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過去4000年のグリーンランド気温変動の原因と、北半球平均気温変動へのインプリケーション
Causes of Greenland temperature variability over the past 4000 years: Implications for Northern Hemispheric temperature

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A new Greenland temperature record reconstructed from argon and nitrogen isotopes from trapped air in a GISP2 ice core, provides high resolution (less than 20 years) and precise annual average temperature estimates for the past 4000 years. Due to tight age controls and abundant paleoclimatic information from the ice core, the temperature record provides an exceptional opportunity to investigate the late Holocene climate in a multidecadal to millennial time scale. To investigate causes of Greenland temperature variability over the past 4000 years, we calculated high latitude (70 to 80N) temperature change using a one dimensional energy balance model with reconstructed climate forcings including orbital, solar, volcanic, and greenhouse gas forcings. Greenland temperature was calculated from the high latitude temperature, considering Greenland negative temperature responses to solar variability due to associated changes in atmospheric and oceanic circulations. The calculated Greenland temperature was significantly correlated with the ice core derived Greenland temperatures with the 97 percent confidence level. Therefore, the past variability of climate forcings can explain at least 10 percent of the multidecadal to millennial variability in Greenland temperature over the past 4000 years. An average temperature trend for the Northern Hemisphere (NH) over the past 4000 years was also inferred from the ice core derived Greenland temperatures. Lines of evidence indicate that the current decadal average temperature of NH is likely warmer than at any time over the past 4000 years. Sequential cooling events starting around 800 B.C.E. (the 2.8ka event), which were induced by several large volcanic eruptions as well as low solar activity, had similar magnitude with the Little Ice Age cooling.

キーワード: グリーンランド, 気温, 古気候, 気候変動, 氷床コア
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