Propane and Light Alkene Enhancements at Thompson Farm: Impact on Ozone Production

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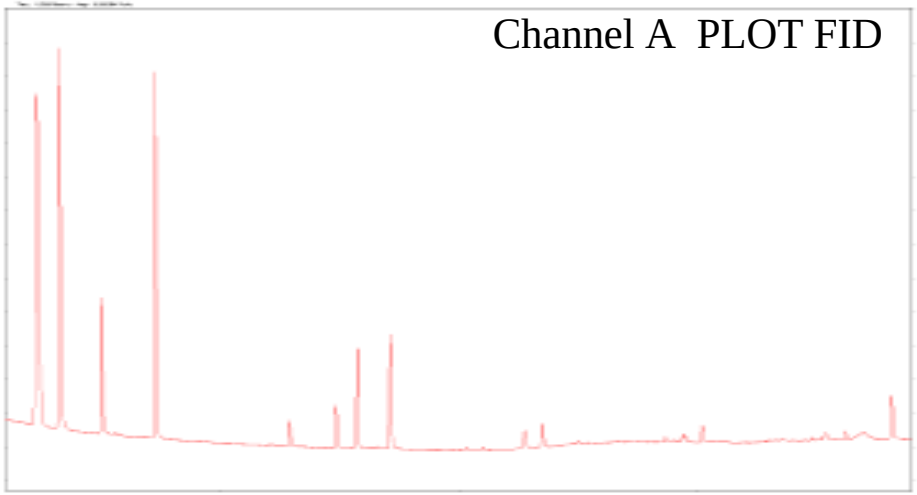
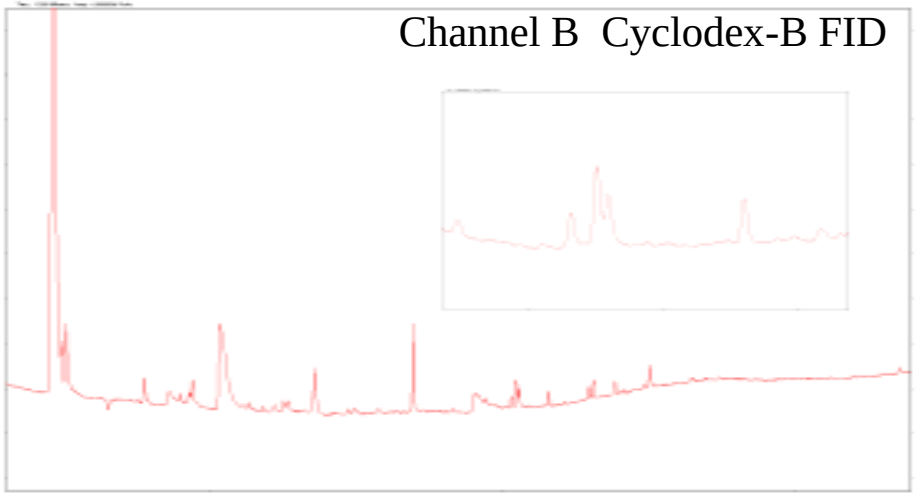
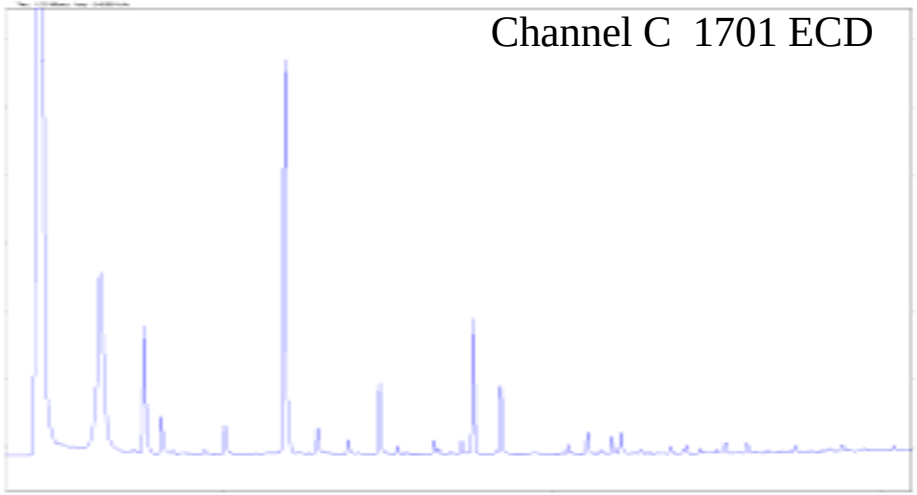
Measurements at Thompson Farm

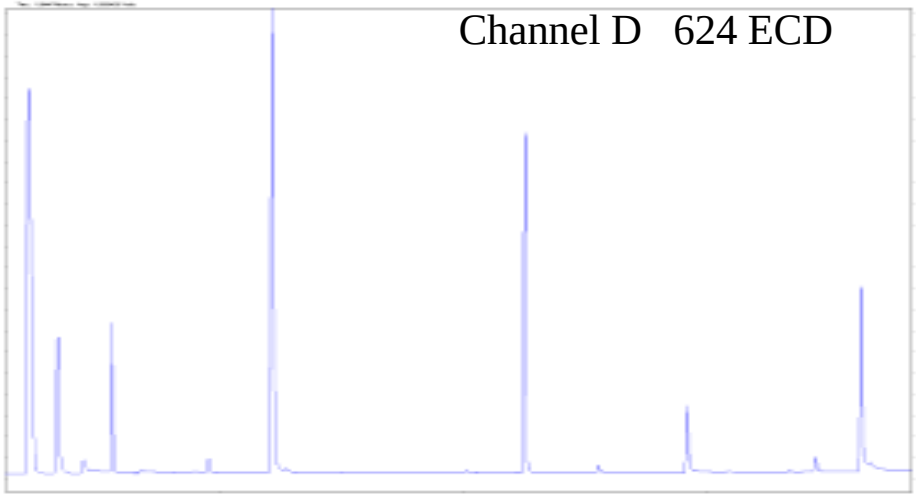
4 Channel GC-FID-ECD System

- *C_2-C_9 NMHCs*
- *C_1-C_2 Halocarbons*
- *C_1-C_5 Alkyl Nitrates*
- *Hourly Measurements*









June 2002

Ethane	Ethene	Propane	Propene	i-Butane	n-Butane	Ethyne	i-Pentane	n-Pentane	Isoprene	Benzene
1281.0	243.0	842.0	97.0	104.0	150.0	454.0	197.0	61.0	41.0	121.0
32.7	7.8	14.5	6.0	5.5	4.4	10.2	12.7	3.3	2.7	6.0
2.6%	**3.2%**	**1.7%**	**6.2%**	**5.3%**	**2.9%**	**2.3%**	**6.5%**	**5.3%**	**6.6%**	**4.9%**

