Regional Emission Estimates of Selected Anthropogenic Greenhouse Gases (HFC-134a, HCFC-22, and CH_4) from California

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Increasing atmospheric burdens of anthropogenic greenhouse gases (GHGs) have exerted a considerable warming effect on climate. Efforts to limit this warming influence will require reductions in emissions of these gases. However, to evaluate the degree to which emissions have been reduced, we should not only rely on self-reported emission inventories, but also verify them with independent, atmosphere-based "top-down" estimates. In this study, we combine GHG measurements from surface discrete air samples collected at three sites in California from 2008 – 2012 (Figure 1) with two newly-developed "top-down" methods in our lab, a tracer-correlation method and a Bayesian approach of a regional inverse model, to estimate regional emissions of several selected anthropogenic GHGs (HFC-134a, HCFC-22, and CH_4). We plan to extend our work to a complete suite of anthropogenic non-CO_2 GHGs in the future. The goal of this study is not only to provide accurate estimates of regional emission magnitudes of anthropogenic non-CO_2 GHGs from California, but also to provide a fair assessment of the advantages and disadvantages of various "top-down" approaches in regional emission estimates.

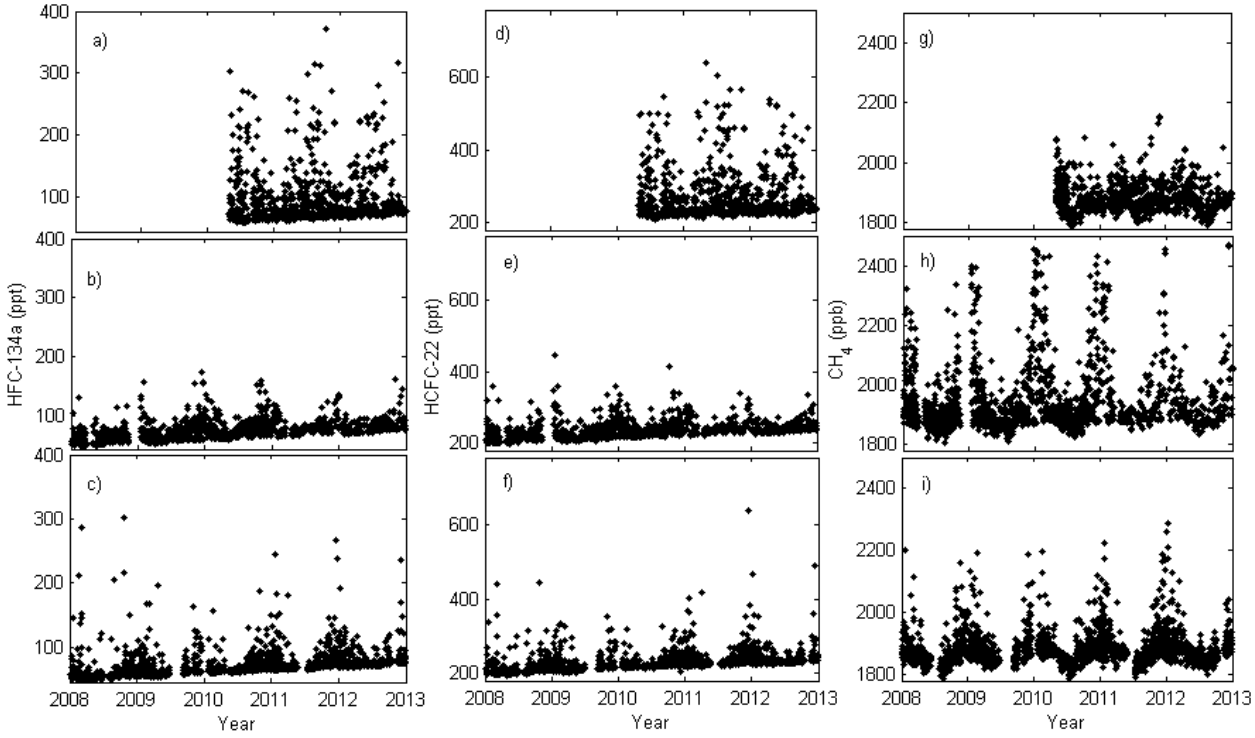

Figure 1. Atmospheric mixing ratios of HFC-134a (a – c), HCFC-22 (d – f) and CH4 (g – i) at Mt. Wilson Observatory (MWO) in Los Angeles (34.22° N, 118.06° W) (a, d, and g), Sutro Tower (STR) in San Francisco (37.76° N, 122.45° W) (b, e, and h) and Walnut Grove (WGC) near Sacramento (38.27° N, 121.49° W) (c, f, and i) in California.