

Non-Methane HydroCarbons (NMHCs) at the World Meteorological Organization (WMO) - Global Atmosphere Watch (GAW) Monte Cimone Station: Trends, Seasonal Variation and Source Characterization

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Twelve Non-Methane HydroCarbons (NMHCs) are continuously measured at the WMO/GAW Global Station of Monte Cimone (Northern Apennines, Italy) via gas chromatography – mass spectrometry, in the frame of the European Union FP7 Project ACTRIS (Aerosols, Clouds, and Trace gases Research InfraStructure Network).

Three-year (2010-2012) time series are available for C₂-C₆ alkanes, benzene, toluene, ethyl-benzene, and xylenes and have been analysed in order to derive trends and seasonal cycles of these important precursors of tropospheric ozone at a background site the Mediterranean area.

Trends and seasonal cycles are calculated on baseline concentrations derived through the use of a statistical method. Analysis of temporal trends showed a slight decrease of some of the NMHCs over the considered period. The observed seasonal cycles showed the typical winter maxima and summer minima driven by the reaction with OH radical. The amplitude of the seasonal cycle allowed the estimate of the annual trend of the OH radical on a regional scale.

The variability-lifetime relationship has been used in order to evaluate to what extent the station is representative of the free troposphere, by comparing the standard deviation of the natural logarithm of the mixing ratio with their estimated lifetimes.

The natural logarithms of NMHC ratios are used to assess photochemical oxidation. Seasonality in the ratios of isomeric alkane pairs (butanes and pentanes) are used to assess the effects of atmospheric transport and photochemical ageing.

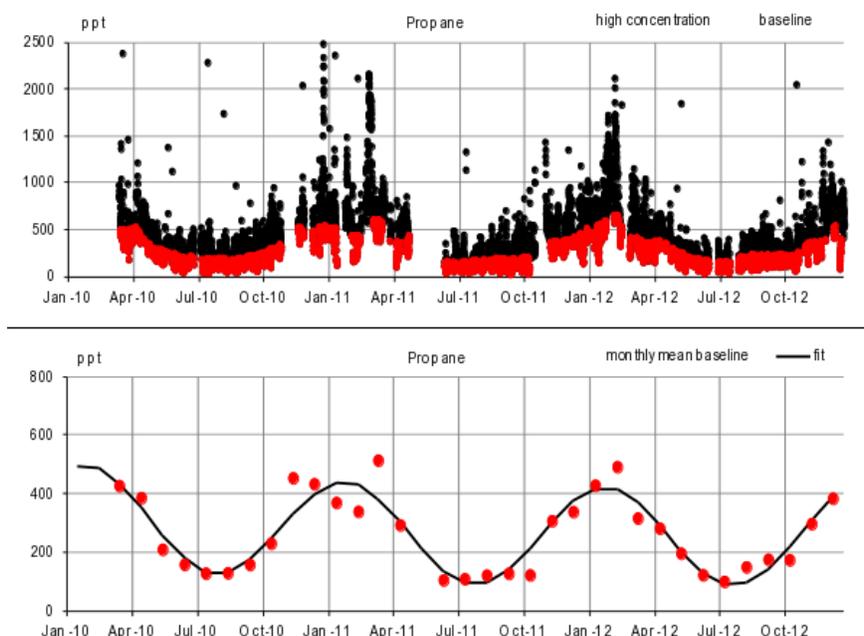


Figure 1. Propane at Monte Cimone. Top box: Time series showing the baseline concentrations (red dots) and pollution episodes (black dots). Lower box: Annual trend and seasonal cycle of baseline data.