

GMD's GC/MS Analytical System for Preconcentration of Environmentally Relevant Species (PERSEUS)

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The development of PERSEUS represents a significant advancement, relative to existing instrumentation of its kind, in the analysis of atmospheric samples for a wide range of halocarbons, hydrocarbons and sulfur-containing compounds at part-per-quadrillion (ppq) to part-per-billion (ppb) mole fractions. Having demonstrated two years of reliable performance, the first version of this instrument 'PR1' is now the 'work horse' instrument for analysis of the samples collected by the Global Greenhouse Gas Reference Network (GGGRN) in their programmable flask packages (PFP) in tall towers, small aircraft and other mobile platforms of the North American sampling programs, and also provides analyses of weekly flask pairs collected globally in the more remote surface troposphere for the Halocarbons and other Trace Atmospheric Species group. Now adding more than a dozen new analytes to the monitoring database, including ethane, perfluorocarbons (PFCs) and toluene, PR1 also provides significantly higher reproducibilities and higher sample throughput relative to previous gas chromatography/mass spectroscopy (GC/MS) instrumentation used for PFP analyses. The lower sample pressure requirements of PR1 permit analyses of GGGRN's 2.5-L glass flask pairs collected in the Cooperative Network. Examples of several new datasets will be presented.

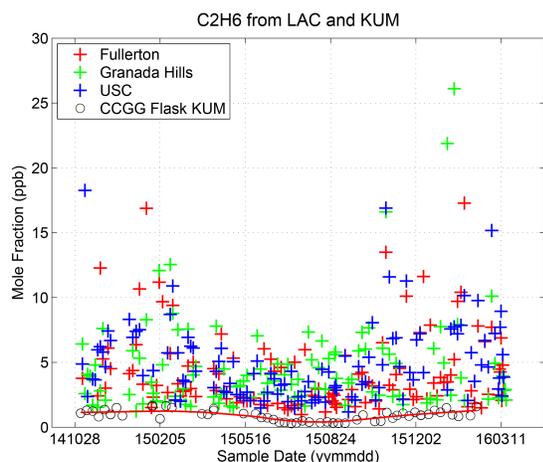


Figure 1. Example new dataset from PERSEUS. (left) Time series of ethane (C_2H_6) mole fractions observed using PFP flasks from three sites of the Los Angeles MegaCities (LAC) program. The C_2H_6 abundances using Cooperative Network flasks from Cape Kumukahi (KUM), HI are the assumed 'background' air masses with respect to LAC.

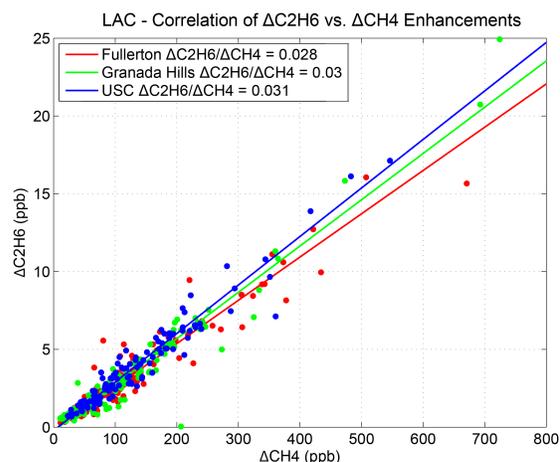


Figure 2. Correlation plot of ΔC_2H_6 vs. ΔCH_4 enhancements (i.e., KUM subtracted from LAC) observed at LAC during period October 2014 to March 2016. Slopes reflect the C_2H_6/CH_4 composition of the natural gas distributed in the L.A. basin, plus additions of CH_4 from landfills, wastewater treatment and agriculture (i.e., cattle).