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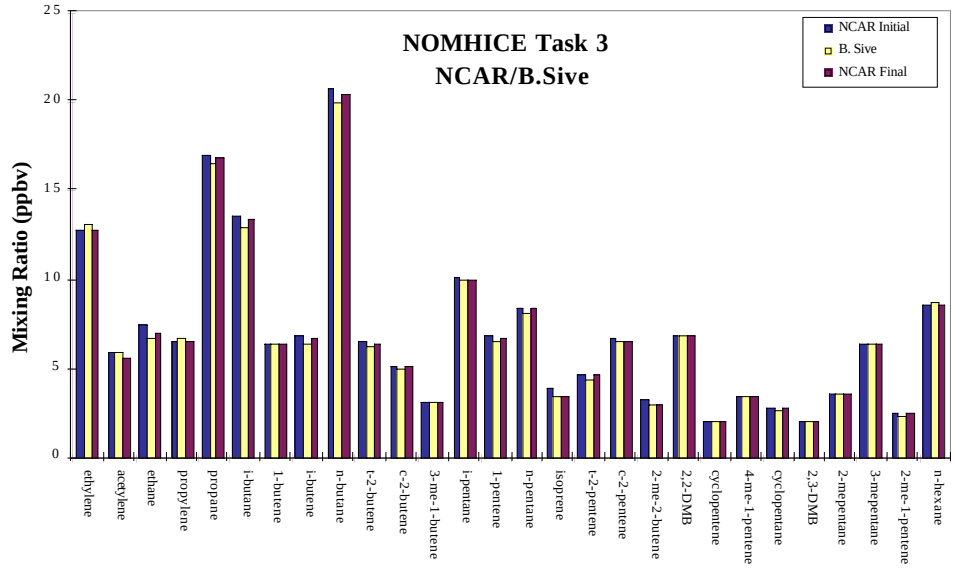

