

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

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Atmospheric lifetimes of Volatile Organic Compounds (VOC) depend on their chemical structure and therefore vary by molecule. Consequently, analyses of anthropogenically emitted VOC can be applied as a powerful tool for assessing impacts and transport times of polluted air to remote sites. The series of short chain atmospheric non-methane hydrocarbons (NMHC) is particularly valuable. Their lifetimes span days (i.e. hexane) to several months (ethane), thereby providing a wide dynamic range for studying atmospheric processes. NMHC have been measured since 2004 in flask samples collected bi-weekly at more than 40 of the NOAA Carbon Cycle Network sites. This growing data record has allowed defining the seasonal and geographical background of NMHC in the global atmosphere. At a number of sites, deviations from background behavior can be clearly identified and be attributed to local pollution influences. These findings provide critical insight for evaluation of data of other greenhouse gases monitored at these stations. Five arctic sites (north of the Arctic Circle) (Fig. 1) participate in this program. Despite the fact that sources of VOC are small in the arctic environment, ambient background levels and seasonal cycles of these compounds are larger than in any other remote environment on Earth. This feature makes NMHC data a sensitive tool for investigating transport and pollution import into the Arctic. The available observations provide convincing evidence for the rapid transport and mixing of the arctic atmosphere and that the elevated NMHC levels are determined by anthropogenic and biomass burning emissions originating from lower latitude regions of the Northern Hemisphere.

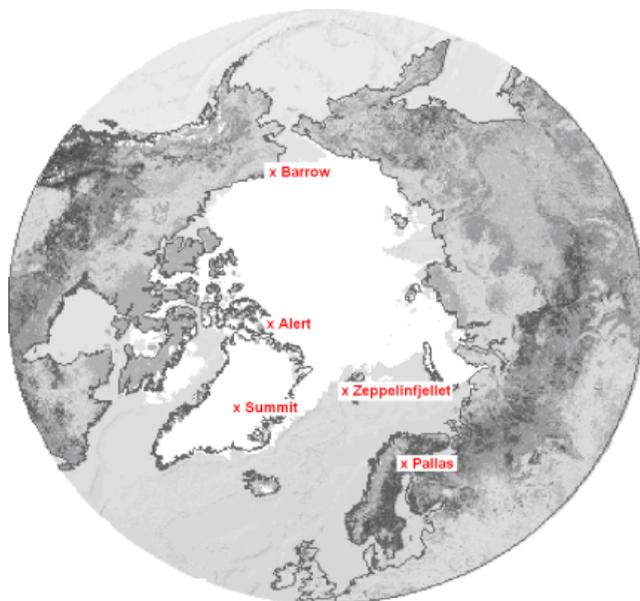


Figure 1. Location of arctic sites participating in the NOAA-Institute of Arctic & Alpine Research NMHC monitoring (Barrow, AK; Alert, Nunavut; Svalberg (Zeppelinfjellet), Spitzbergen; Pallas, Finland, and Summit, Greenland).

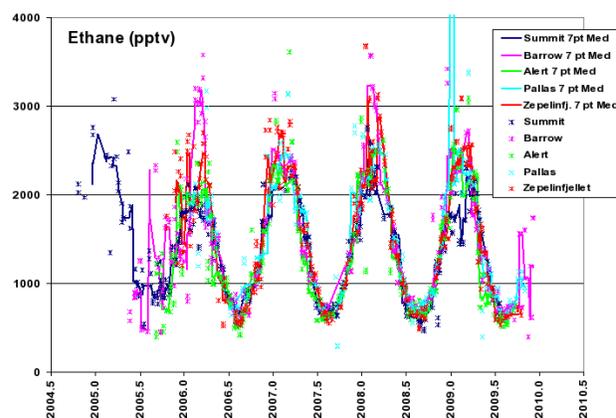


Figure 2. Record of five years of ethane measurements from NMHC monitoring locations.