Nonmethane Hydrocarbons at the NOAA ESRL Cooperate Network Flask Sampling Sites and Their Use for Site and Atmospheric Transport Evaluation

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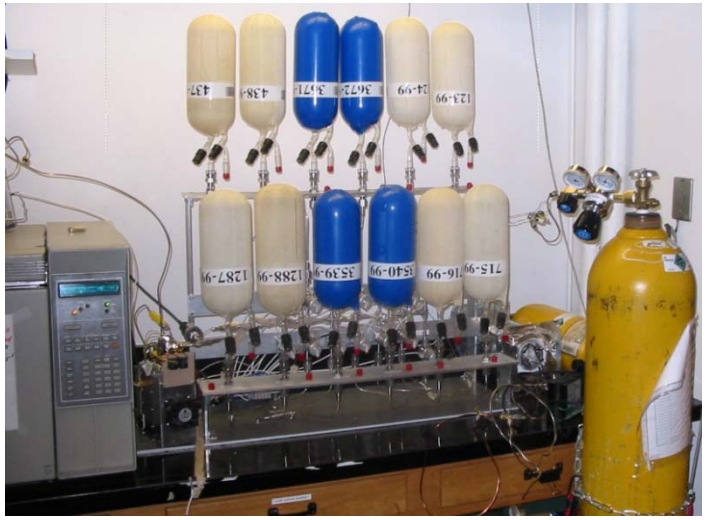
and the entire ESRL GMD Flask Team



NMHC monitored:

Ethane
Propane
iso-Butane
n-Butane
iso-Pentane
n-Pentane
Isoprene
Benzene
Toluene

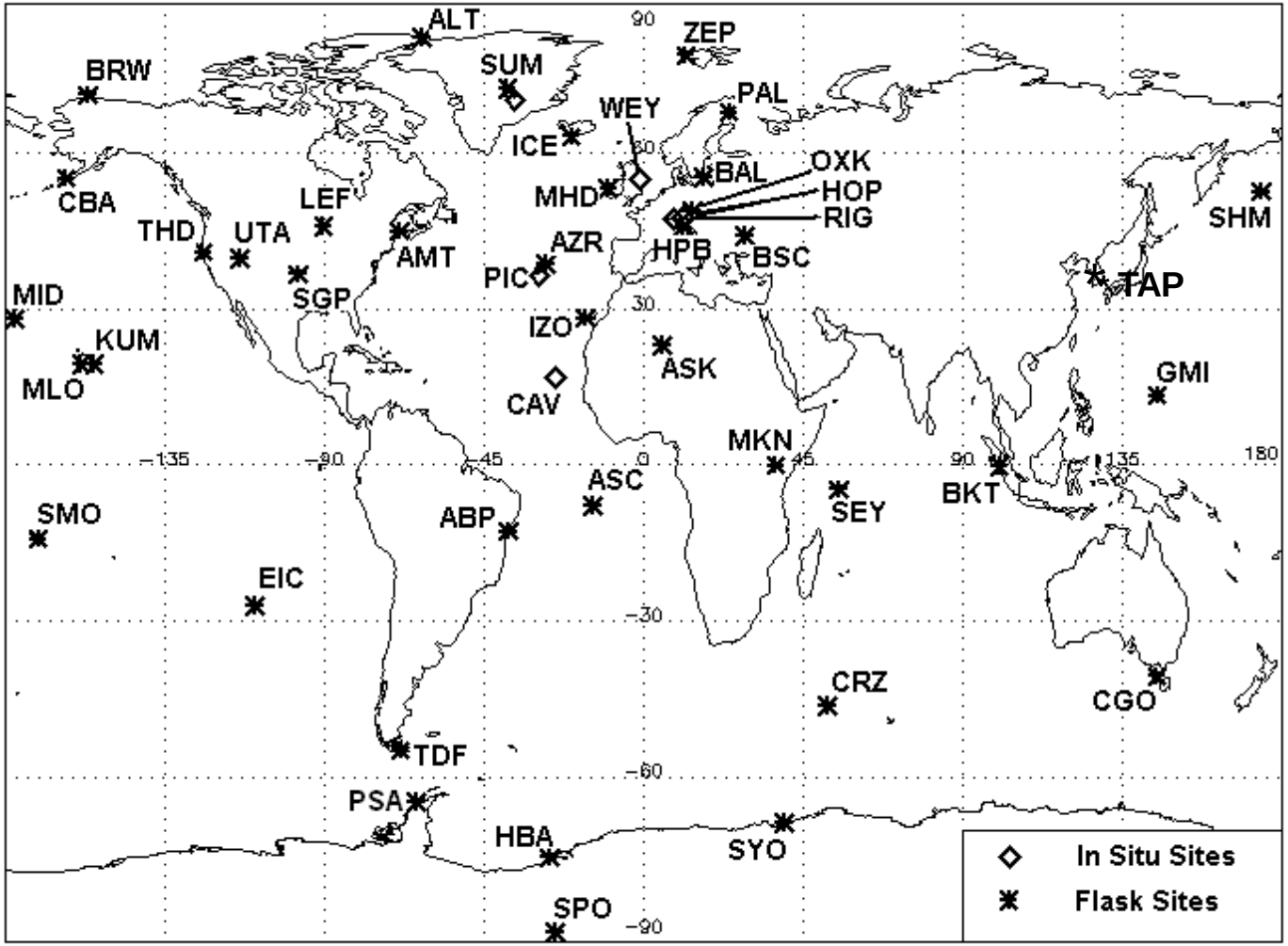
Flask Facts:

- Since 2004
- Continuous, 5+ years of data
- 3+ Years of side by side intercomparison with in-situ system at Hohenpeissenberg
- 1.5 Years of intercomparison with in-situ system at Summit
- Currently 42 sites
- > 5000 NMHC analysis results in NOAA data base

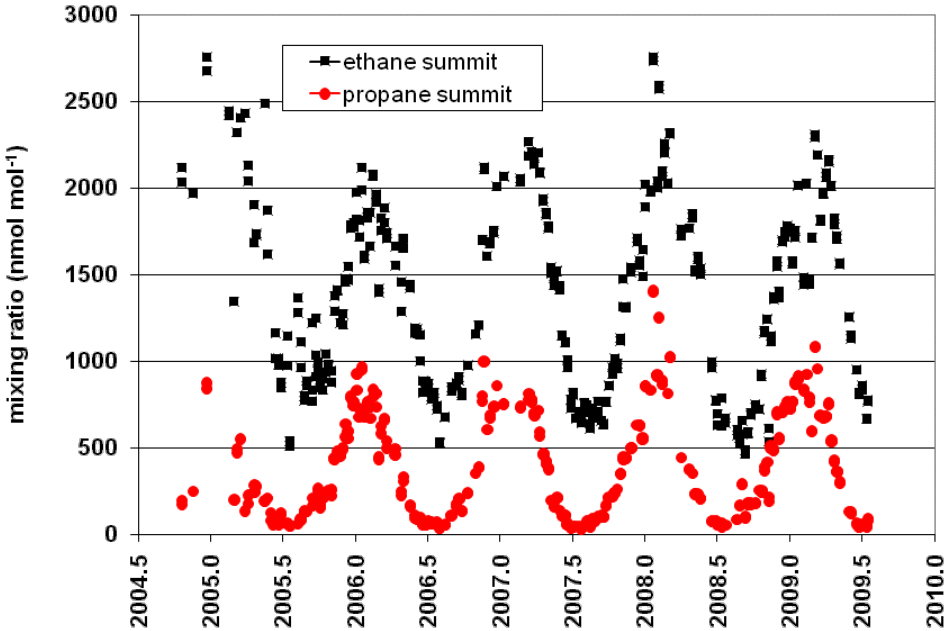
Outcomes of NMHC Monitoring

- Identification of Contaminated Flask Samplers (MLO, 2006)
- Identification of Flask Site Contamination (Easter Island)
- Eight CU Boulder Students have been Trained
- Centerpiece of WMO GAW Global VOC Network
- Method Publication in J. Chromatography (Pollmann et al., 2006)
- Feature Article in EOS (Helmig et al., 2009)
- Modeling Development/Data Comparison Publication in ACP (Pozzer et al., 2010)
- Atmospheric Chemistry and Air Transport Research
- New Interpretations for Sources and Sinks of Greenhouse Gases
- First Greenland Firn Air Analyses

