



## NMHC Climatology from Central European Mountain Observatories

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NMHC (non-methane hydrocarbons) are a major group of atmospheric trace gases with impact on photochemical processes in the atmosphere, especially oxidant formation with ozone being the most prominent of them, and contributions to SOA (secondary organic aerosols). By this, they are coupled to climate issues via the oxidizing capacity of the atmosphere, the greenhouse gas ozone and aerosol effects. NMHC monitoring was initiated in Europe in the “Tropospheric Ozone Research” project (1988-1995), and it was continued in EMEP and GAW (Global Atmosphere Watch) where it is an ongoing initiative which recently has been reinforced (GAW Report 171). In this presentation we will focus on time series from Central European mountain stations (46-49°N, 7-13°E):

Hohenpeissenberg (985 m, DWD, Germany, 1998-ongoing), Rigi (1031 m, EMPA, Switzerland, 2003-ongoing), Jungfraujoch (3580 m, EMPA, Switzerland, 2000-ongoing, and ULg (FTIR), Belgium, 1984-ongoing), Zugspitze (2650 m, UBA, Germany, 2000-ongoing), Schauinsland (1205 m, FZ-Jülich (1989-94), and UBA, Germany, 2004-ongoing), Brotjacklriegel (1016 m, UBA, Germany, 2000-2004), Donon (775 m, EMD, France, 1997-2007).

Most sites used weekly flask samples but also on-line measurements were carried out with higher time resolution within the former TOR project and in the more recent time series at Hohenpeissenberg, Rigi, and Jungfraujoch. All samples were analysed by GC. Additionally to these GC measurements, a time series of column integrated acetylene and ethane by FTIR (Fourier Transform InfraRed spectrometry) is available from Jungfraujoch, from 1984 onwards. We focus here on time series of monthly averages of anthropogenic hydrocarbons over the 1997-2009 time period. They show quite similar patterns among the various stations over the whole period with pronounced seasonal cycles. Significantly lower mixing ratios were measured at the highest elevated sites, the Zugspitze and Jungfraujoch. Differences between the lower mountain sites (775-1200 m) are on first view surprisingly small. Generally, the differences between the high altitude and the other mountain sites are lowest in summer due to enhanced vertical mixing and thermal upslope winds. Downward trends for anthropogenic hydrocarbons are very similar at the various stations and are 2 %/yr for C<sub>2</sub>-C<sub>3</sub> alkanes (+/- 1%), 3-6 %/yr for C<sub>4</sub>-C<sub>7</sub> alkanes (+/- 2%), 2-3 %/yr for C<sub>2</sub>-C<sub>3</sub> alkynes and ethene (+/- 2%), 4 %/yr for propene and benzene (+/- 2%), and 5-10%/yr for toluene and xylenes (+/-3 and 5%, respectively).