

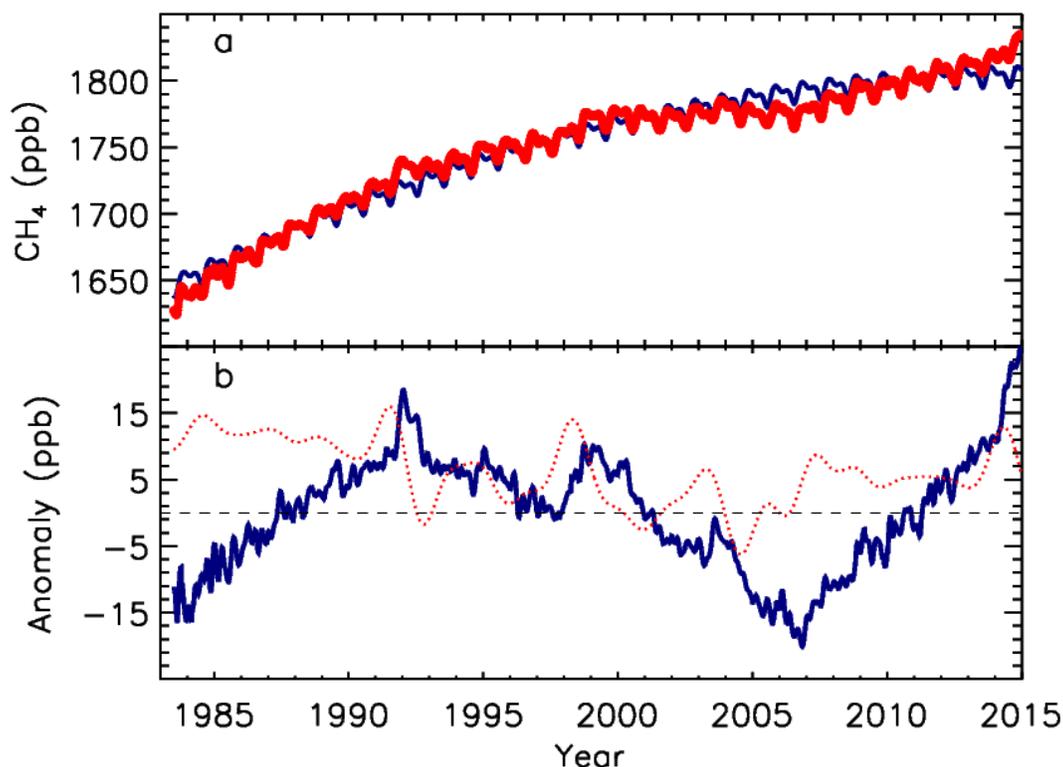
## An Update on the Atmospheric Methane Growth Rate: Growth Surges During 2014

E.J. Dlugokencky<sup>1</sup>, P. Lang<sup>1</sup>, K. Masarie<sup>1</sup>, M. Crotwell<sup>2,1</sup>, A. Crotwell<sup>2,1</sup>, L. Bruhwiler<sup>1</sup> and P. Novelli<sup>1</sup>

<sup>1</sup>NOAA Earth System Research Laboratory, Global Monitoring Division, Boulder, CO 80305; 303-497-6228, E-mail: ed.dlugokencky@noaa.gov

<sup>2</sup>Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309

Methane (CH<sub>4</sub>) is the most interesting of the long-lived greenhouse gases. It is emitted by a varied set of processes and sources. Emission rates are often small and variable, both temporally and spatially, making quantification of emissions difficult, except at global scales. NOAA observations of globally averaged atmospheric CH<sub>4</sub> began in 1983, and the data are rich in features (see Figure), capturing small changes in its budget of emissions and sinks. From the start of measurements through 1999, the rate of increase of atmospheric CH<sub>4</sub> was decreasing. This was followed by a period through 2006 when its atmospheric burden remained nearly constant. Assuming a constant lifetime from 1983-2006, this implies that total global CH<sub>4</sub> emissions were constant and atmospheric CH<sub>4</sub> achieved steady state. Superimposed on top of the long-term pattern are significant interannual variations in growth rate. The latest began in 2007, seen clearly in the growth rate and residuals in panel b, when CH<sub>4</sub> began increasing again. Still assuming constant lifetime, this implies an increase in emissions of ~16 Tg CH<sub>4</sub> yr<sup>-1</sup>. Many detailed explanations exist for this increase, but the most likely involves increased emissions from wetlands and anthropogenic sources like fossil fuel exploitation. One thing is clear: the increase that started in 2007 can no longer be considered a short-term anomaly in growth rate. It has persisted for 8 years, and analysis of preliminary data suggests the growth rate increased further in 2014.



**Figure 1.** (a) Globally averaged atmospheric CH<sub>4</sub> dry air mole fractions (red) at weekly time steps. A function was fitted to the global means that approximates the average long-term trend and seasonal cycle (blue). (b) Residuals calculated as the difference between the global means and function in the top panel (blue). For comparison, the growth rate (same scale, but units of ppb yr<sup>-1</sup>) is plotted in red.