

Little Evidence for Significant Increases in Total U.S. CH₄ Emissions over the Past Decade

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Recent studies show conflicting estimates of trends in methane (CH₄) emissions from oil and natural gas (ONG) operations in the U.S. We analyze atmospheric CH₄ measurements from 20 North American air sampling sites in the ESRL/GMD Global Greenhouse Gas Reference Network (GGGRN) and determined trends for 2006-2015. Using CH₄ vertical gradients as an indicator of regional surface emissions, we find no significant trends at most GGGRN sites, but modest trends at three sites heavily influenced by oil and natural gas (ONG) activities. The suggested increases in ONG CH₄ emissions (on average $\sim 2.91 \pm 0.69 \text{ \% yr}^{-1}$) are much smaller than several studies, and below detection threshold for the east coast sites that capture the outflows of the U.S. We also find that when enhancements of ethane (C₂H₆) and propane (C₃H₈) are used to estimate trends in ONG CH₄ emissions, they significantly overestimate CH₄ trends.

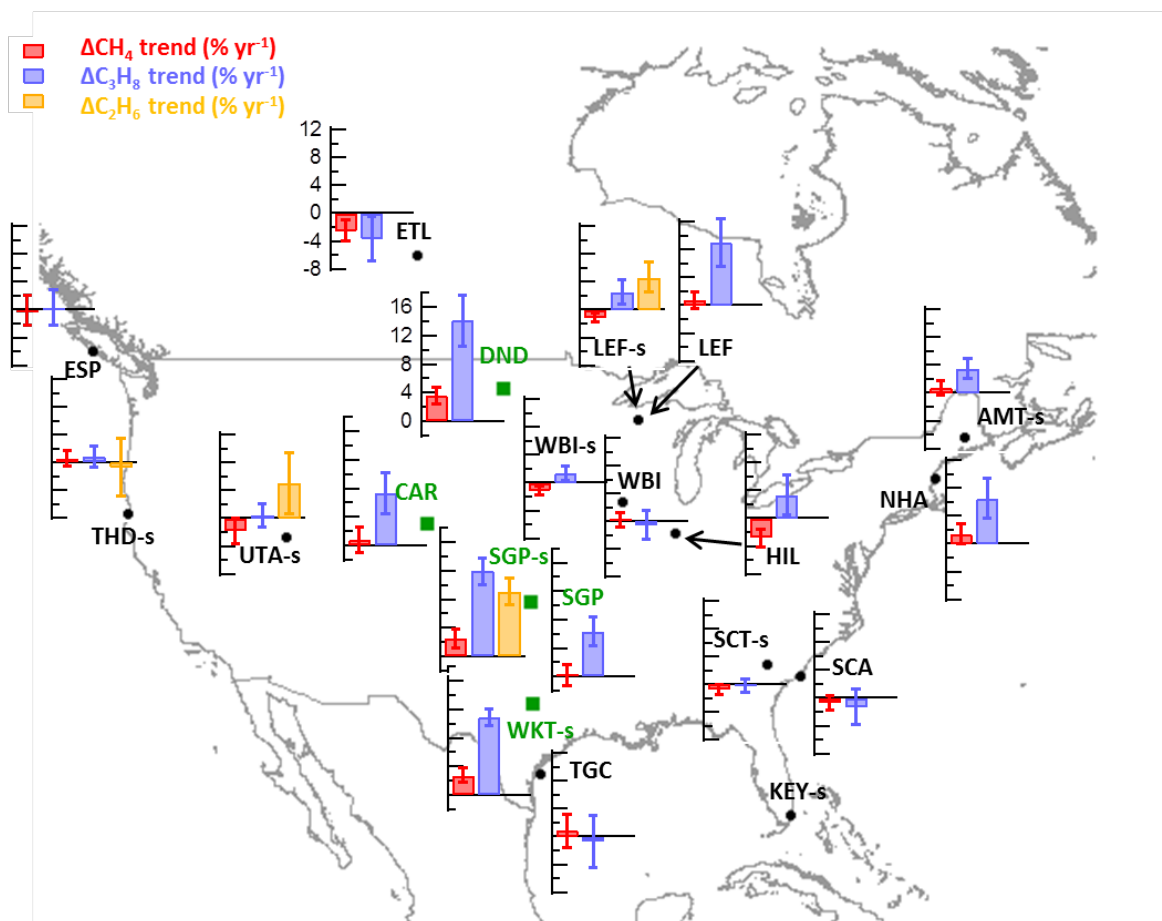


Figure 1. Trends in CH₄, C₃H₈ and C₂H₆ enhancements (Δ) over the North America in recent years (2006-2015 for CH₄, and 2008-2015 for C₂H₆ and C₃H₈ for most sites). Green squares and black dots show the geographic locations of ONG sites and non-ONG sites, respectively. Bar figures show trends in \% yr^{-1} increase of mole fraction relative to previous year. The left axes in the bar figures for ONG sites are the same as for DND (Site codes on map are defined in Table S1). For non-ONG sites, left axes are the same as for ETL, and the axis ranges are the same as those for ONG sites so that the size of the bars from all sites are comparable. Error bars show 1σ uncertainty.