Year 2010 Participating NOAA-INSTAAR NMHC Flask Sites

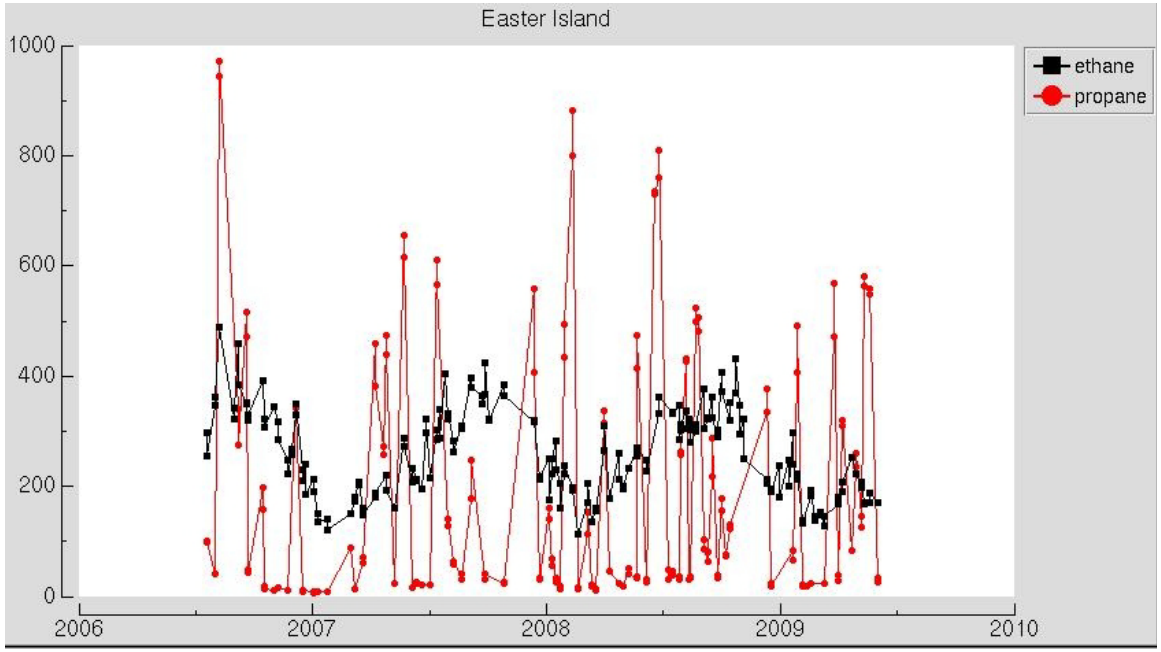


Identified Site Contamination

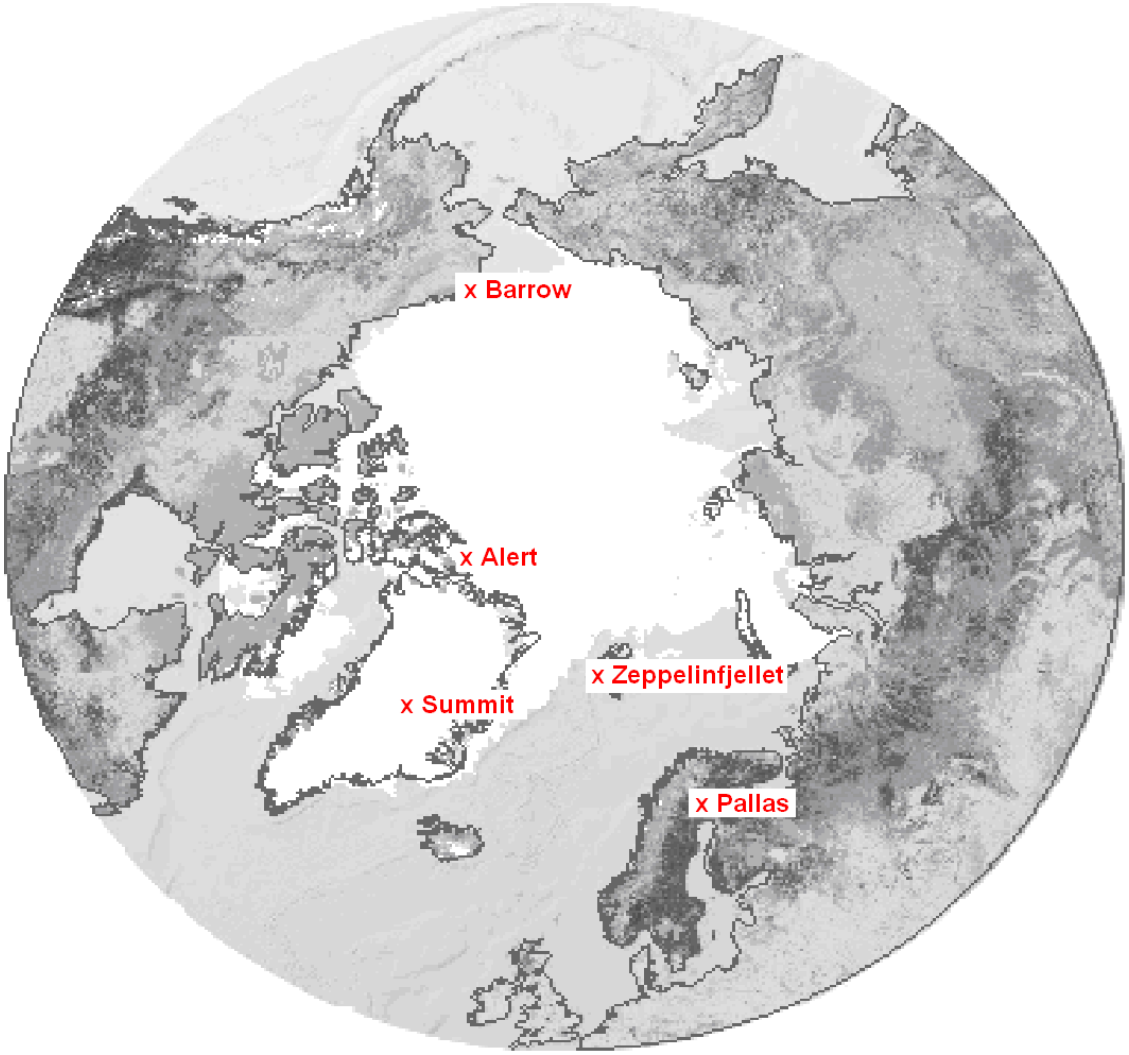


<- Summit

Easter Island ->