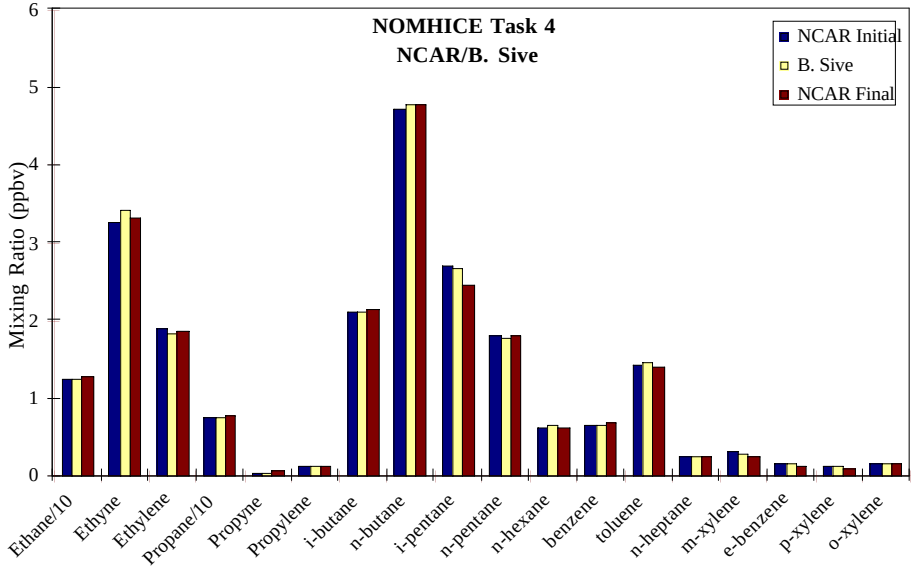

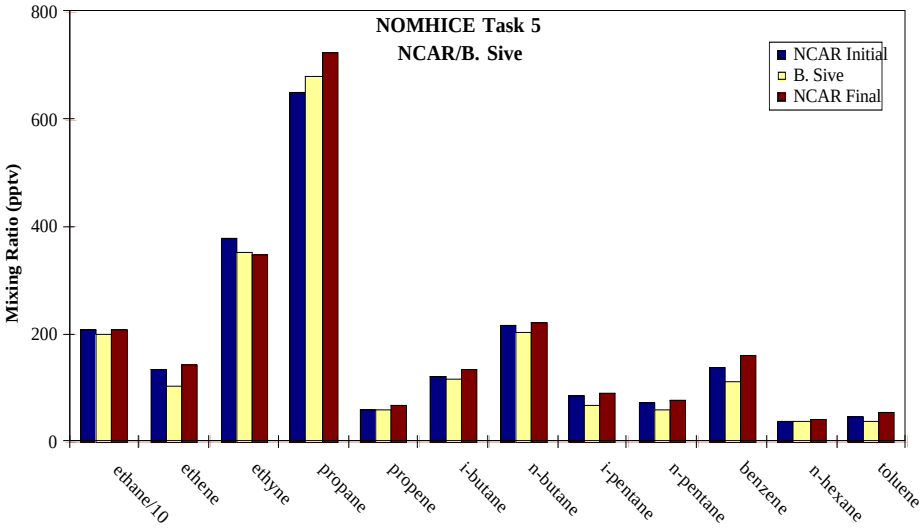

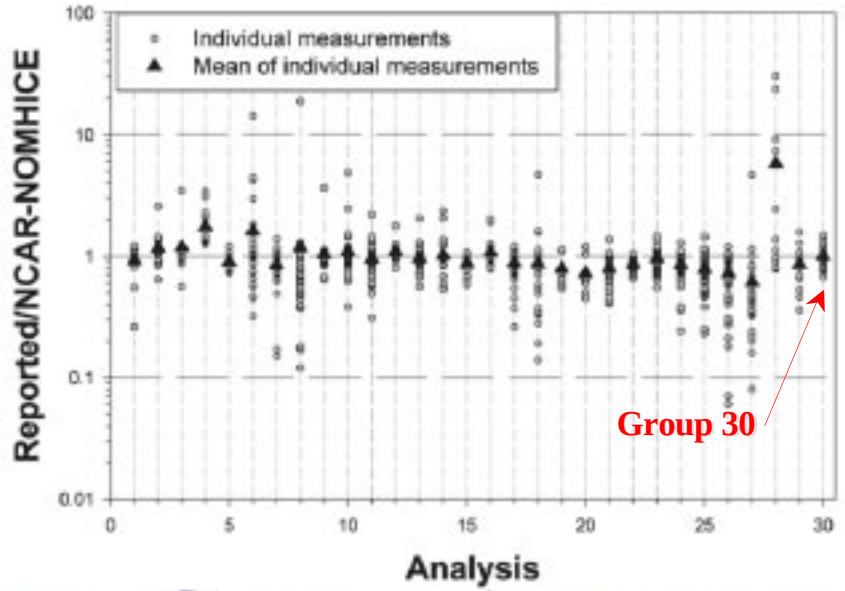

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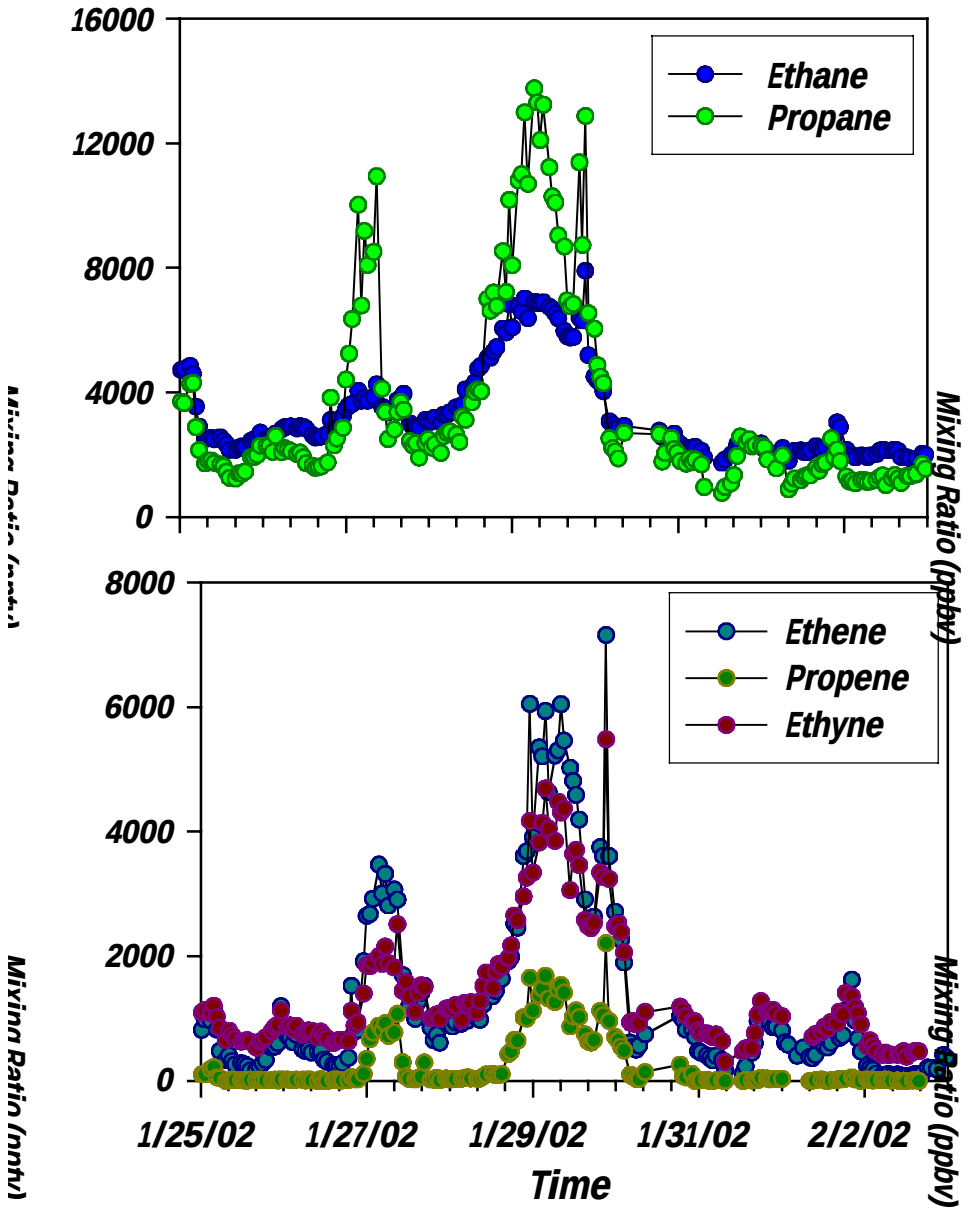
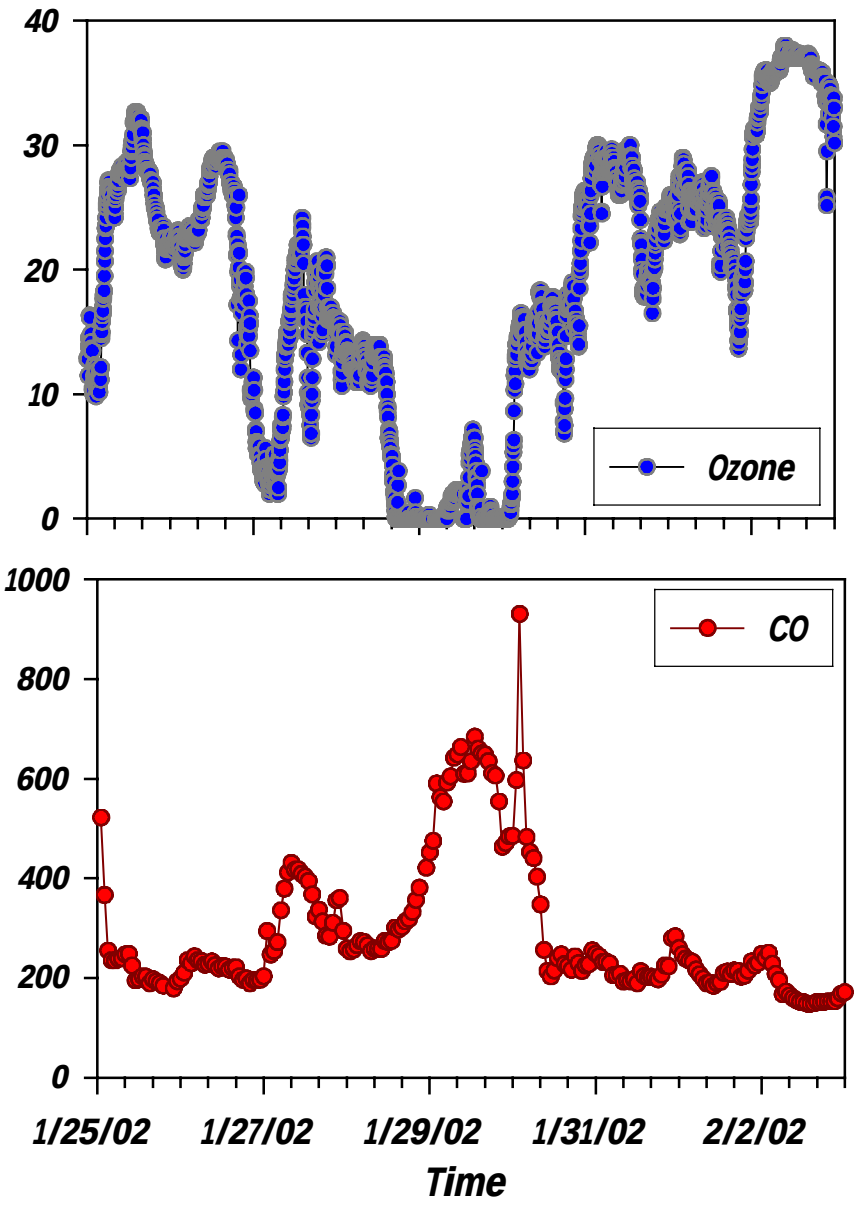
Thompson Farm January 25-February 3, 2002





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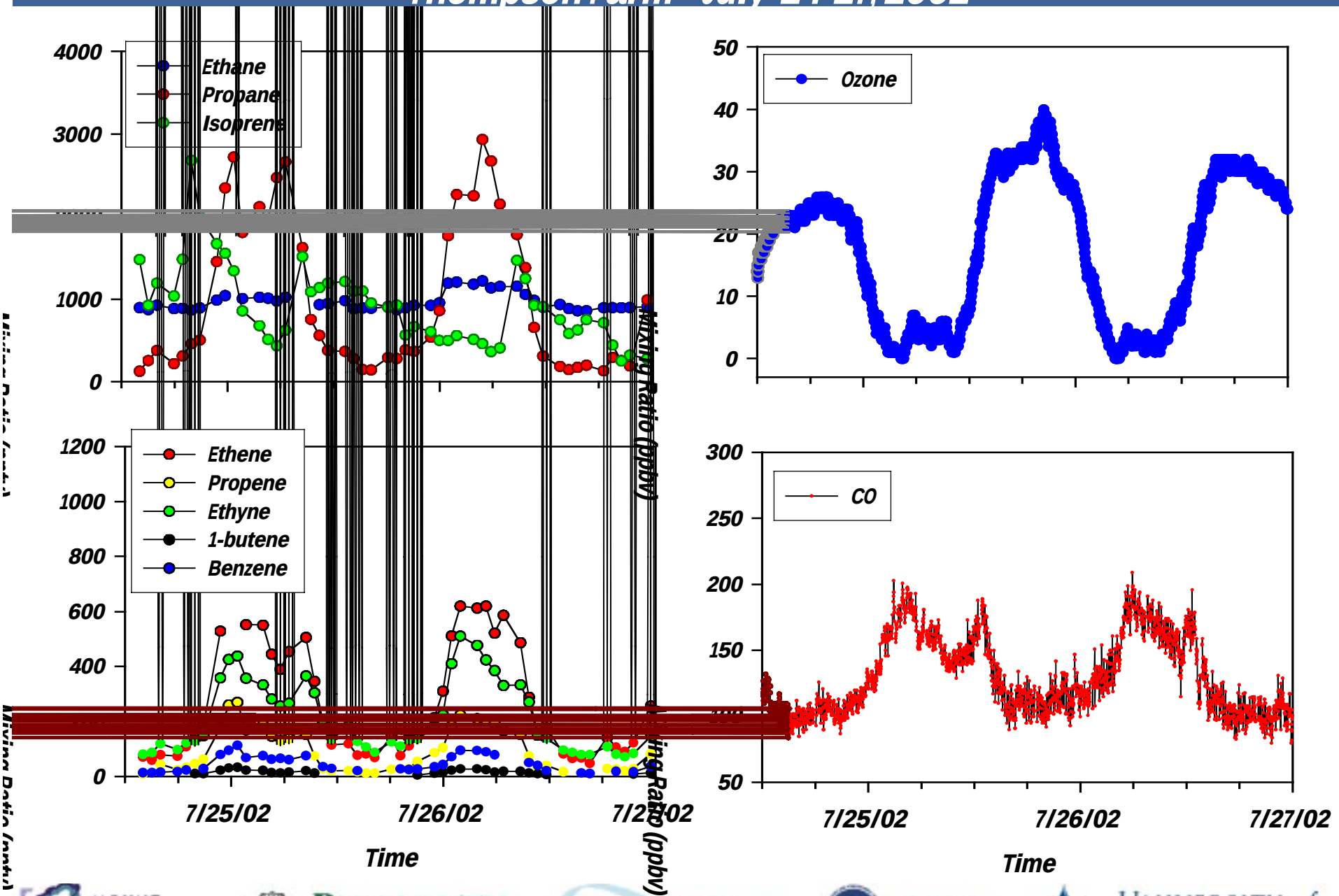
Thompson Farm July 24-27, 2002



