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A recurrent pattern of Antarctic temperature change

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The Antarctic is an important region for the Earth's energy balance and climate. Here, we investigate the spatial patterns of Antarctic temperature change across a range of timescales. We use multiple ice-core water isotope records and an improved method for inverting water-isotope ratios to moisture-source and precipitation-site temperatures. We find that between the Last Glacial Maximum and the Holocene, East Antarctic warming was less than previously thought, and less than concurrent warming in West Antarctica; the latter point is confirmed by independent temperature estimates. More broadly, we identify a pattern of temperature variability in which lower, warmer sites show more temperature change than higher, colder sites. This spatial pattern of change is robust across a range timescales, including glacial-interglacial, AIM events and millennial variability, is consistent with observed changes in the last century, and holds for both warming and cooling trends. Because this pattern persists across climate changes driven by diverse forcing over a range of timescales, it may reflect a fundamental aspect of Earth's energy balance. We investigate potential sources for this pattern using a hierarchy of model complexities. We identify a likely cause, temperature-dependent radiative feedbacks, that is timescale independent. These results have implications for quantifying changes in ice sheet surface elevation through the deglaciation and for polar climate dynamics more generally.