

Asynchrony of abrupt climate changes between the north Atlantic and Lake Suigetsu, Japan during the Last Termination

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High-resolution pollen analyses were done on the annually laminated (varved) sediment core from Lake Suigetsu, Japan. The analyzed part of the core spans from ca. 16,000 to 10,000 Suigetsu varve years before present (SG vyr BP), the period typically represented by the deglacial warming and the series of abrupt climate changes. The time resolution of the analyses is slightly lower than 15 years in average. The age of each analyzed sample was determined by varve counting at annual resolution, though the error of +/- 100 to 150 years is potentially included.

Climate indices (mean annual temperature) were quantitatively inferred to the pollen curves using the Best Modern Analogues (BMA) method. The resultant climate curve was calibrated by the method of Nakagawa et al. (2002) for the purpose of distinguishing statistically meaningful climate fluctuations from others.

An abrupt warming event which seems to be a counterpart of Bolling onset was recognized at ca. 15,000 SG vyr BP, several centuries earlier than in the North Atlantic. Conversely, a Younger Dryas-like stadial phase started at ca. 12,300 SG vyr BP, several centuries later than in the North Atlantic.

The earlier onset of the interstadial phase in Lake Suigetsu is consistent with the growing body of evidences which show that the deglacial climate warming in the Pacific and the southern hemisphere preceded that of the north Atlantic, implying that the climate system of the Pacific and the southern hemisphere responded more linearly to the increase of the solar insolation. The later onset of the stadial phase shows, on the contrary, that the cooling event was triggered by the north Atlantic forcing agent (most possibly the melt water pulse: MWP) and it expanded its effect to the Pacific regions with several centuries of delay.

The climate changes at Lake Mikata (reported by the authors in the Joint Meeting of Earth and Planetary Science, 2002, Tokyo) showed that the trend of deglacial warming in Japan was more gradual than abrupt, also implying stronger linkage to the low-latitude Pacific and the southern hemisphere. However, the high-resolution analyses at Lake Suigetsu (just adjacent to Lake Mikata sharing the common vegetation setting and pollen catchment) revealed that the influence from the north Atlantic to Japan is also present though at much smaller amplitude. This is in accordance with Porter and An (1995) who proposed the linkage between the north Atlantic and China through seasonally limited factor such as winter monsoon.