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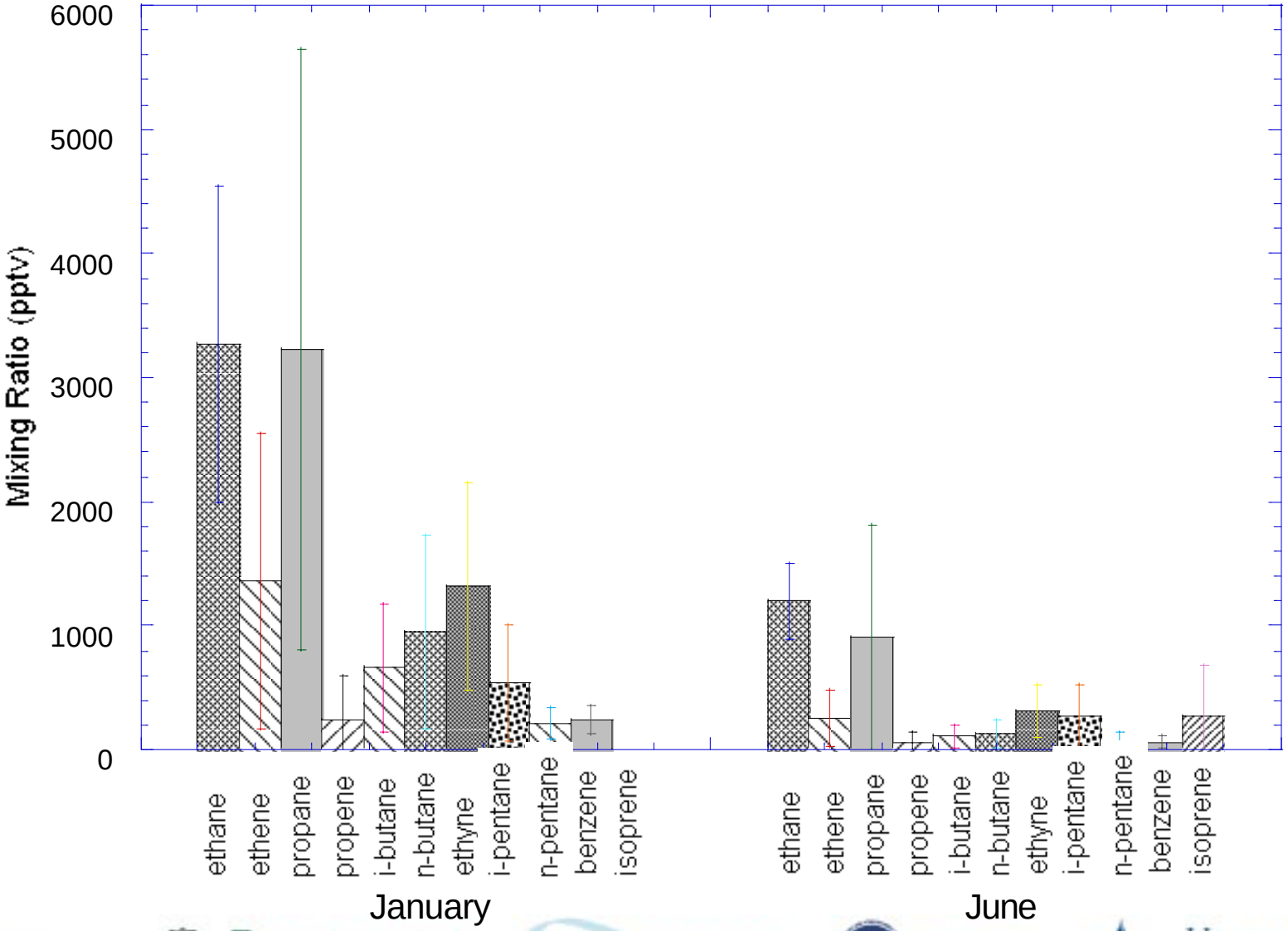
Monthly Averages at Thompson Farm
January and June 2002



