A Comprehensive Approach to Understanding Renewed Increase in Atmospheric CH_4

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NOAA observations of atmospheric methane (CH_4) from a globally distributed network of air sampling sites began in 1983. Much of what we know about the global CH_4 budget of emissions and sinks is based on these observations of CH_4 abundance. Since 1998, NOAA's measurements have been complemented by measurements of $\delta^{13}C$ in CH_4 in a subset of samples by our colleagues at INSTAAR, further constraining the global CH_4 budget. The combination of CH_4 abundance and stable carbon isotope ratio are particularly powerful in constraining the causes of renewed increase in atmospheric CH_4 burden that began in 2007 (see Figure). Common opinions regarding the renewed increase are "it must be fracking" or "it must be the Arctic". But observations of CH_4 abundance and isotopic composition representative of large spatial scales rule out both as significant contributors. Spatial patterns on CH_4 abundance suggest a significant contribution from the tropics, while the measurements of $\delta^{13}C$ in CH_4 clearly indicate changed emissions predominantly from microbial sources, not fossil fuels.

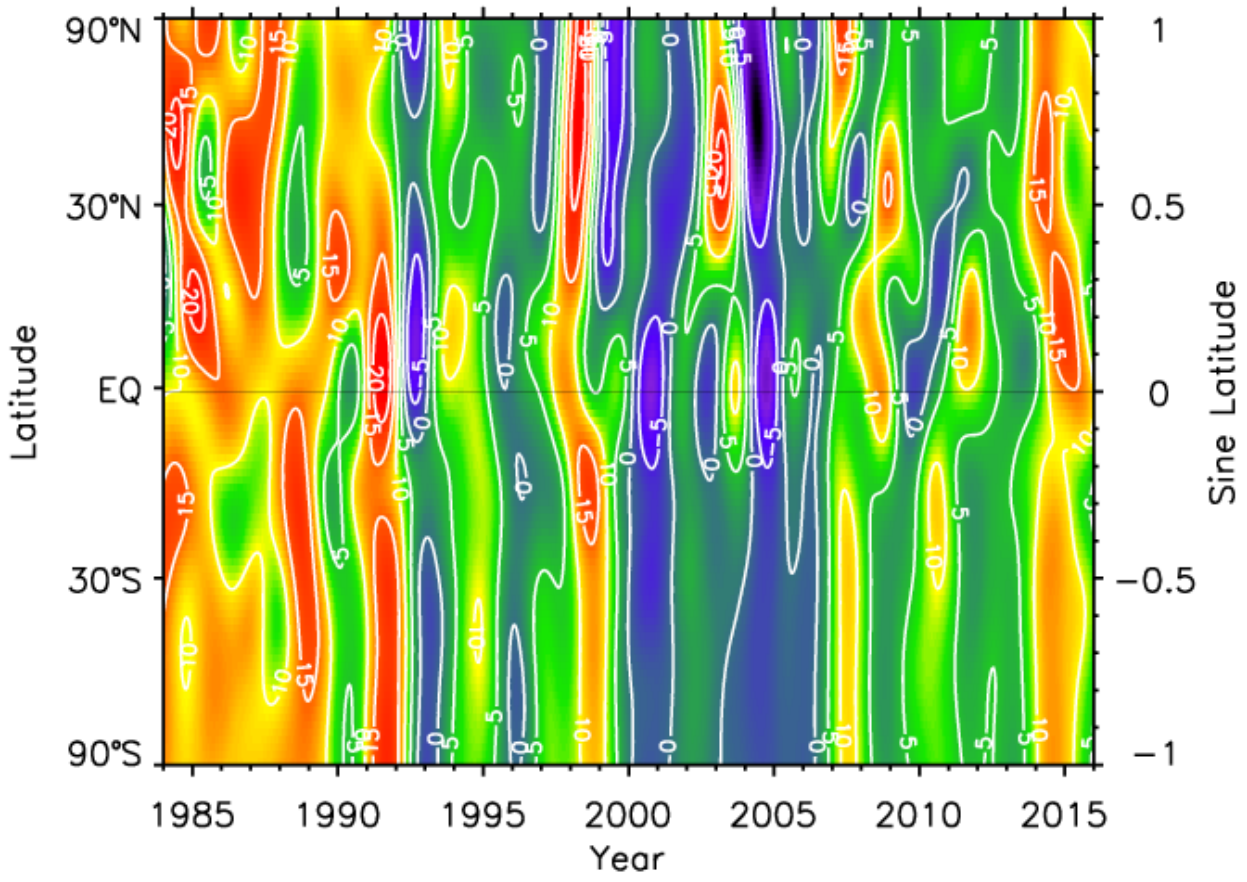

Figure 1. Contours of atmospheric CH_4 growth rate as functions of time and latitude in units of ppb yr^{-1}. Warm colors are for positive growth and cool colors for negative growth; green is near-zero growth. Contours are calculated from trends based on measurements of CH_4 in air samples collected at sites in NOAA's Cooperative Global Air Sampling Network.