Observation and simulation of ethane at 22 FTIR sites

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Ethane is the most abundant non-methane hydrocarbon in the Earth atmosphere. Its main sources are of anthropogenic origin, with globally 62% from leakage during production and transport of natural gas, 20% from biofuel combustion and 18% from biomass burning. In the Southern hemisphere, anthropogenic emissions are lower and so biomass burning is a more significant source. The main removal process is oxidation by the hydroxyl radical (OH), leading to a mean atmospheric lifetime of 2 months [1].

Until recently, a prolonged decrease of its abundance has been documented, at rates of -1 to -2.7%/yr, with global emissions dropping from 14 to 11 Tg/yr over 1984-2010 owing to successful measures reducing fugitive emissions from its fossil fuel sources [2].

However, subsequent investigations have reported about an upturn in the ethane trend, characterized by a sharp rise from about 2009 onwards (e.g., [3], [4]). The ethane increase is attributed to the oil and gas boom in North America (e.g., [5]), although significant changes in OH could also be at play.

In the present contribution, we report about the trend of ethane at 22 ground-based Fourier Transform Infrared (FTIR) sites spanning the 80°N to 79°S latitude range, focusing more specifically on the 2010-2015 time period. Dedicated model simulations by EMAC (1.8×1.8 degrees) implementing various emission scenarios are included in order to support data interpretation.

References

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