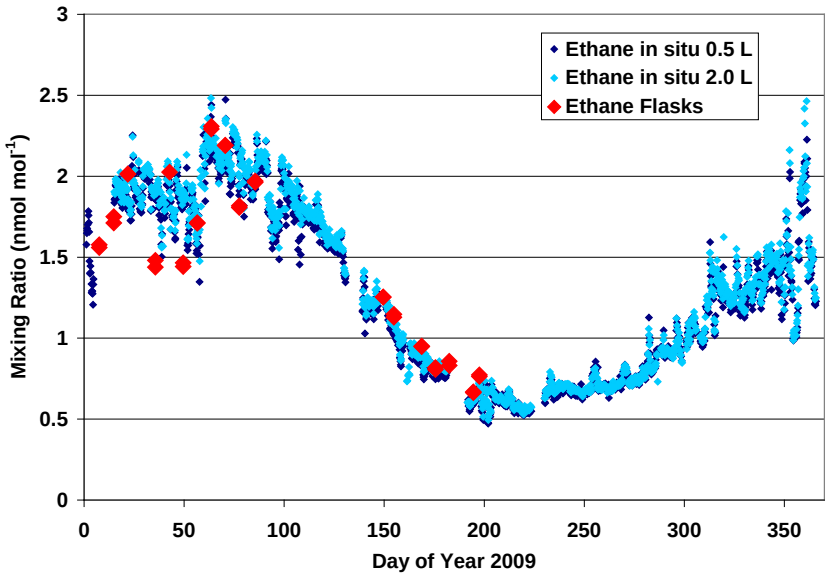


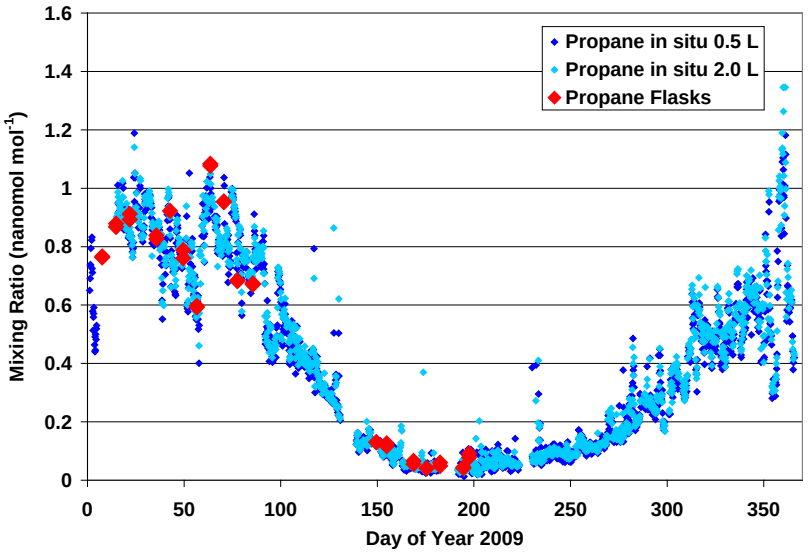
Participating Arctic NMHC Sites



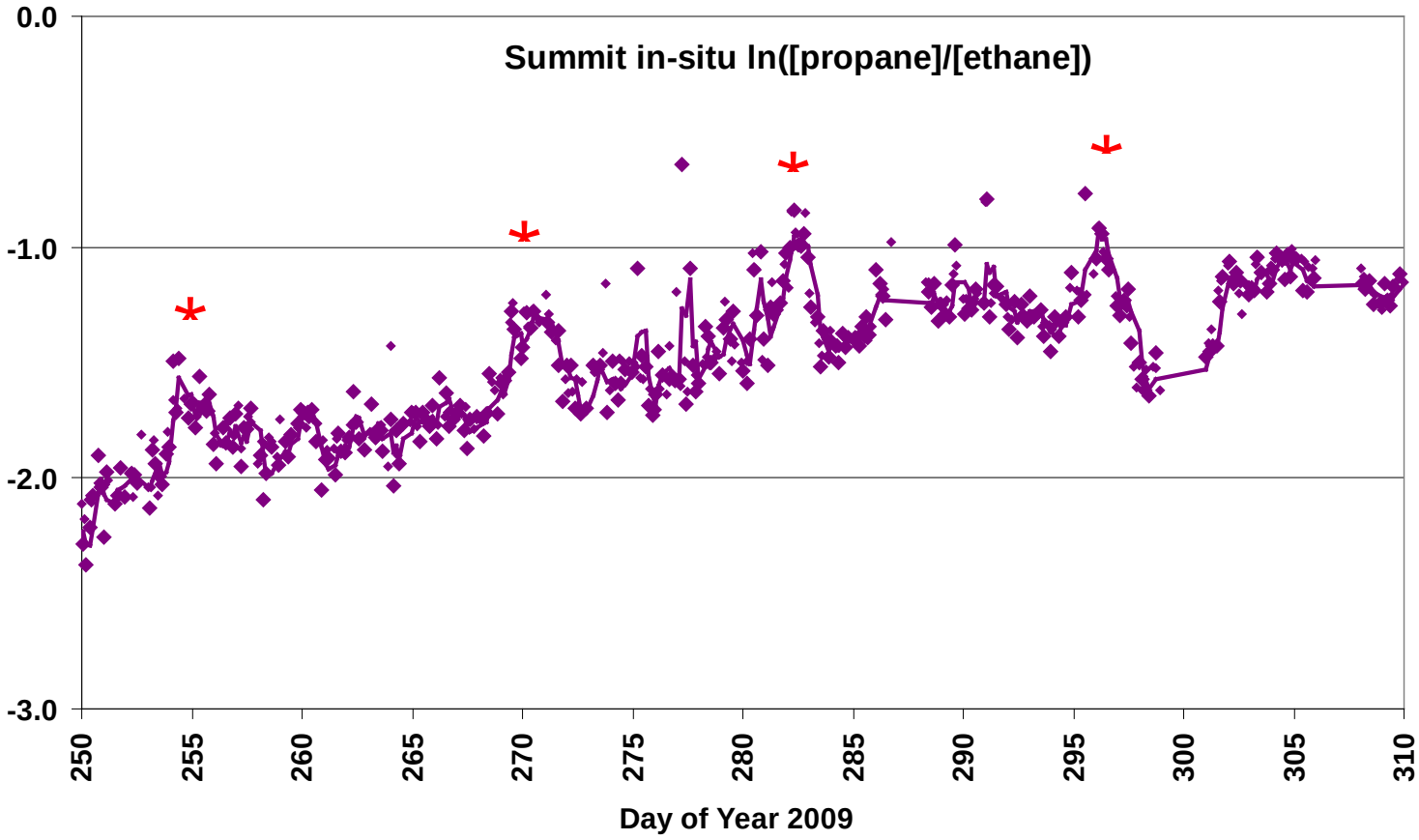
Summit Ethane and Propane, in-situ and NOAA Flasks

