A Study of Non-Methane Hydrocarbons

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Background

Non-methane hydrocarbons (NMHC's) function as precursors to oxidant formation through a series of reactions that begin with the hydroxyl radical (OH). This oxidation pathway leads to a mixture of peroxy radicals that oxidize NO to NO_2 without the consumption of ozone (O_3) causing its accumulation in the troposphere. Although ozone in the stratosphere acts as a filter for ultra-violet radiation, ozone in the troposphere is harmful due to its implications concerning human and environmental health. Therefore, the role of NMHC's in atmospheric reactions is important when looking at the many facets that surround global change.

Introduction

NMHC's originate from both biogenic and anthropogenic sources. Depending upon their source, NMHC's have varying reaction rates. For instance, isoprene emitted from vegetation has an atmospheric lifetime with respect to the OH radical of 20 min. However, 2-methylbutane found in vehicle exhaust has a lifetime of 20 min. with respect to OH. These kind of differences in reaction rates lead to a foundation of study that focuses on the contribution of different target analytes in atmospheric reactions. One air quality study that addressed this issue was in Phoenix, Arizona. Hence, a large portion of this summer's work dealt with the analysis of the data obtained from this site.

Experimental Design

A. Canister Cleaning System

1. Air samples were taken in Summa steel canisters that were first pre- evacuated to less than 30 mtorr

B. Chromatography Analysis

1. Samples were then connected to a G.C. system for analysis

a. Cryogenic pre-concentration

b. Flame ionization detection

C. Data Analysis

1. HP chemistry station

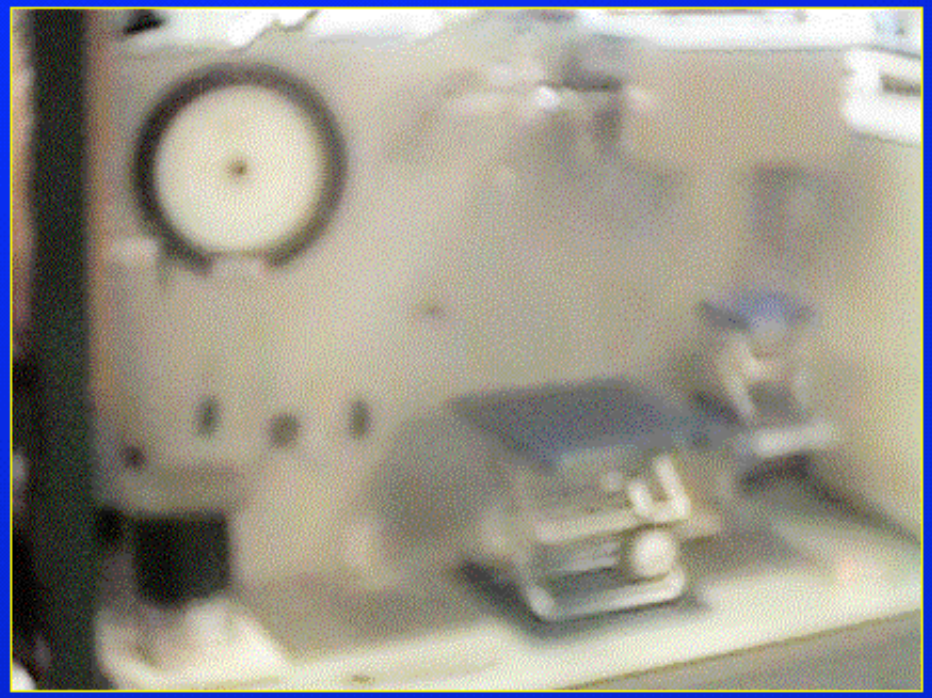
Canister Cleaning System

Canister Cleaning System: A Closer Look

Data Analysis

Data obtained from field research projects was analyzed with a computer program referred to as HP chemistry station. This program allowed for the integration of each target analyte in the chromatogram. Once each peak corresponding to a specific analyte was integrated, thereby giving area, it was then possible to convert that area into ppbC (parts per billion carbon). This calculation required that the area be divided by an averaged response factor and the sample's initial volume.

Gas Chromatography System



Overall Laboratory Design

Conclusion

Volatile organic compounds play a crucial role in atmospheric chemistry processes. This is evident when examining their affect on the production of not only tropospheric ozone but also free radicals and organic aerosols. With further field research in correspondence to mathematical modeling, the degree to which NMHC's contribute to atmospheric reactions can be better quantified. Overall, NMHC's are integral in the big picture that surrounds atmospheric global change.

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