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Decoupling atmospheric methane isotope records during MIS 5-4 transition

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Methane (CH_4) is the third most important greenhouse gas in the Earth's atmosphere and contributes 20% to the total radiative forcing from all long-lived greenhouse gases today. Methane concentrations generally changed in sync with northern hemisphere temperature during both glacial/interglacial transitions as well as with rapid climate changes during marine isotope stage 3 (MIS 3) (Dansgaard-Oeschger events). Together with the CH_4 interhemispheric gradient, stable isotopic studies on methane (δ^{13}C and) in ice cores allow us to investigate individual CH_4 source/sink changes. We measured 12 ice core samples from the NEEM core for δD_{CH4} covering DO 8 and the MIS 5-4 transition. Replicate analyses of NEEM ice from DO 8 agreed with previously measured samples from NGRIP (Bock et al., 2010). External precision of the analyses based on replicate air standards run throughout each analytical day were ± 1.8‰. These data were overlain on previously measured $\delta^{13}CH_4$ data from the Vostok core from the same periods. The $\delta^{13}CH_4$ data for the MIS5-4 transition start at -48‰around 75ka and increase to -44‰at 65ka and then decrease to -46‰by 59ka. In contrast, values start at -90‰at 70ka and decrease to -97‰at 64ka before increasing to -92‰by 59ka. These two records appear to be roughly in phase with one another but opposite in the sign of their changes. One plausible explanation for the observed decoupling involves a shift from C_3 plant type to C_4 plant types. Moreover, this ecological transition may be related to the observed drop in atmospheric CO_2 values from 240 ppm to 195 ppm associated with the MIS 5-4 transition. An 8-box BOSCAGE model describing the $\delta^{13}CH_4$ and data and observed decoupling is in progress, and we expect to present an analysis of the related CH_4 source changes.