Summit Ethane and Propane Annual Cycle
Flask and in-situ GC Measurements

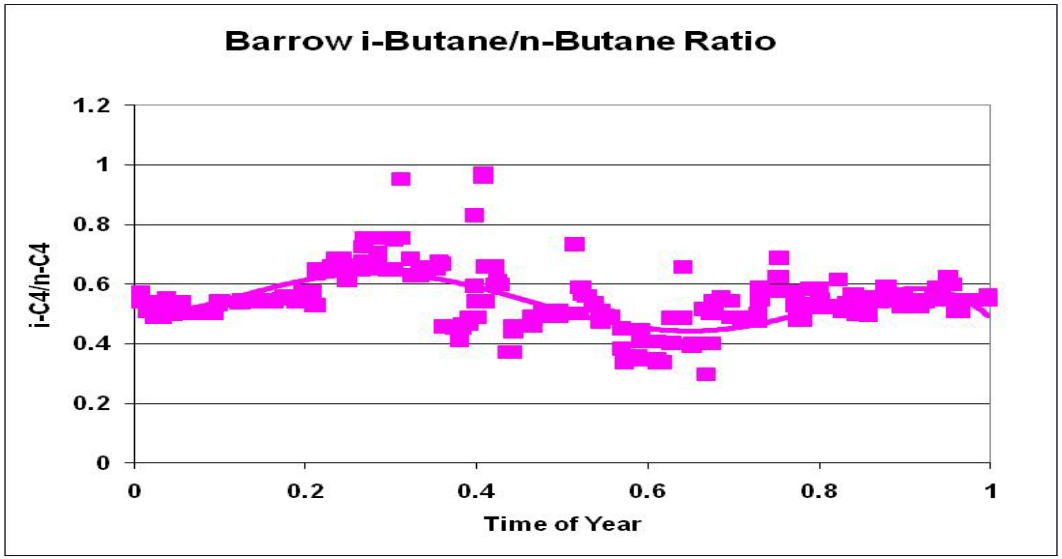


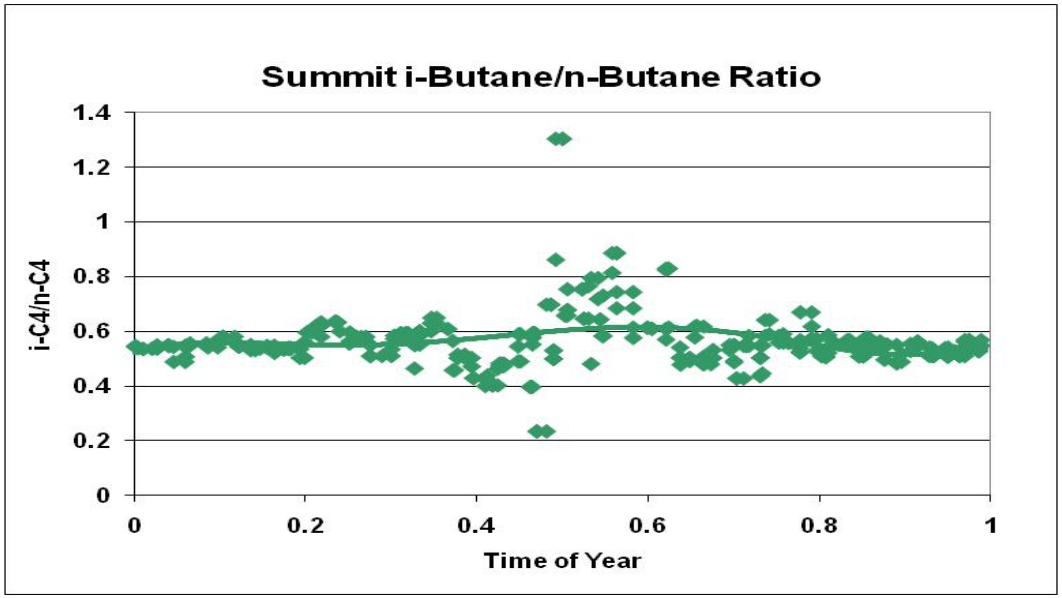


Identification of Pollution Transport Events at Summit by NMHC Aging Analysis from in-situ Data



