

## State dependence of climatic instability from ice-core records over the past eight glacial cycles

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Climatic variability on millennial timescales with bipolar seesaw pattern during glacial period has been documented in palaeo-climatic records, but their frequencies and relationships with mean climatic state are still unclear. Here we investigate the long-term characteristics of such variability using a new 700,000-year ice core record from Dome Fuji, East Antarctica, combined with another long Antarctic record. The  $10^3$ - to  $10^4$ -year warming events over the past eight glacial-interglacial cycles are most frequent when Antarctic temperature is slightly below average, equivalent to an intermediate climate during glacial periods. With the ice core data and climate modeling, we suggest that the prerequisite for the most frequent climate instability with bipolar seesaw pattern during the late Pleistocene is not only the extent of continental ice sheets but also low CO<sub>2</sub>. North Atlantic cooling sets high sensitivity of AMOC and climate to small perturbations such as moderate freshwater anomaly.

Keywords: Dome Fuji ice core, Abrupt climate change, Millennial-scale variability