NGRIP the rhyolitic KHG tephra from Khangar volcano (western Kamchatka) has a GICC05 age of 7950 ± 41 years b2k and is located close to the termination of the 8.2 ka cold event that affected the Northern Hemisphere. KHG is a key terrestrial marker deposit in Kamchatka and is stratigraphically significant as it marks the end of this cold event in Kamchatka in a number of records. This is the first finding of the KHG tephra outside Kamchatka and the first confirmed identification of any Kamchatka tephra in Greenland ice. Additionally, the correlation of a rhyolitic cryptotephra in found in NEEM and NGRIP to a widespread Japanese deposit, Towada To-H ($15,706 \pm 113$ a b2k) represents the first long range tie-point to be established within the LGIT, creating an opportunity help validate local marine reservoir effect calculations of cores containing To-H from the forearc terrace of the Japan Trench. The findings highlight the relevance of locating long-range, low-concentration cryptotephra deposits in well-dated ice cores.

Plain Language Summary

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