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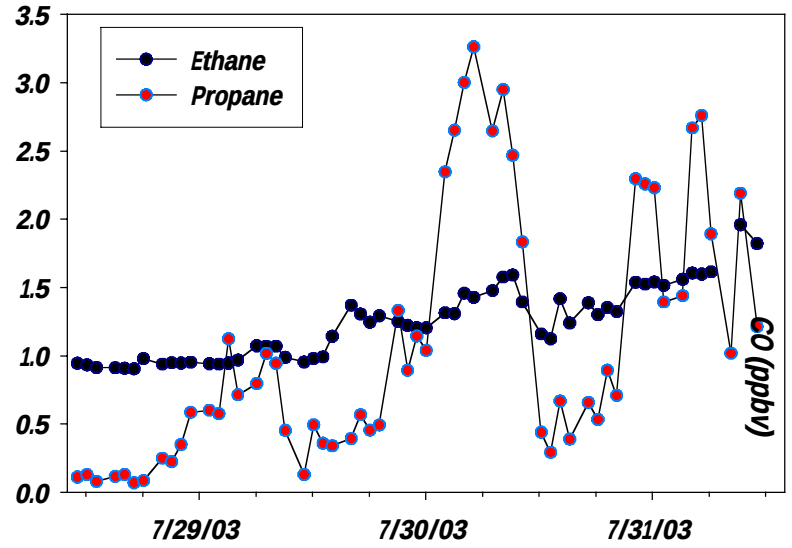
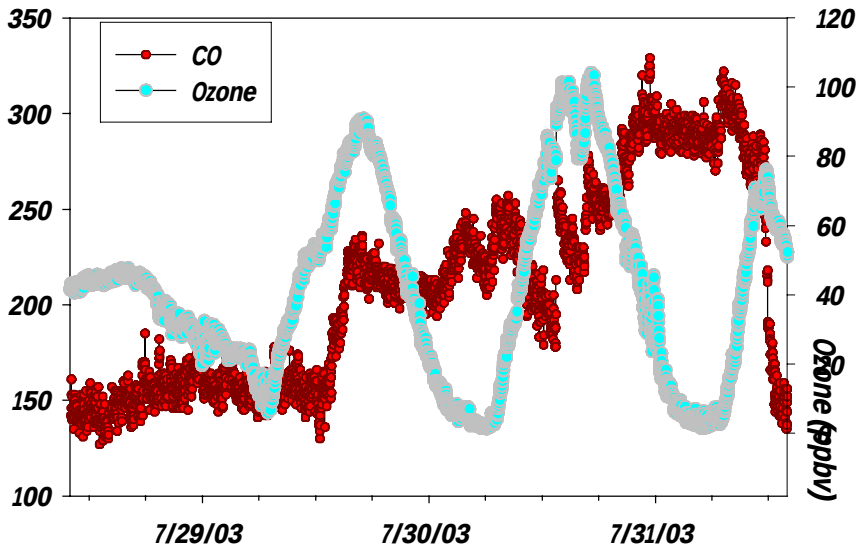
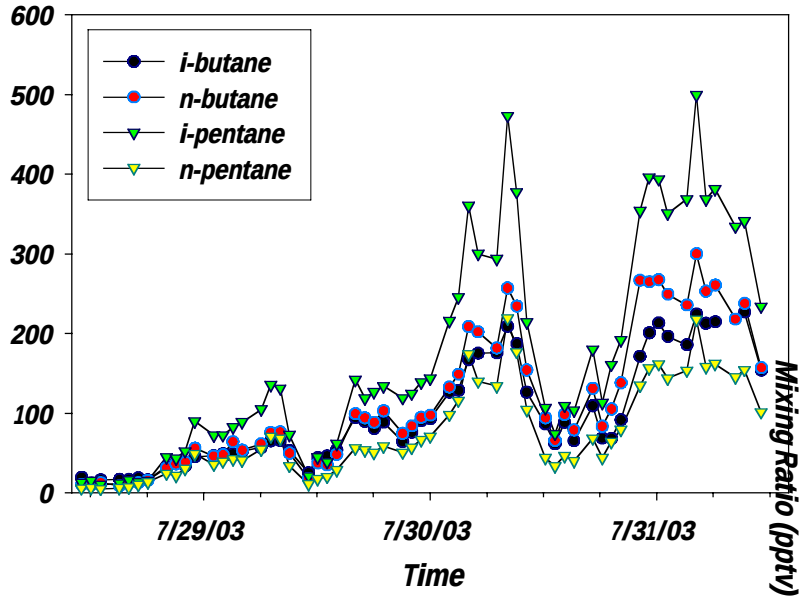
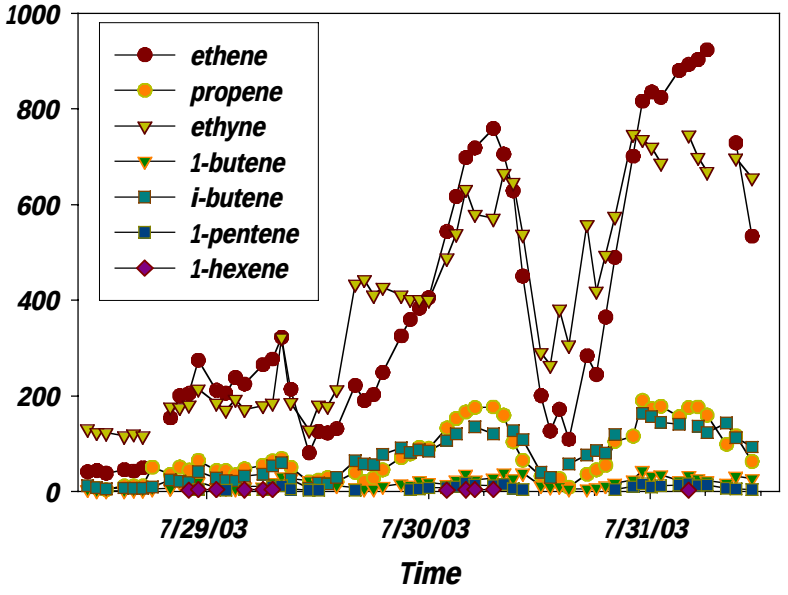
Thompson Farm July 28-31, 2003





Mixing Ratio (ppbv)





Mixing Ratio (pptv)

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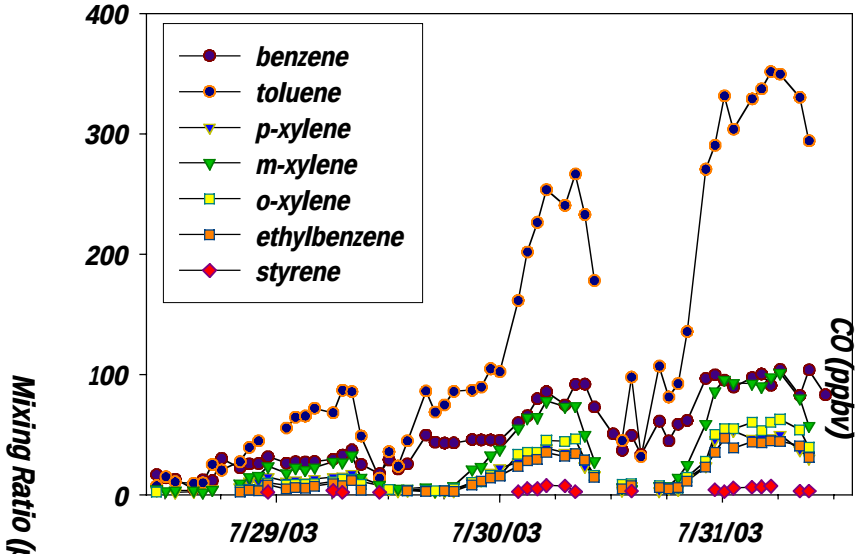