Summit – Barrow Comparison Butane Oxidation

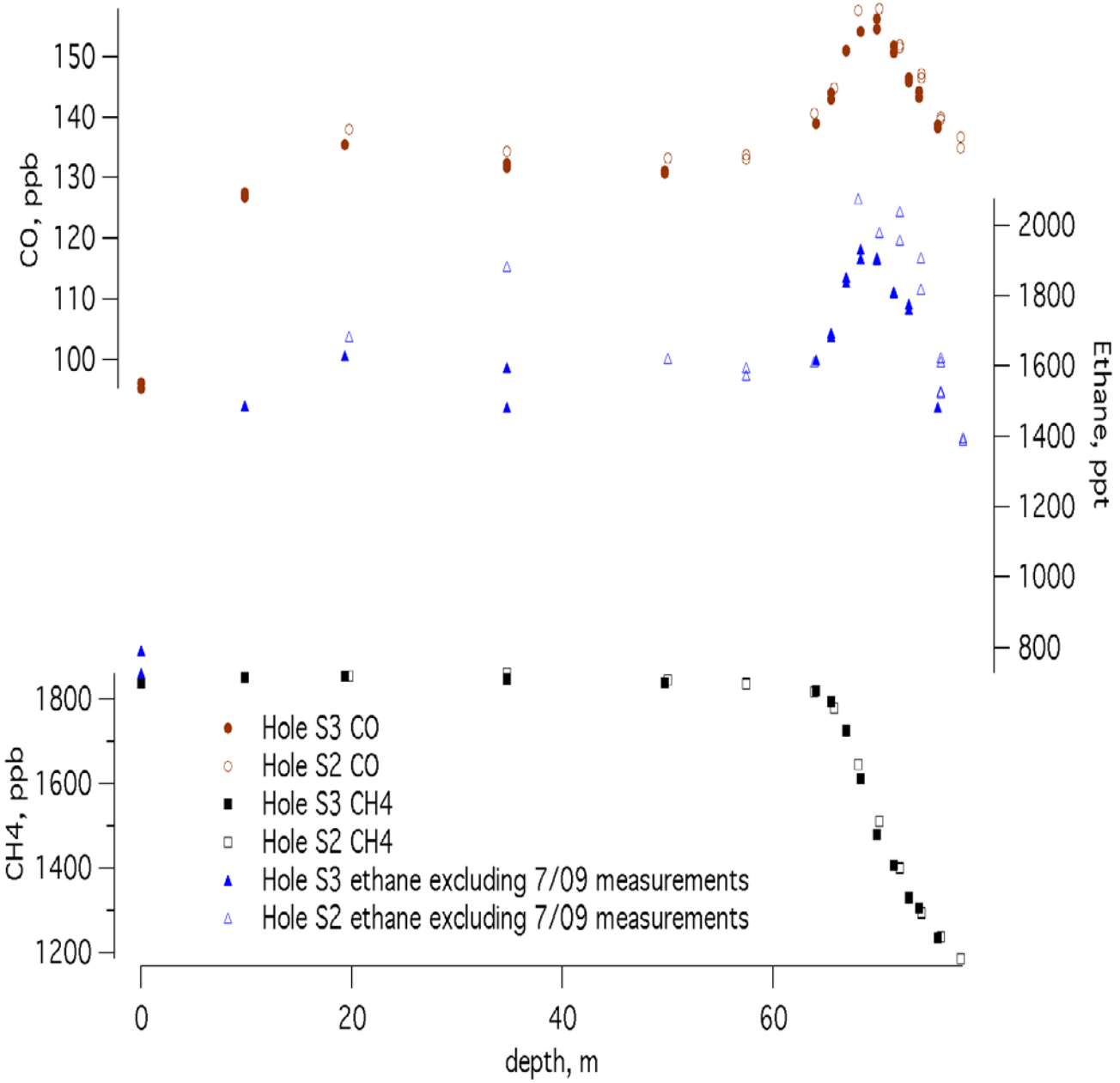


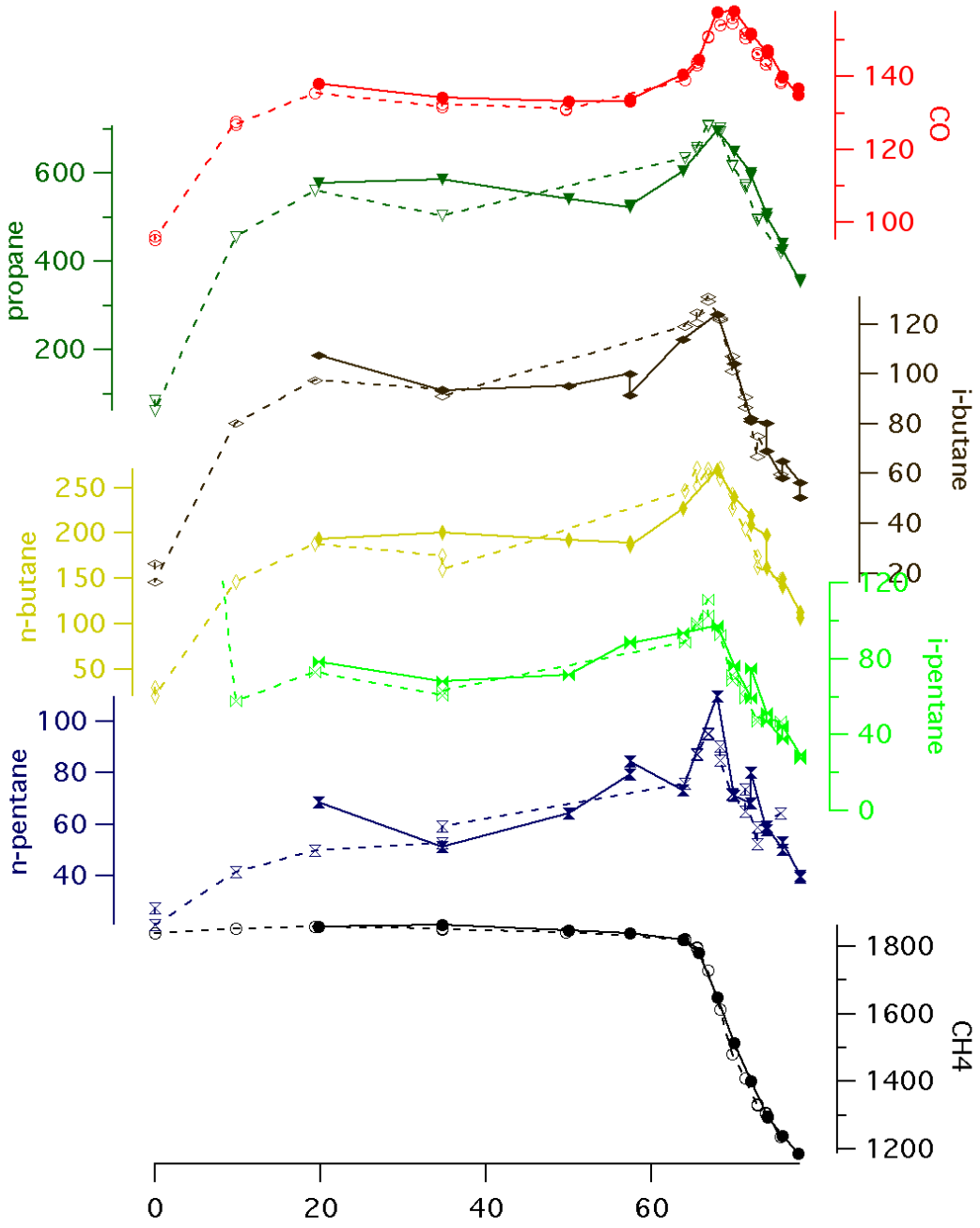


K_{OH} i-C4/n-C4 ~ 0.98

K_{cl} i-C4/n-C4 ~ 0.70

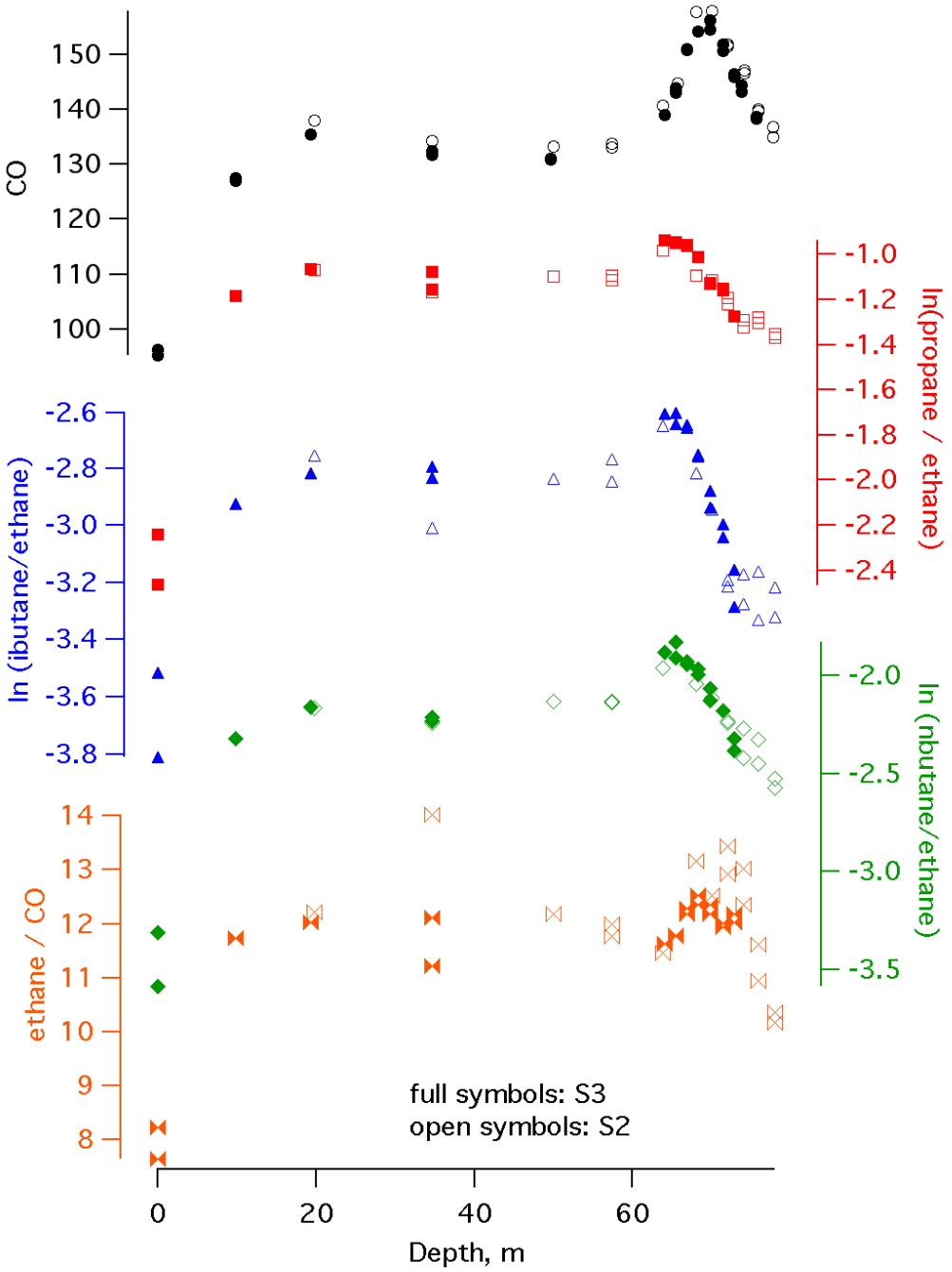
