Unlocking atmospheric temperatures from Antarctica's past

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Abstract

Computer model reconstructions of Antarctic ice sheet configurations during Earth's past warm intervals underestimate the contribution from East Antarctica – i.e. measured sea levels are higher than calculated melt amounts. These climate models employ ocean driven melt as the primary control of ice mass loss rather than atmospheric warming. To date, atmospheric temperatures have not been considered as a mechanism to melt Antarctic ice sheets. Instead, past Antarctic ice sheet configurations have been derived from geomorphic deposits in the Dry Valleys, and sea floor moraines. Such deposits do not reveal temperatures for inclusion in climate models. Deriving a paleothermometer for Antarctica that predates ice core records is required to test the role of atmospheric temperature in ice sheet melt. Recent discoveries of bacteria in Antarctic permafrost samples provide a potential solution. New molecular genetic tools allow microbial species and concentrations to be calculated for ancient permafrost horizons. We propose to develop a terrestrial paleoecological transfer function for paleotemperature from the bacteria species and concentrations preserved in these permafrost horizons.

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