Investigation of the Ethane-Methane Relationship at the NOAA Global Cooperative Air Sampling Network Sites

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A tight correlation between atmospheric ethane and the methane growth rate has been reported in previous GMD Annual Meeting Conference presentations and in Simpson et al (2012). This behavior suggests that emissions of both gases are closely linked. Since the atmospheric lifetime of ethane (~ 2 months) is much shorter than for methane (~9 years), ethane data offer a sensitive tool for investigating methane emission trends and sources. In particular, the ethane-methane relationship was used to infer the contribution of emissions from fossil fuels to changes seen in the recent methane growth rate. These previous interpretations build primarily on the UC Irvine 25-year data record from flask samples collected during four periods each year along a North-South transect in the Pacific. During 2008-2010 a significant deviation was observed in the ethane-methane growth relationship in these data, with an increase in the methane growth rate that is not reflected in the ethane atmospheric mole fraction. This change indicates a potential recent divergence in the ethane and methane emission sources, and possibly points towards a higher contribution of biogenic emission to methane sources.

In this work we investigate the ethane-methane relationship using data from the NOAA Global Cooperative Air Sampling Network. While the NOAA data cover a shorter period than the UCI record, the global distribution of sampling sites and year-round continuous sampling offer an opportunity to investigate spatial dependencies of this relationship and the colocation or separation of methane and ethane sources.

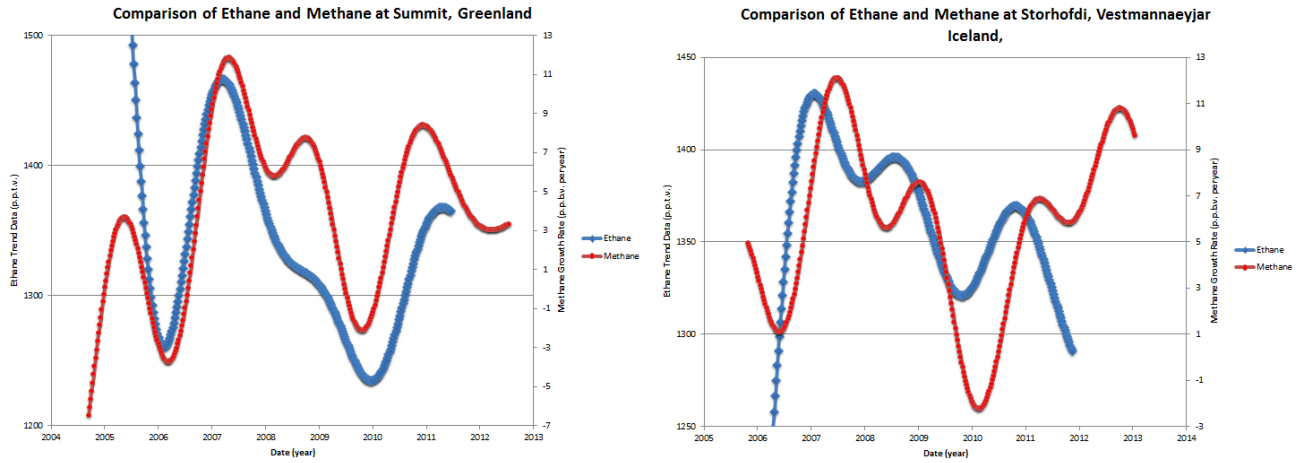

Figure 1. Two examples of the ethane trend and methane growth rate in whole air flask samples from a NOAA flask sampling network site. Shown are results from Summit, Greenland (left) and Storhofdi, Vestmannaeyjar, Iceland (right). Please note that the divergence in the ethane trend at the beginning of the record is an artifact of the fitting algorithm.