NEEM, Greenland, Firn Air Profile



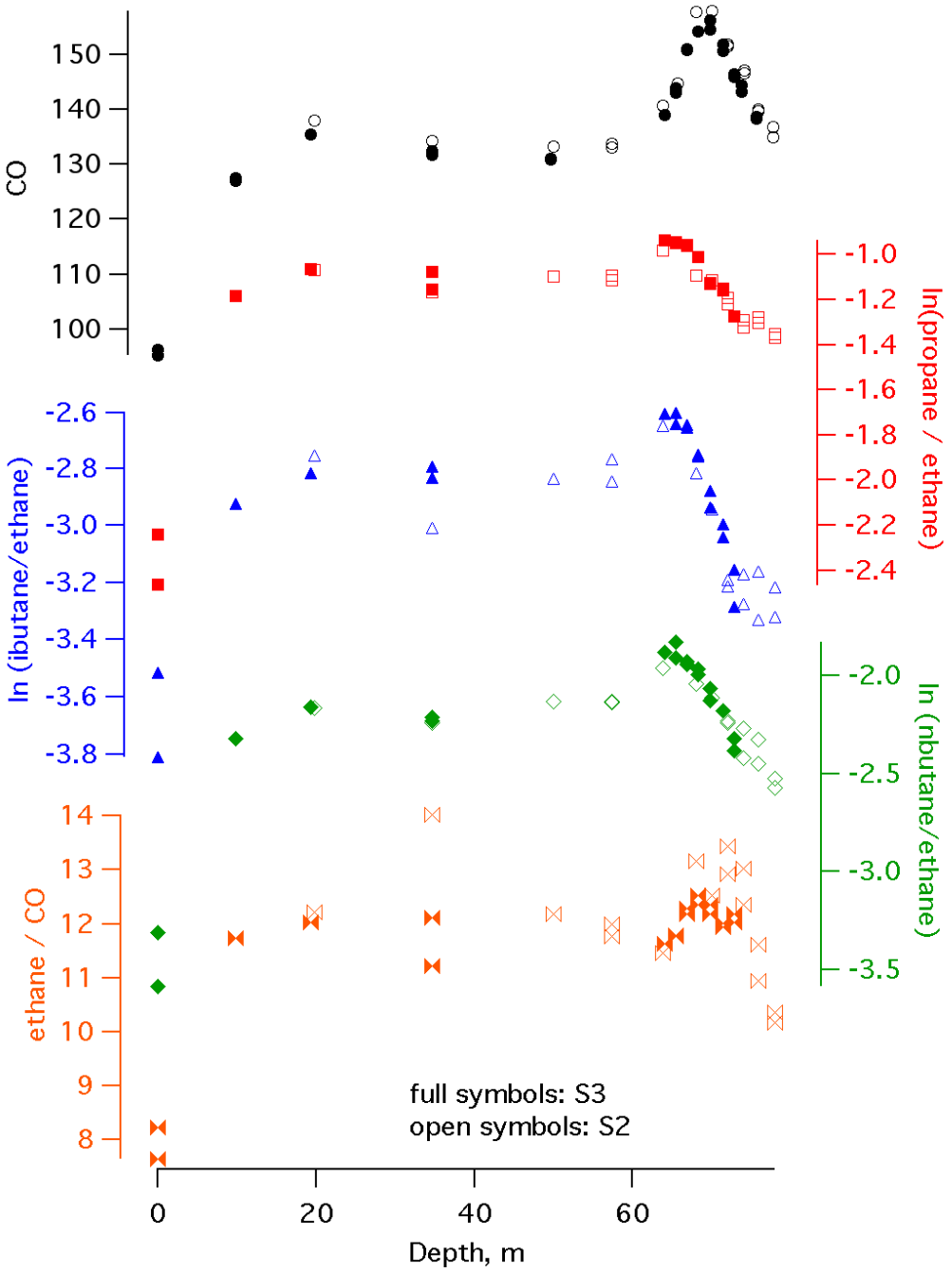


CO, NMHC, and CH_4, in NEEM Firn Core

NEEM NMHC Ratios



NEEM NMHC Ratios

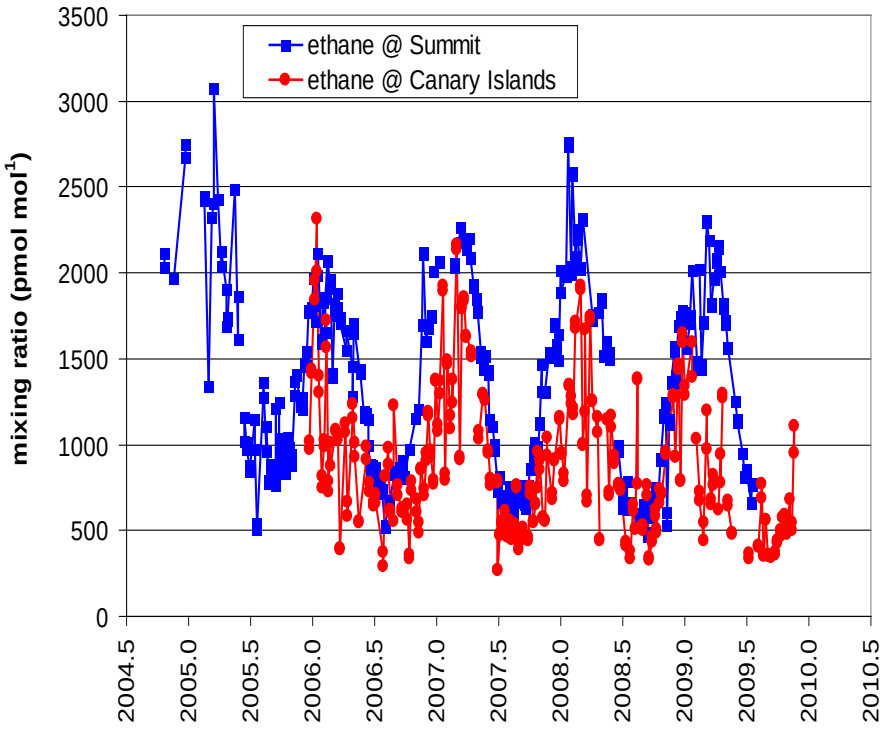


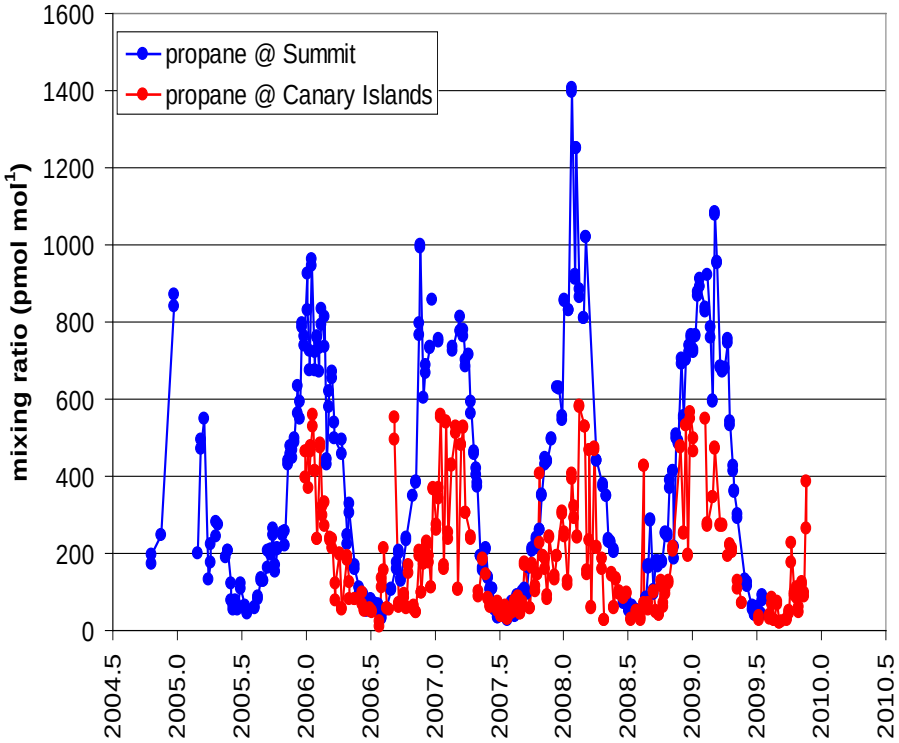
