First Results of Non-Methane Hydrocarbon Monitoring in Flask Samples from the NOAA Cooperative Air Sampling Network

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Three years ago NOAA ESRL GMD and INSTAAR began a cooperative project to investigate the feasibility of analyzing Non-Methane Hydrocarbons (NMHC) in air that remains in the Cooperative Air Sampling Network glass flasks after completion of other greenhouse gas measurements. The early focus of this study was on the development of an analytical method that would allow extraction of sample aliquots from the below-ambient pressure samples with subsequent sample focusing and NMHC analysis by gas chromatography. The method was tailored towards an automated and cryogen-free technique in order to allow automated analysis of a large number of samples at low cost. Extensive experiments were done on the sample collection technique, effects of water vapor in the samples, storage (up to 1 year) of samples and blanks in network flasks, sample extraction and on the comparison of calibration methods and standards. Currently, 9 NMHC (ethane, propane, *iso*-butane, *n*-butane, *iso*-pentane, *n*-pentane, isoprene, benzene, toluene) are quantified and reported. NMHC monitoring in network sample began in spring 2005; stations and number of samples included in this program have been steadily increasing. Since spring 2006 a comparison between flask results and two in-situ NMHC methods at the GAW station in Hohenpeissenberg, Germany has been taking place. The flask analyses have yielded global distribution maps of series of NMHC and their ratios (Fig. 1). NMHC data have also provided improved characterizations of stations in respect of local influences on air composition. Variability of NMHC has yielded estimates of average, seasonal OH distribution. Comparison of NMHC ratios in data from different stations and hemispheres allows interpretations of air mixing and transport times and testing of the conformity of the distribution of NH versus SH network stations in their distances to emission sources. Since tight correlations exist between sources of NMHC, CO_2 and methane and sinks of NMHC and methane, analysis of their correlations offer new opportunities for interpretations of sources and sinks of CO_2 and methane.

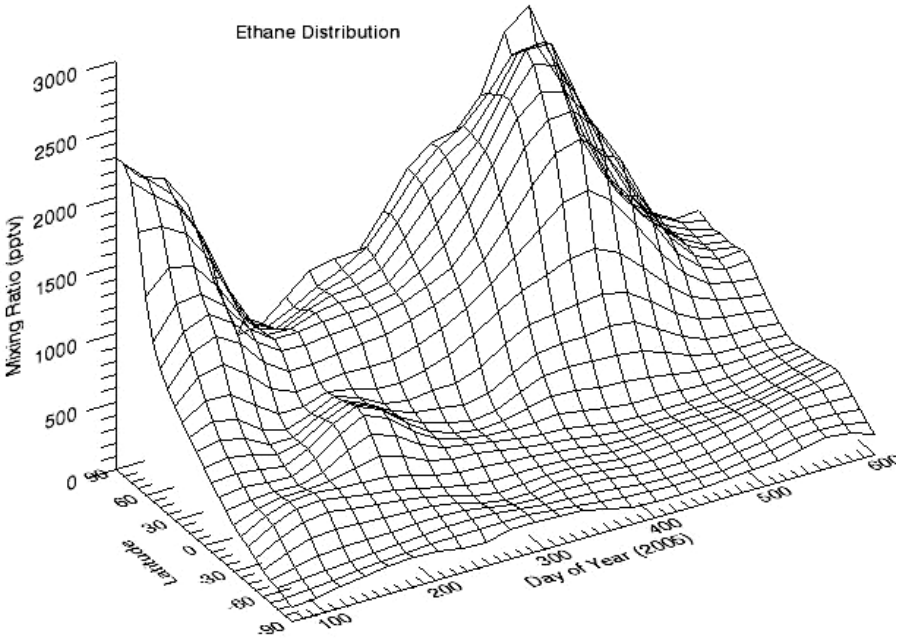

Figure 1. Global and temporal distribution of ethane from analysis of >2000 network samples during Apr. 2005 – Dec. 2006.