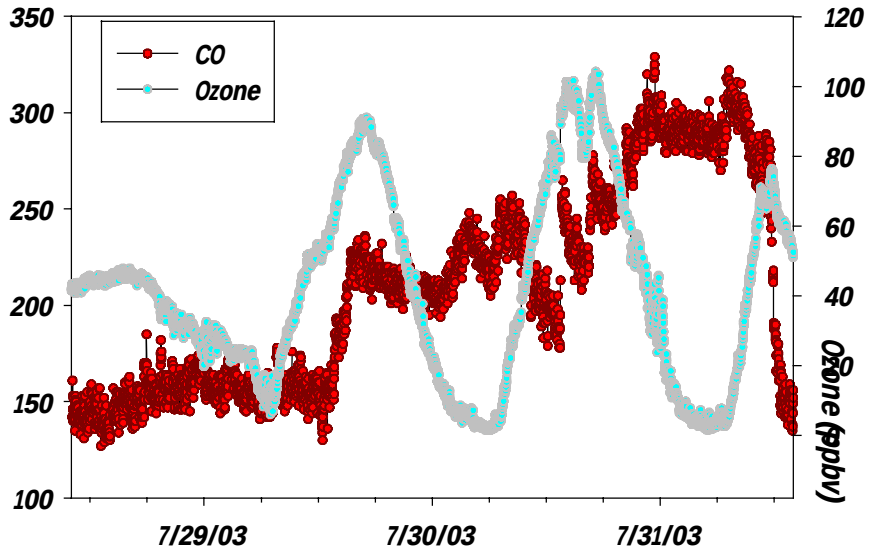

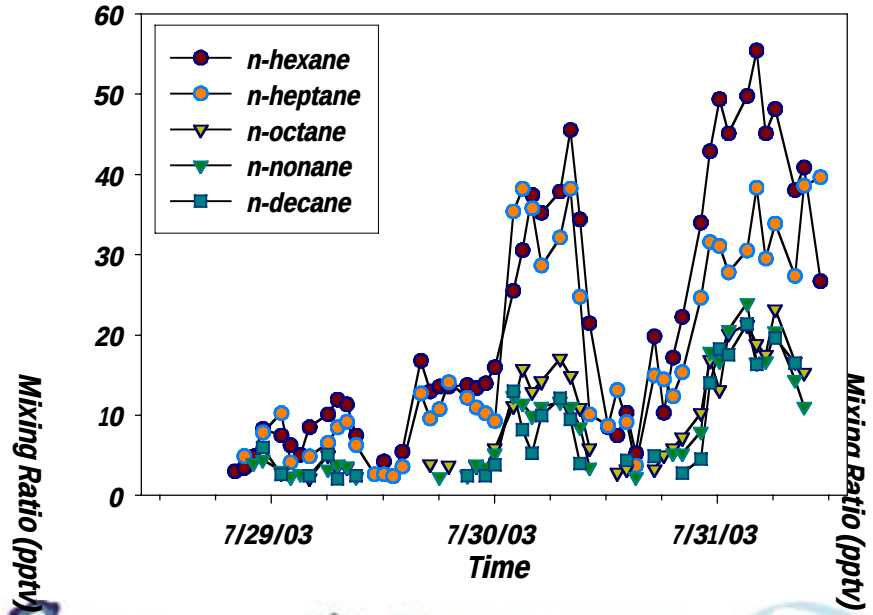

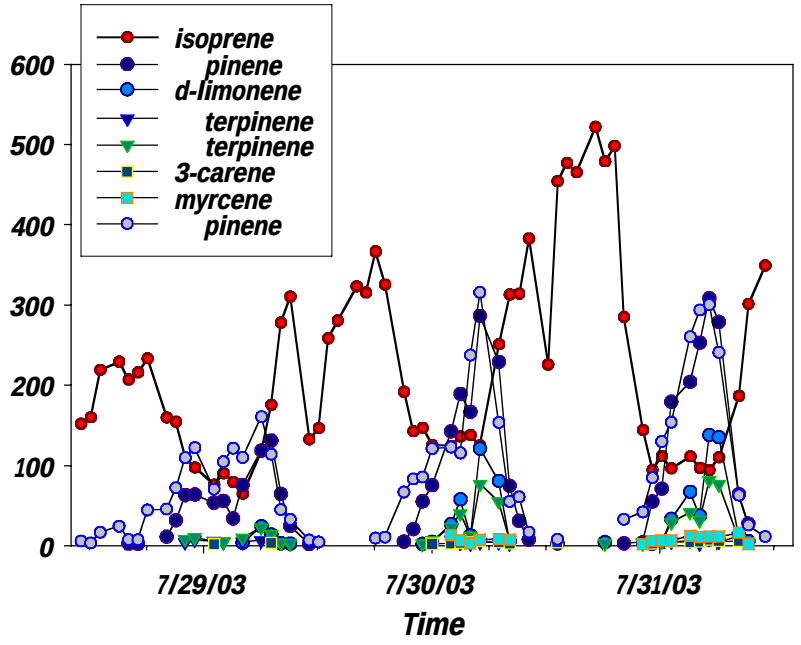

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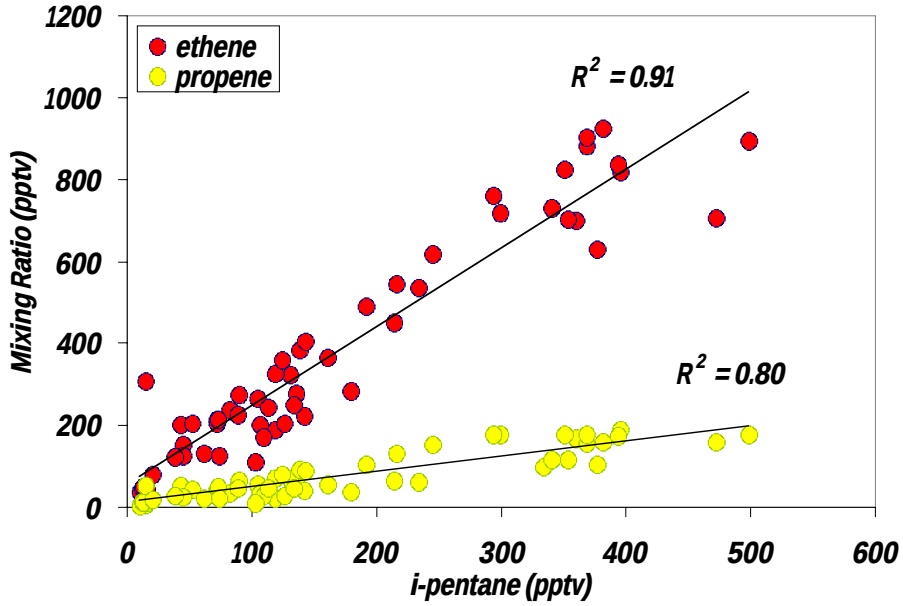

