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Stable isotopes provide revised global limits of aerobic methane emissions from plants

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Abstract. Recently Keppler et al. (2006) discovered a surprising new source of methane – terrestrial plants under aerobic conditions, with an estimated global production of 62–236 Tg yr⁻¹ by an unknown mechanism. This is ~10–40% of the annual total of methane entering the modern atmosphere and ~30–100% of annual methane entering the pre-industrial (0 to 1700 AD) atmosphere. Here we test this reported global production of methane from plants against ice core records of atmospheric methane concentration (CH₄) and stable carbon isotope ratios (δ¹³CH₄) over the last 2000 years. Our top-down approach determines that global plant emissions must be much lower than proposed by Keppler et al. (2006) during the last 2000 years and are likely to lie in the range 0–46 Tg yr⁻¹ and 0–176 Tg yr⁻¹ during the pre-industrial and modern eras, respectively.

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