



Super Interglacial Teleconnections between Lake El'gygytyn, NE Russia, and the West Antarctic Ice Sheet: a Milankovitch answer?

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Geologic records of the warm Pliocene and Pleistocene super interglacials from both the Arctic and the Antarctic show us that ice sheets are more vulnerable to subtle polar warming than once thought. The continuous 3.6 million-year old sediment record from Lake El'gygytyn (Lake E), the largest, deepest unglaciated Arctic lake located in central Chukotka, Russia, contains evidence of the warm forested Pliocene and the transition to changing glacial/interglacial climate cycles including at least 9 super interglacials and numerous other strong interglacials. Most of these super interglacials especially MIS 11 and 31, record conditions warmer than MIS 5e and many occur when global cycles are dominated by apparent 41ka forcing during the transition from the warm Pliocene to stronger G/IG variability. Given community consensus on the reduction of the Greenland Ice sheet (GIS) during MIS5e, we suggest that previous interglacials likely forced even larger reductions in the GIS, perhaps consistent with cosmogenic isotope exposure histories. We can best match MIS 11 and 31 from the Antarctic ANDRILL records when diatomaceous ooze deposition in the past recovered from under the modern Ross Ice Shelf suggests collapse of the WAIS and open water conditions. It is possible that a large number of the other Lake E super interglacials correspond to other intervals of WAIS collapse, within the uncertainty of the ANDRILL chronology. The forcing of super interglacials was not necessarily the result of high atmospheric CO₂ but the result of preconditioning during periods of extremely low eccentricity and high obliquity. The challenge is now to incorporate oceanographic models (as suggested in Melles et al. 2012) to gauge ice sheet and ocean circulation sensitivity and timescales to preconditioning. Yet confirmation of past warming driving frequent ice sheet collapse in both hemispheres is clear geologically-based evidence that informs our future.