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Rising methane: post-2007 growth, geographic loci, timings and isotopic shift

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Atmospheric methane is rising rapidly again, after a period of stability [1]. NOAA report a global growth rate from 2007-2013 of 5.7±1.2 ppb yr-1, followed by extreme growth of 12.6±0.5 ppb in 2014 and 10.0±0.7 ppb in 2015. Growth has been accompanied by a shift in δ13C(CH4) (a measure of the 13C/12C isotope ratio in methane) to significantly more negative values since 2007. This isotopic shift has been observed in independently calibrated NOAA, Royal Holloway and NIWA-New Zealand measurements: thus the negative trend is real, global, and not a calibration artifact. Fossil fuel methane emissions, which are mostly more positive than atmospheric values, are not driving the rise in methane. Instead, the geographic loci of post-2007 growth, and the timings of the methane rise and isotopic shift suggest growth was dominated by significant increases in biogenic methane emissions, particularly in the tropics and Southern Hemisphere: for example in years with heavy rainfall under the Inter-Tropical Convergence, from wetlands and increased agricultural sources such as ruminants and rice paddies. Changes in the removal rate of methane by the OH radical or other sinks may also have occurred but do not appear fully to explain short term variations in methane isotopes. All these drivers of rising methane - wetlands, ruminants, changing sinks – may reflect underlying decade-long trends in tropical climate: methane may thus be an important climate-change signal.

1. Nisbet, E.G. et al. (2016) Rising atmospheric methane: 2007–2014 growth and isotopic shift, Global Biogeochem. Cycles, 30, doi:10.1002/ 2016GB005406.