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Constant biomass burning and switch on of boreal CH_4 emissions during rapid climate changes in the course of the last glacial/interglacial transition

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The glacial/interglacial changes in atmospheric methane concentrations are characterized by a strong increase from 350 ppbv during the Last Glacial Maximum (LGM) to values as high as 700 ppbv during the early and late Holocene. In addition global atmospheric CH_4 concentrations change in phase with rapid climate variations in the North Atlantic region during last glacial period and show a pronounced local minimum during the Holocene Climate optimum. With tropical and boreal wetlands, living biomass as well as biomass burning all contributing to the atmospheric CH_4 level, an unambiguous source attribution remains difficult. Carbon (and hydrogen) isotopic studies on CH_4 in ice cores allow narrowing down the impact and amplitude of individual CH_4 source changes. Here we present the first $\delta^{13}CH_4$ record over the entire last glacial/interglacial transition and for selected Dansgaard/Oeschger events during Marine Isotope Stage 3 from the EPICA (European Project for Ice Coring in Antarctica) ice core drilled in Dronning Maud Land. Using a simple box model of the global methane cycle driven by source emissions in a forward Monte Carlo mode we are able to constrain the potential changes for individual CH_4 sources in the past. This shows that the $\delta^{13}CH_4$ changes encountered during the Bolling-Allerod/Younger Dryas os-

cillation can be essentially explained by emission changes in high latitude northern hemisphere sources such as boreal wetlands, permafrost and thermokarst while other sources showed only secondary changes. Especially, pyrogenic CH_4 emissions remained rather constant over the entire last glacial/interglacial transition. The overall glacial decrease in CH_4 concentrations compared to the preindustrial period can only be explained by additional reduction in tropical wetland sources and a significant reduction of the atmospheric lifetime of CH_4.