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

Peter Sperlich (1,2,3), Hinrich Schaefer (3), Sara Mikaloff Fletcher (3), Myriam Guillevic (1,4,5), Keith Lassey (3,6), Célia Sapart (7,8), Thomas Röckmann (7), and Thomas Blunier (1)

(1) Centre for Ice and Climate, University of Copenhagen, Copenhagen, Denmark, (2) Max-Planck-Institute for Biogeochemistry, Jena, Germany, (3) National Institute of Water and Atmospheric Research, Wellington, New Zealand, (4) Laboratoire des Sciences du Climat et de l’Environnement, Gif sur Yvette, France, (5) Swiss Federal Institute of Metrology, Bern-Wabern, Switzerland, (6) Lassey Research and Education Ltd, Lower Hutt, New Zealand, (7) Institute for Marine and Atmospheric Research Utrecht, Utrecht University, Utrecht, Netherlands, (8) Laboratoire de Glaciologie, Université Libre de Bruxelles, Brussels, Belgium

Samples from two Greenland ice cores (NEEM and NGRIP) have been measured for methane carbon isotope ratios (delta 13C-CH4) to investigate the CH4 mixing ratio anomaly during Greenland Interstadial (GI) 21.2 (85,000 years before present). This extraordinarily rapid event occurred within 150 years, comprising a CH4 mixing ratio pulse of 150 ppb (~25%). Our new measurements disclose a concomitant shift in delta 13C of the additional CH4 source constituting the CH4 anomaly as $-56.8 \pm 2.8\%e$, which we confirm by means of a previously published box model. We propose tropical wetlands as the most probable additional CH4 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 CH4 sources, such as permafrost degradation, contributed significantly to the atmospheric CH4 increase, despite the pronounced warming in the Northern Hemisphere during GI-21.2.