

## Reconstruction of 1950 – 2010 Northern Hemisphere Non-methane Hydrocarbon Histories

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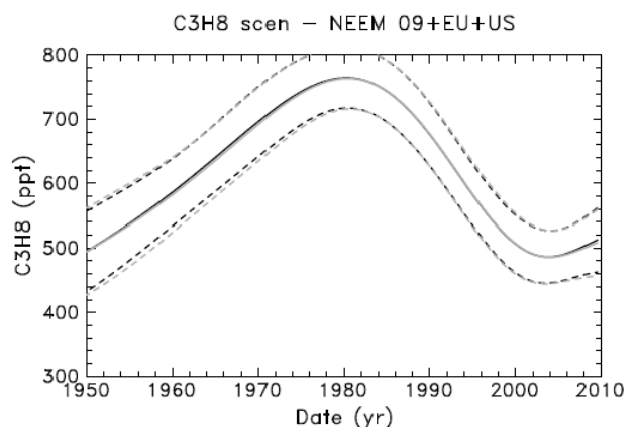
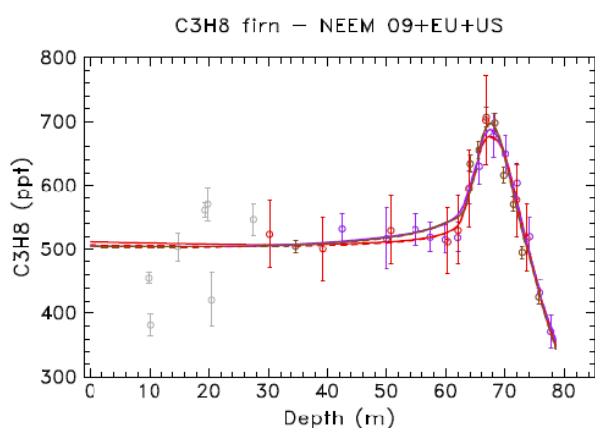
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Several recent studies, including three presentations by University of California, Irvine, scientists at previous NOAA-GMD annual meetings, have pointed out a tight linkage of non-methane hydrocarbon (NMHC) and methane emissions. Furthermore, NMHCs play a pivotal role in photochemical production of ozone in the troposphere. We reconstructed the 1950–2010 Northern Hemisphere concentrations of ethane, propane, *i*-butane, *n*-butane, *i*-pentane, and *n*-pentane using records of: 1) firn air samples extracted from three boreholes from the North Greenland Eemian Ice Drilling (NEEM) project; 2) eight years of ambient NMHC monitoring at five Arctic NOAA/GMD Cooperative Air Sampling Network sites; 3) two years of continuous NMHC monitoring at GeoSummit, Greenland; and 4) one year of atmosphere-snowpack gas exchange studies at GeoSummit. This information was incorporated in the LGGE-GIPSA model of gas transport in firn to estimate historic atmospheric NMHC concentrations and emissions. Results indicate that these C2–C5 NMHC increased by ~40–120% after 1950, peaked between 1965–1985, and have since declined again to be now back close to 1950 concentrations.



**Figure 1.** Mixing ratio of propane (mean with uncertainty range) from the U.S. (brown) and EU (purple) NEEM firn air samples. Red points show results from the NEEM-2009 drill hole. Grey data points were excluded from the scenario reconstruction because they were influenced by seasonal variations. Continuous lines represent runs of the reconstructed scenario through the forward firn air model.

**Figure 2.** Reconstructed ambient propane mixing ratios over Greenland (solid line) with upper and lower limit uncertainty range (dotted lines).