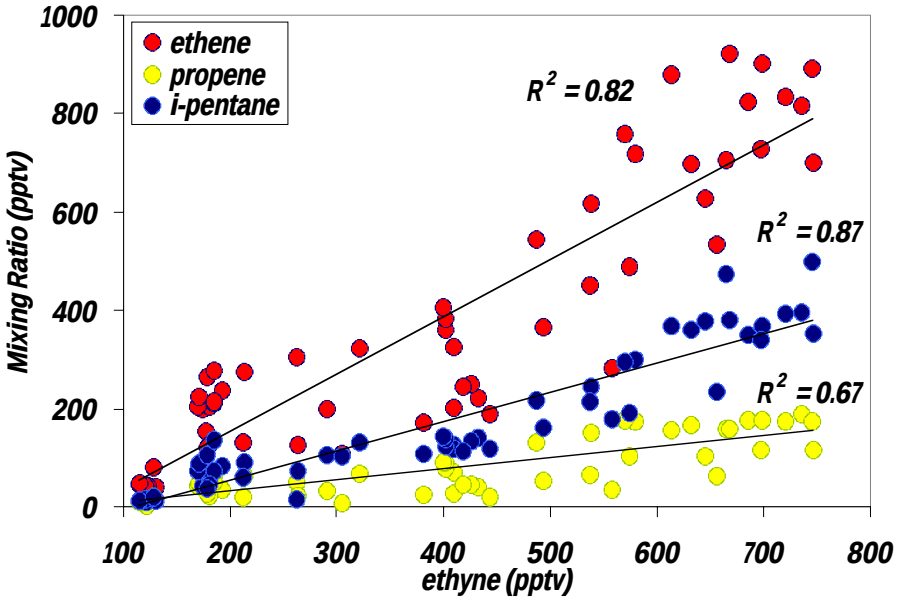

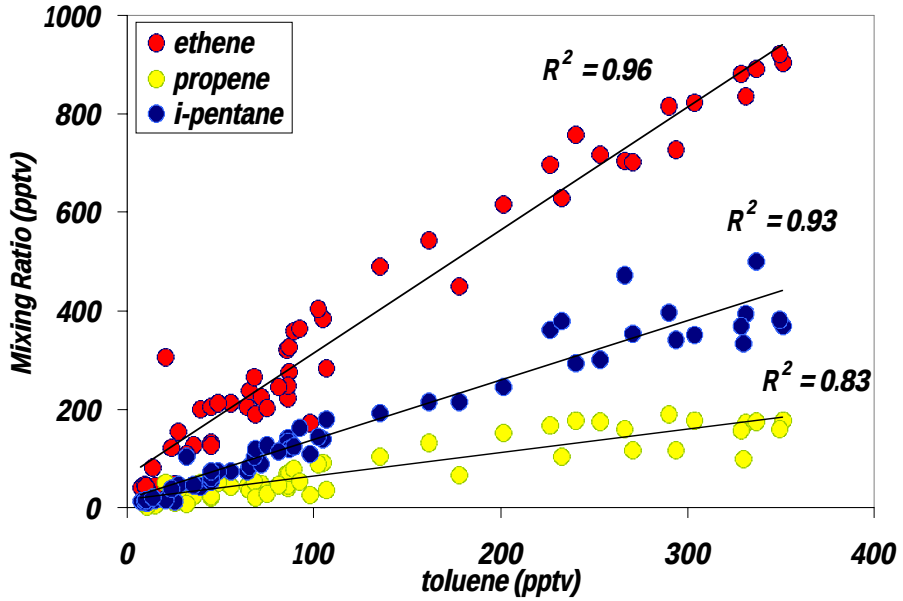

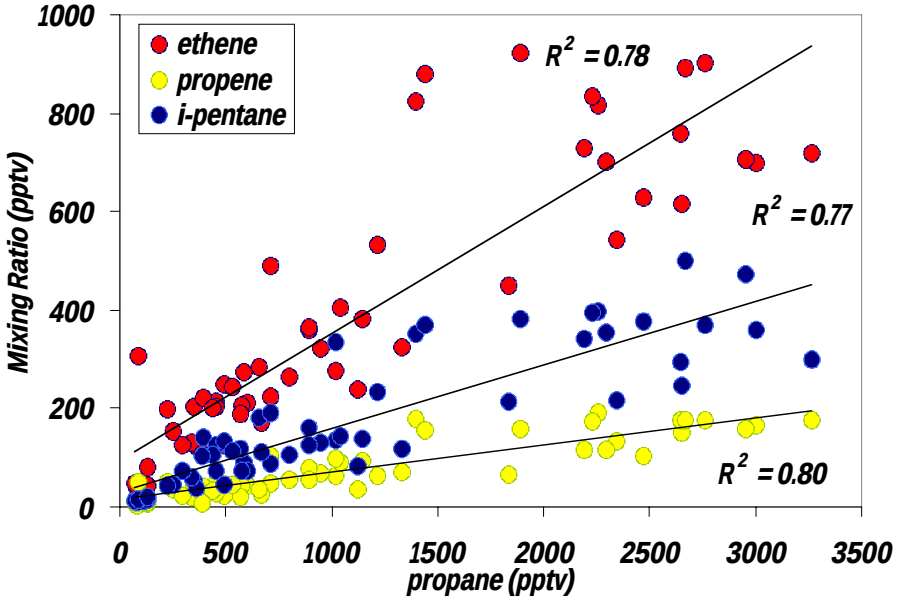

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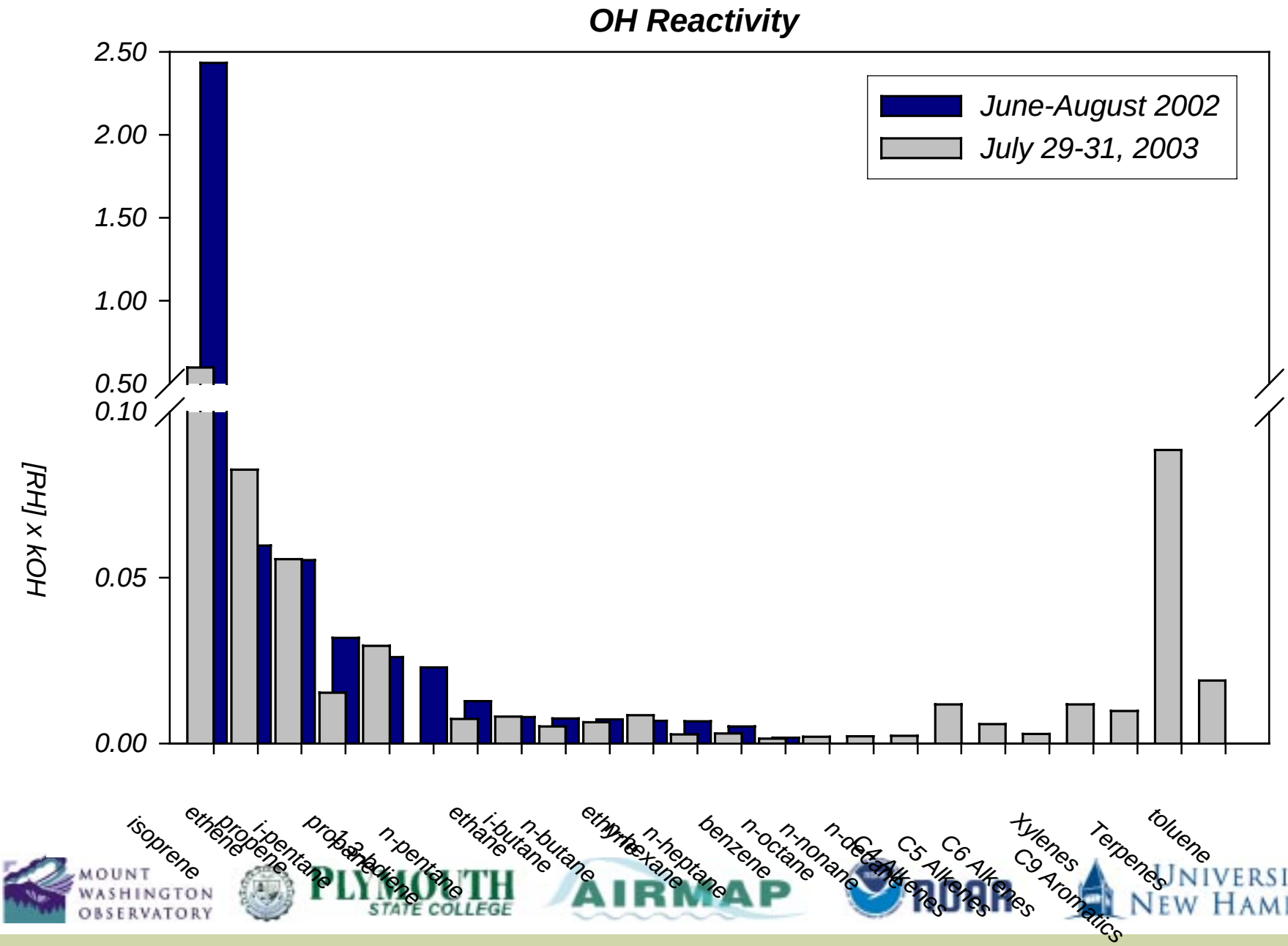
Determination of the Relative Importance of NMHCs in Ozone Production



