Introduction of a Newly Developed GC System for VOC Analysis in the CMDL Network Flasks

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Volatile organic compounds (VOC) can serve as atmospheric tracers for diverse combustion and pollution processes such as wildfires, oil drilling or fossil fuel combustion. Atmospheric VOC mixing ratios can also be used to characterize boundary layer depth and atmospheric transport. Furthermore, atmospheric concentration changes can yield insight into the oxidation processes in the atmosphere, particularly by the hydroxyl radical (OH). A gas chromatography (GC) system was developed to analyze VOC ranging from ethane to benzene in the NOAA network flasks. Samples are extracted from the flasks with a vacuum system at a repeatability of 0.2% relative standard deviation. VOC are concentrated on a multistage solid adsorbent trap and injected onto a porous layer open tubular GC column by thermal desorption. The minimum required sample pressure left in the flasks for one analysis is 400 mbar. C2 to C7 hydrocarbons are quantified with a precision of ~4%. Detection limits are 5 pptC for a 0.5-liter sample volume. The system has been automated allowing analysis of ~24 flasks per day. VOC results from Trinidad Head, California, one of the NOAA flask network sites located in the marine boundary layer, are presented in Figure 1.

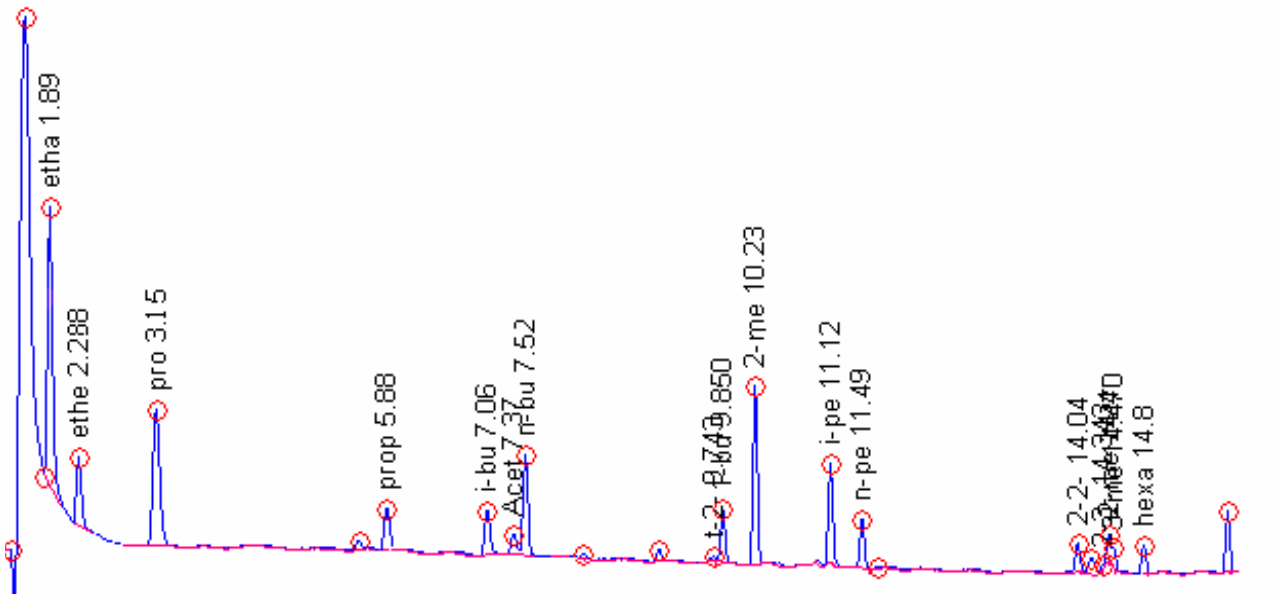

Figure 1. Chromatogram obtained from a network flask sampled at Trinidad Head, California; abbreviations and mixing ratios are: etha: ethane, 1900 pptV; ethe: ethene, 525 pptV; pro: propane, 949 pptV; i-bu: iso-butane, 156 pptV; acet: acetylene 196 pptV, n-bu: n-butane 324 pptV, t-2: t-2-butene 7 pptV, 1-bu: 1-butene 156 pptV, 2-me: 2-methyl-propene, 472 pptV; i-pe: iso-pentane, 219 pptV; n-pe: n-pentane, 110 pptV; 2-2-: 2, 2 – methylbutane, 56 pptV;, 2-3-: 2, 3 – methylbutane, 13 pptV; 2-me: 2-methylpentane, 63 pptV; 3-me: 3-methylpentane, 41 pptV; hexa: hexane, 57 pptV.