Possible Explanations for NMHC Ratio Changes:

-> Change in oxidation chemistry, with weaker oxidation in past ?

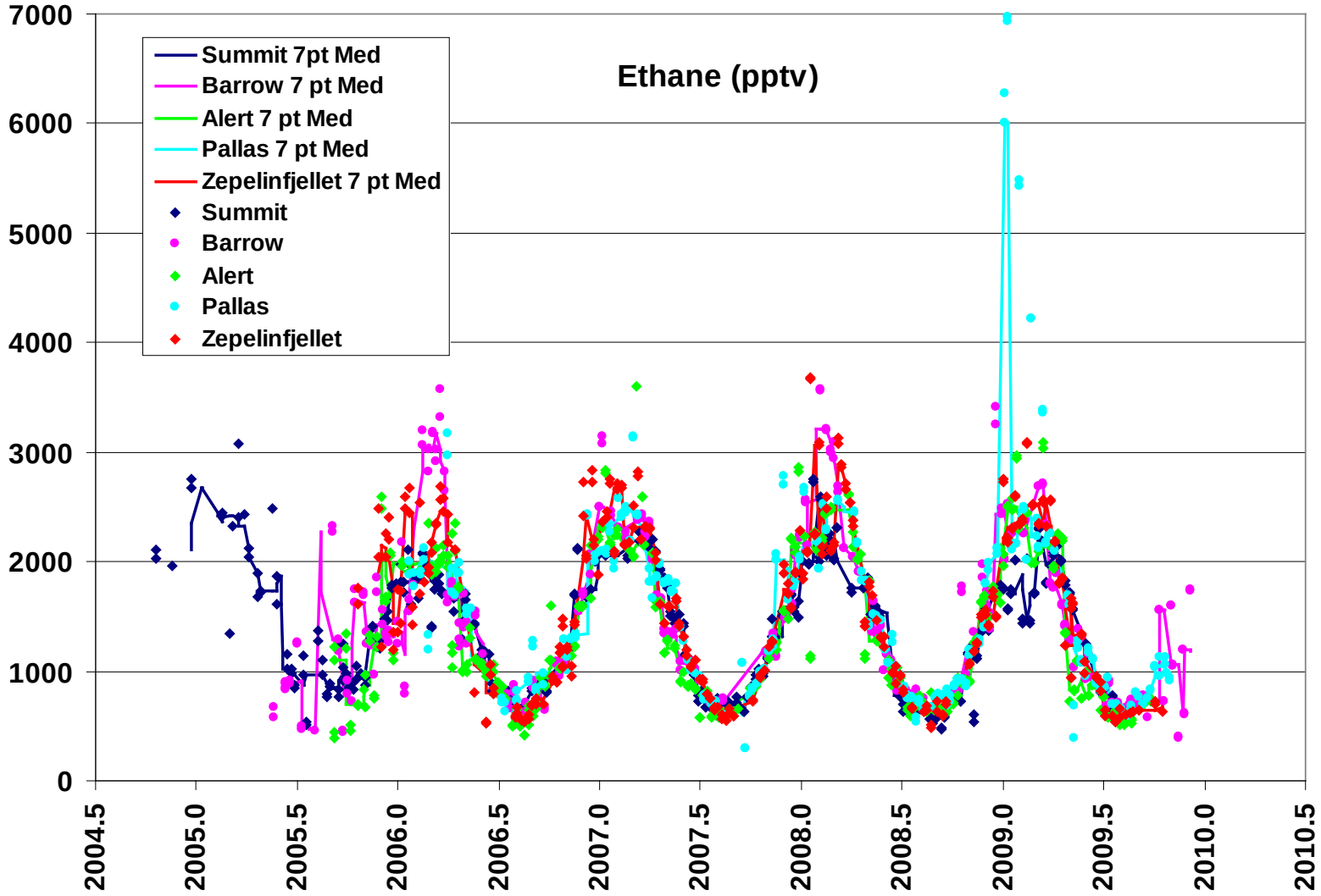
-> Higher C3 – C5/ethane emission ratios in past?

