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Tropical cooling and the onset of North American glaciation

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Abstract. We offer a test of the idea that gradual cooling in the eastern tropical Pacific led to cooling of North America and the initiation of glaciation ~3 Myr ago. Using modern climate data we estimate how warming of the eastern tropical Pacific affects North American temperature and ice-ablation. Assuming that the modern relationship holds over the past millions of years, a ~4°C warmer eastern tropical Pacific between 3–5 Ma would increase ablation in northern North America by approximately two meters per year. By comparison, a similar estimate of the ablation response to variations in Earth's obliquity gives less than half the magnitude of the tropically-induced change. Considering that variations in Earth's obliquity appear sufficient to initiate glaciations between ~1–3 Ma, we infer that the warmer eastern equatorial Pacific prior to 3 Ma suffices to preclude glaciation.

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