

Highlights from the UC-Irvine Global Monitoring Program (1978-2010)

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The University of California, Irvine (UC-Irvine) has monitored global atmospheric trace gas mixing ratios continuously since 1978 using ground-based measurements in the Pacific Basin (71°N to 47°S). The measured gases include methane (CH₄), C₂-C₄ alkanes, ethyne, C₁-C₃ alkyl nitrates, chlorofluorocarbons (CFCs), CH₃CCl₃, CCl₄ and H-1211. Long-term records of several of these gases are unique to the UC-Irvine global monitoring network, and here we present our program's research highlights. The global growth rate of CH₄ has slowed considerably in the past three decades, from 19 ± 2 ppbv yr⁻¹ in 1985 to 5.3 ± 0.9 ppbv yr⁻¹ in 2010. Over the same time, the global mixing ratio of ethane (C₂H₆) has declined by approximately 170 pptv (21%), from 791 ± 19 pptv in 1986 to 625 ± 12 pptv in 2010. The global trends of CH₄ and ethane have shown remarkably good agreement in the past 25 years, both in terms of their long-term declines (most of which occurred prior to 2000) and short-term anomalies. Whereas the global CH₄ and ethane trends dissociated from each other for the first time in 2008, CH₄ and ethane increased together again in 2010, and the ethane growth rate in 2010 was 31 ± 11 pptv yr⁻¹. The long-term global ethane decline has been accompanied by simultaneous decreases in global levels of propane and the butanes since 1996, as well as an 11% decline in global levels of the combustion tracer ethyne between 1996 and 2008. The anthropogenic tracer tetrachloroethene (C₂Cl₄) has shown a 60% decline in its global mixing ratio since 1989 and is currently approaching 2 pptv. Global mixing ratios of CFCs, CH₃CCl₃ and CCl₄ have also continued to decrease, and our measurements show generally good agreement with other global monitoring networks. In contrast to many halocarbons, global levels of the industrial solvent chloroform (CHCl₃) have increased by almost 20% since the late 1990s, from 9.0 ± 0.3 pptv in 1997 to 10.7 ± 0.4 pptv in 2008.

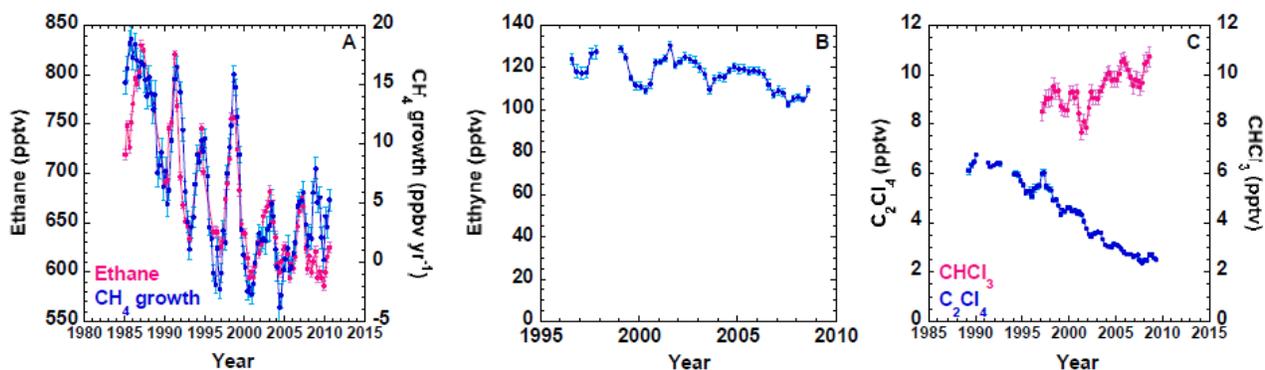


Figure 1. Global atmospheric mixing ratios and growth rates of selected gases measured by the UC-Irvine global monitoring network. (a) Global methane (CH₄) growth rate and ethane mixing ratio; (b) global ethyne mixing ratio; (c) global tetrachloroethene (C₂Cl₄) and chloroform (CHCl₃) mixing ratios. The data are plotted as running annual averages.