Climatology and Atmospheric Chemistry of Non-Methane Hydrocarbon Emissions Over the North Atlantic

M. Muñoz[1], D. Helmig[1], J. Hueber[1], C. Mazzoleni[2], L. Mazzoleni[2], R. Owen[2], M. Val-Martin[2] and P. Fialho[3]

[1]Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, CO 80309; 832-693-5498, E-mail: Mauricio.Munoz@colorado.edu
[2]Atmospheric Sciences Program, Michigan Technological University, Hougton, MI
[3]University of the Azores, Angra do Heroismo, Portugal

Non-methane hydrocarbons (NMHC) spanning the C2 to C7 volatility range have been monitored at the Pico Mountain Observatory, located at 2,225 m a.s.l., on Pico Island, in the Azores, Portugal, since 2004. Observations at this site, due to the topography, location, and height of the station, during most times reflect long-range transport of air from the continents bordering the North Atlantic. The seven-year NMHC record shows that NMHC exhibit a regular annual cycle. NMHC photochemical processing was analyzed by calculating the ln([propane])/[ethane]) as an indicator for photochemical processing, and extracting the lower and upper 10 percentiles of the data (Fig.1). These events were then investigated for characteristic transport pathways and emission source region using HYSPLIT back trajectory models. Occurrences of low NMHC ratios (indicating aged air) were tested for clean background conditions and occurrences of elevated NMHC ratios (indicating fresh emissions) were tested for possible pollution influences. Variability between slow and rapid transport was greatest during the summer. These analyses further show that elevated NMHC mole fractions at Pico Mountain can be traced to emissions arriving predominantly from North America, mostly from urban areas but also from biomass burning in boreal Canada during the late summer.

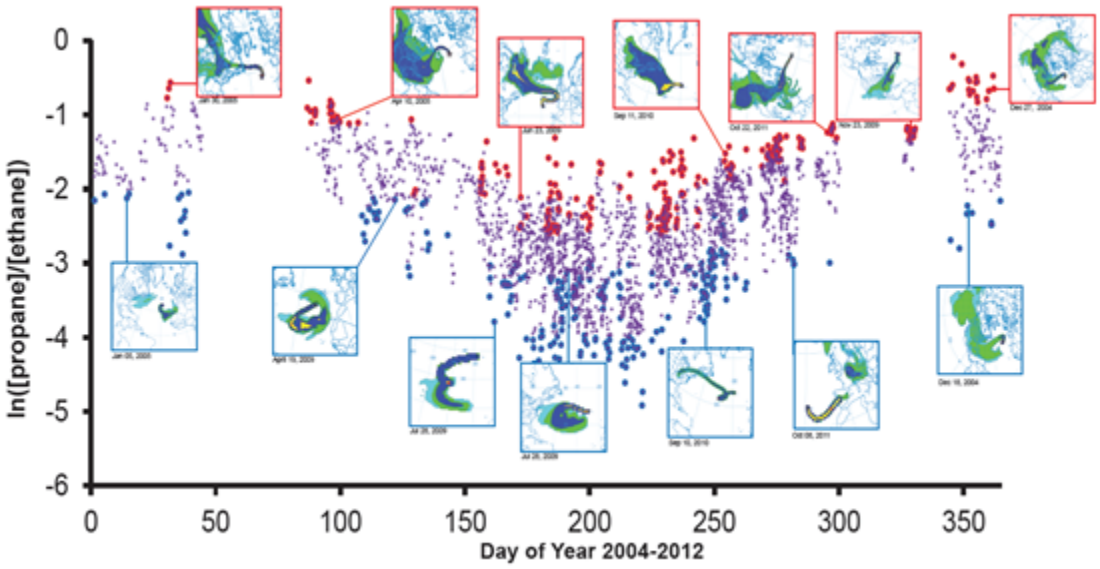

Figure 1. Results for ln ([propane]/[ethane]) calculations in seven years of data. Upper and lower 10 percentile data are shown in red and blue, respectively. HYSPLIT outputs are used to identify transport and source regions for selected data points.