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# Causes of orbital and millennial scale changes in methane concentration

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Methane (CH4) is important as a greenhouse gas, for its role in atmospheric chemistry, and as a bulk diagnostic of our understanding of the interaction between climate and terrestrial systems. The ice core record shows a rich history of variability over the last 800,000 years, with large changes at both orbital and millennial scales dominating the record. The observed changes are a result of changes in a small number of potential sources (boreal and tropical wetlands, biomass burning, marine hydrates and perhaps other sources), and in the strength of the principal atmospheric sink (oxidation by OH). Previous studies have attempted to diagnose the causes of change using ice core concentration and isotopic data, or with bottom-up modelling approaches. Here, using insights from recent data syntheses and new modelling studies, we will for the first time describe solutions that are compatible with: (a) the ice core data, (b) evidence about the sources from charcoal, peatland and pollen reconstructions, (c) the most recent understanding of atmospheric chemistry related to methane sinks, (d) the timescales over which change occurred, and (e) the interactions between climate, the terrestrial biosphere and atmospheric chemistry based on the most recent modelling studies. The work is the result of methane studies within the palaeoclimate projects of the UK QUEST programme.

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