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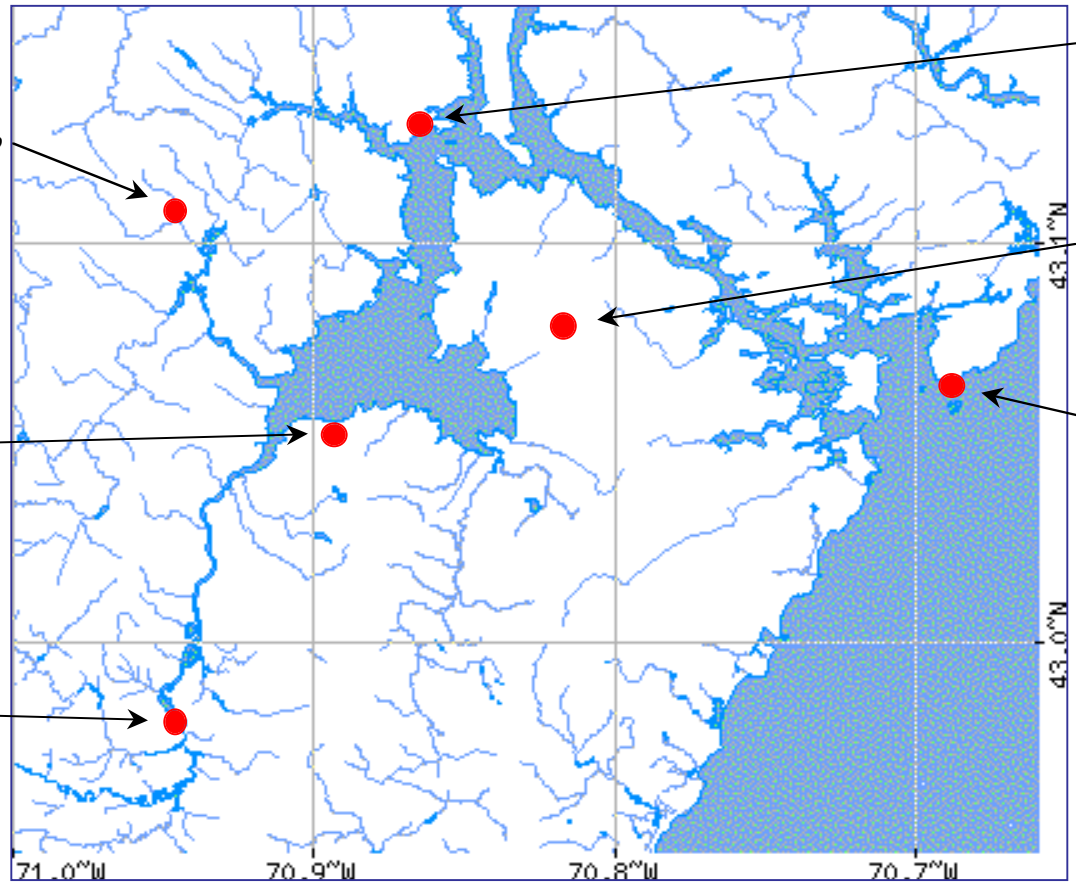
Great Bay, NH
August 18-19, 2003



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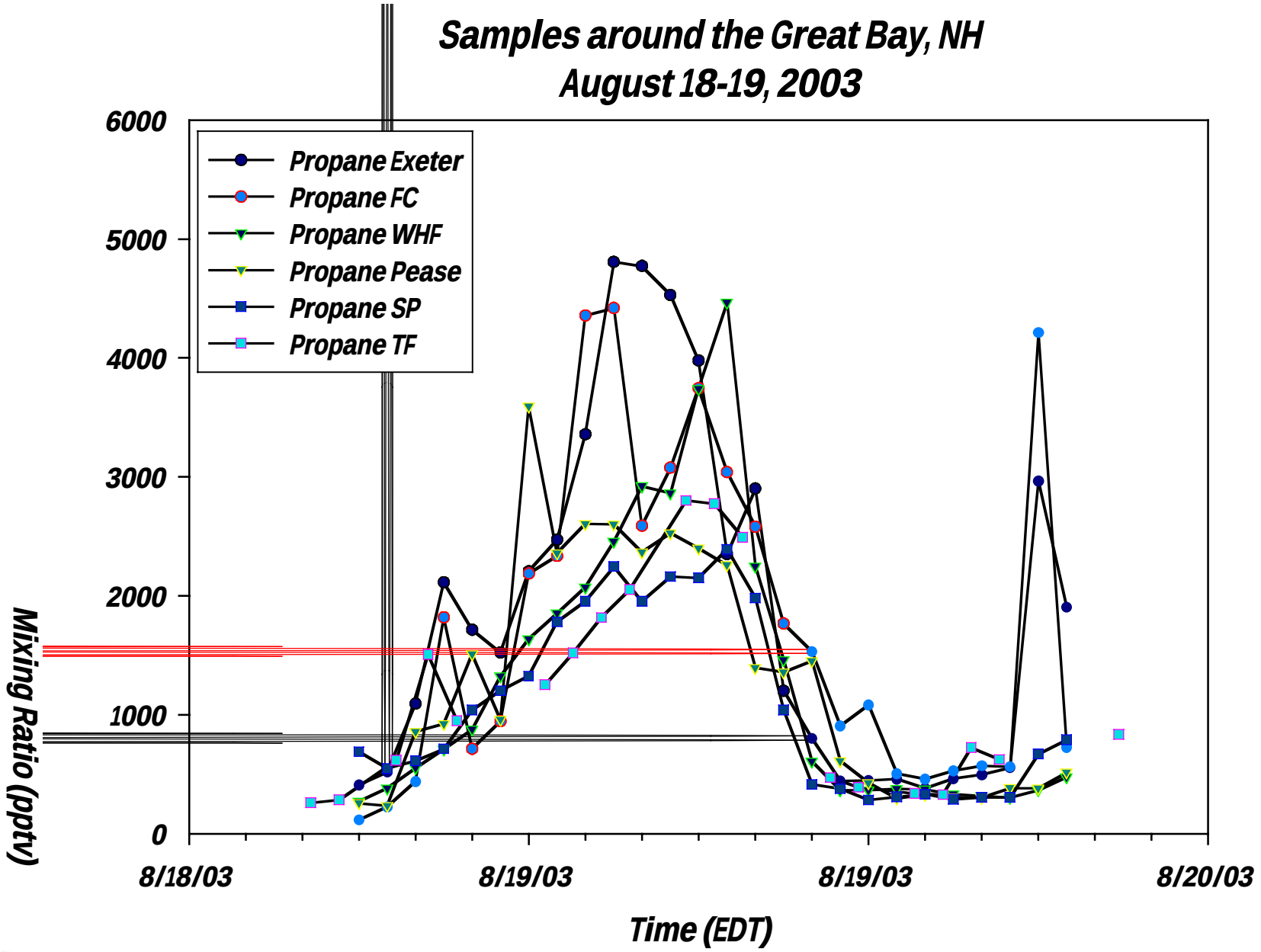

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NMHC emission rates from Thompson Farm

$$\text{Emission Rate} = \{ [RH] / t \} \times H = \{ [RH]_f - [RH]_i / 5 \text{ hrs} \} \times 300 \text{ m}$$

	Mixing Ratio (pptv) Initial	Mixing Ratio (pptv) Final	Emission Rate molecules cm^{-2} s^{-1}
ethane	1396	1574	7.4×10^{9}
propane	1519	2801	5.3×10^{10}
i-butane	183	240	2.4×10^{9}
n-butane	226	279	2.5×10^{9}

Propane emission rate is about an order of magnitude larger than other NMHCs.

Summary

- High levels of propane as well as other trace gases are observed regularly at TF and around the Great Bay, but what about the rest of New England?
- Attributed to a low level nocturnal boundary layer allowing emissions to build up to extremely high levels – impacting regional chemistry (?) – more to come….
- During the stable nocturnal inversion events, propane fluxes are about an order of magnitude larger than other NMHCs.
- OH reactivities were similar between 2002 and 2003 measurements at TF with biogenics being the largest contributors followed by ethene, propene and propane.
- Ethene and propene are well correlated with markers of vehicular emissions/fossil fuel combustion.

- Thanks to Nicola Blake (UCI), Sallie Whitlow, Eric Scheuer, Ruth Varner, + the rest of CCRC.
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