Summit (72ºN) – Izania/Canary Islands (28ºN)
Ethane and Propane Comparison

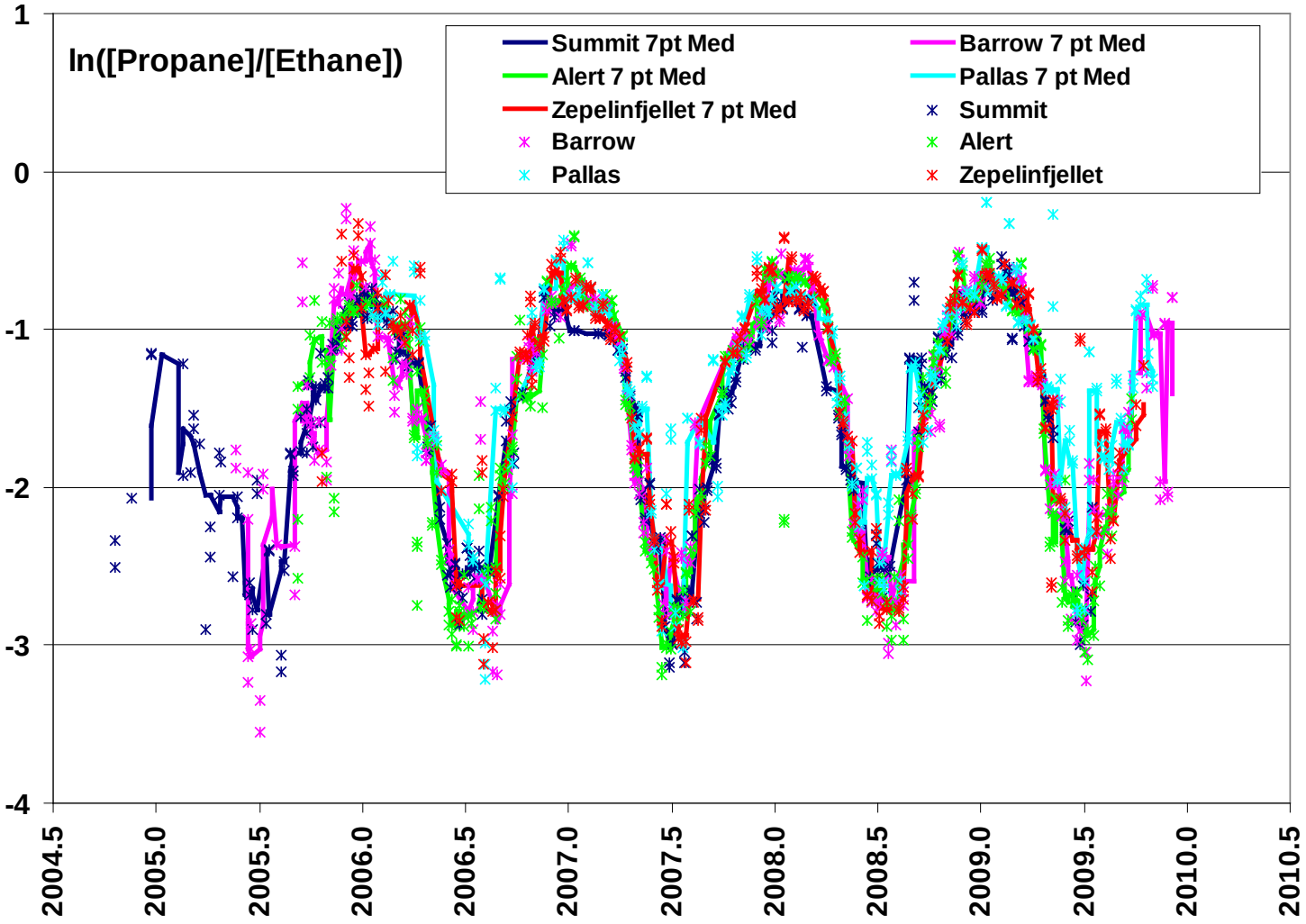




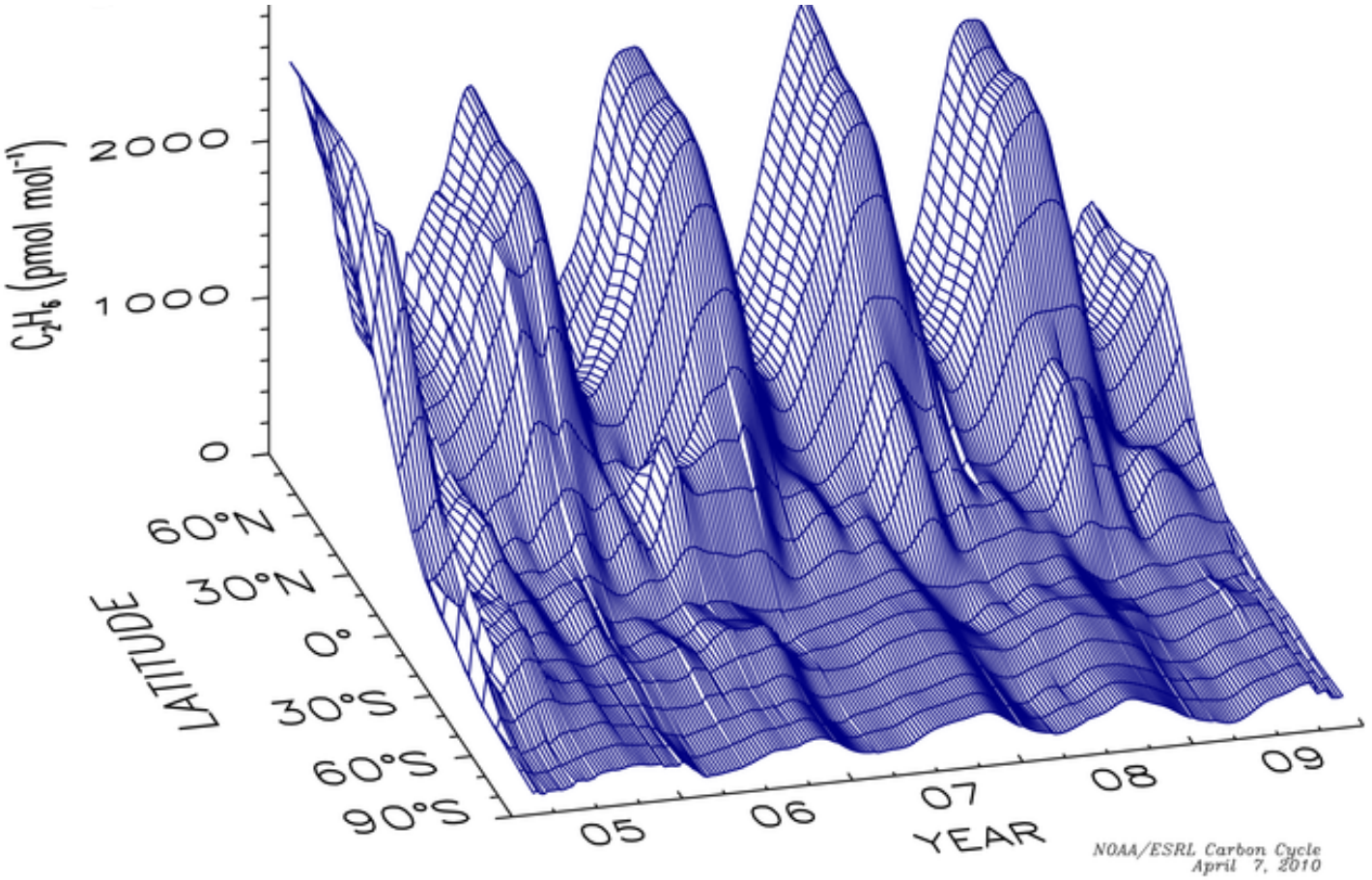
Ethane at Five Arctic Sites



Arctic Sites Comparison – Photochemical Processing



Ethane 2005 – 2009 Global Distribution



NMHC Oxidation During Transport

Text