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Modelling Methane during the Holocene

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Quantifying and understanding the global methane budget is still a major challenge. Whilst the present-day atmospheric burden is well constrained, with the major sources identified, many of the individual source strengths are still uncertain. One of the largest natural sources is wetlands, but climatic conditions are important in controlling their dynamics and hence methane production. Atmospheric methane concentrations are also dependent on the sink terms, primarily through reaction with the OH radical. OH availability for reaction with methane depends on humidity and the atmospheric concentrations of other trace gases, including isoprene and other biogenic volatile organic compounds, both of which are also controlled by the climate.

One of the ways of testing our understanding of natural sources and sinks is to investigate changes that occurred during the paleo record. We have applied an Earth Systems modelling approach to the Holocene to investigate this problem. We used a slab ocean version of the Hadley Centre climate model (HadSM3) to simulate climate change for the last 10,000 years, at 1000 year intervals. The resulting climate simulations were then as input into the Sheffield dynamic global vegetation model, which includes a representation of vegetation, fire and nitrogen. Closely coupled to this are a processed based wetland model (Cao *et al*., 1996) and the Guenther *et al.*, (1995) isoprene model. We will present results showing how these modelled emissions vary through the Holocene. For the mid Holocene we have also input these emissions into a fully 3D climate-chemistry model (HadSM3 coupled to STOCHEM) to predict atmospheric composition changes during this period.