



Carbon isotope ratios suggest no additional methane from boreal wetlands during the rapid Greenland Interstadial 21.2

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Samples from two Greenland ice cores (NEEM and NGRIP) have been measured for methane carbon isotope ratios ($\delta^{13}\text{C-CH}_4$) to investigate the CH_4 mixing ratio anomaly during Greenland Interstadial (GI) 21.2 (85,000 years before present). This extraordinarily rapid event occurred within 150 years, comprising a CH_4 mixing ratio pulse of 150 ppb ($\sim 25\%$). Our new measurements disclose a concomitant shift in $\delta^{13}\text{C-CH}_4$ of 1‰ . Keeling plot analyses reveal the $\delta^{13}\text{C}$ of the additional CH_4 source constituting the CH_4 anomaly as $-56.8 \pm 2.8\text{‰}$, which we confirm by means of a previously published box model. We propose tropical wetlands as the most probable additional CH_4 source during GI-21.2 and present independent evidence that suggests that tropical wetlands in South America and Asia have played a key role. We find no evidence that boreal CH_4 sources, such as permafrost degradation, contributed significantly to the atmospheric CH_4 increase, despite the pronounced warming in the Northern Hemisphere during GI-21.2.