

Volatile Organic Compound measurement Campaign in Crete, VOCCC

Stefan Reimann

- **Introduction and motivation**

Tropospheric ozone (O₃) and secondary organic aerosols (SOA) are formed as a consequence of the degradation of atmospheric volatile organic compounds (VOCs). These gases are not only important in terms of air pollution but are also contributing to climate change. In the Eastern Mediterranean region no continuous VOC measurements are available. However, this is a region of Europe with enhanced interest as impacts of climate change will be potentially more accentuated than in other regions due to higher solar radiation. At the site of Finokalia in Crete in the Eastern Mediterranean ideal conditions exist for sampling VOC precursors and their products

- **Scientific objectives**

The Mediterranean is an important source region for both anthropogenic and biogenic VOCs. Together with enhanced solar radiation the contribution of VOCs to the production of tropospheric ozone (O₃) and secondary organic aerosols (SOA) can be important. Last measurements of VOCs were performed at the same site in 2001 (Gros et al., ACP, 2003), which make it important to check actual values in a prolonged campaign to check for trends and composition changes. Furthermore, the VOC measurements will be incorporated into the EBAS data base will contribute to the assessment of Pan-European determination of VOCs during these periods.

Additionally, source regions for the VOCs will be determined using meteorological models and concurrent measurements of CO and halogenated hydrocarbons.

- **Reason for choosing station**

At the site of Finokalia in Crete in the Eastern Mediterranean ideal conditions exist for the combination of VOC precursor measurements with their atmospheric products to fill the gap of understanding of these very important atmospheric gases. The site is equipped with a range of aerosol measurements which make it ideal to check the combination of precursors and products in this very important European region.

- **Method and experimental set-up**

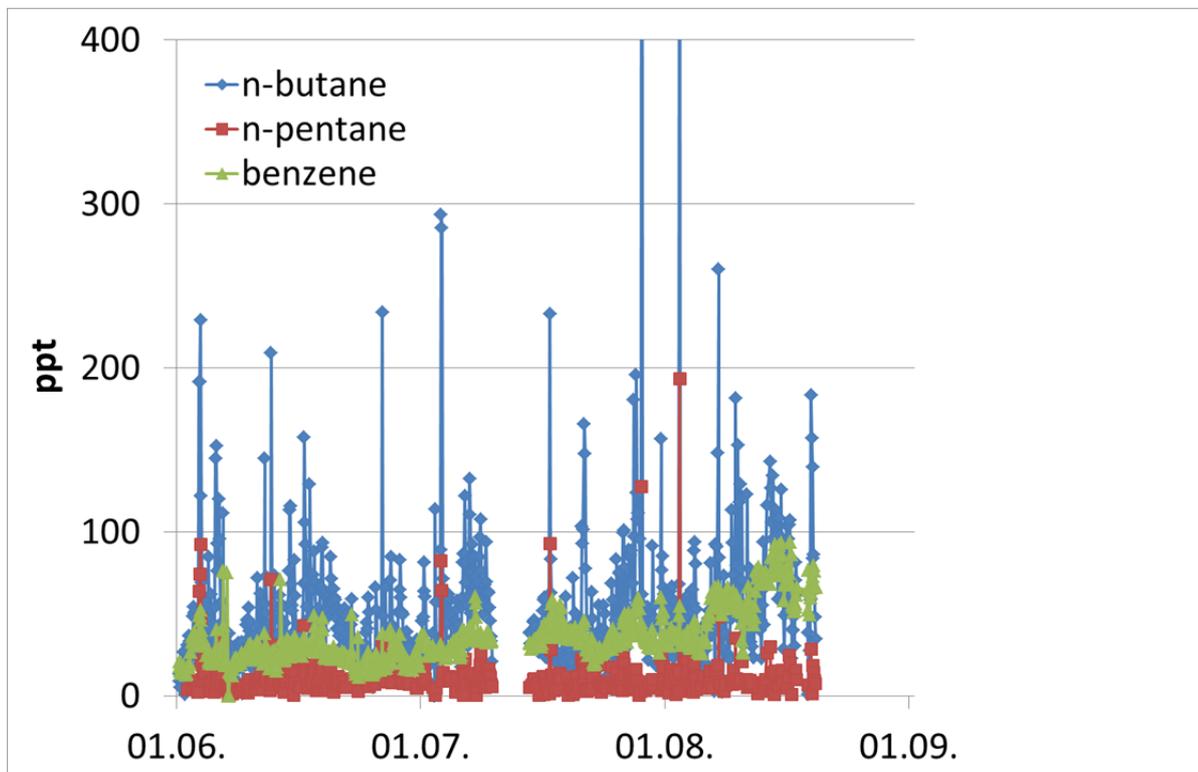
Volatile organic compounds were measured between December 2012 and September 2013 at the station Finokalia in Crete.

Measurements of VOC species were performed by a gas chromatograph-mass spectrometer (GCMS), which was equipped with a specific trapping system to preconcentrate the VOCs (and halogenated VOCs) from 2 Liters of air using a 3-stage microtrap and subsequent analysis by GCMS.

Measurements of elevated peak events were compared with concurrent measurements of other atmospheric trace gases (e.g. CO, halocarbons) and were combined with meteorological transport models.

- **Preliminary results and conclusions**

Measurements of GC-MS showed a very consistent picture for the VOCs. Whereas n-butane and n-pentane were more correlated, especially for higher peak events, benzene had less pollution events. Benzene has a higher lifetime of nearly one month compared to several days for n-butane and n-pentane. Its sources are combustion of fossil fuel, whereas n-butane and n-pentane are emitted from unburnt fuel, such as fuel spills. First analyses showed that there was a distinct change of air flow at the station occurring in the second half of the measurement period, where the air was more influenced from high-emitting regions such as Istanbul and Athens. The more in-depth analysis will be used to estimate amongst others, regional emissions of these compounds.



Concentrations of n-butane, n-pentane and benzene measured at Finnokalia in summer 2013.

- **Outcome and future studies**

The measurement campaign at the Finokalia station was a successful in providing a very valuable data sets which will be uploaded to the ACTRIS EBAS database and will contribute to the assessment of Pan-European determination of VOCs. This dataset can then be used together with the dataset from Gros et al. (2003) to check for decadal trends of VOCs in the Eastern Mediterranean.

It is planned to incorporate the VOC measurements in to a peer-reviewed publication on the source attribution of VOCs in the Eastern Mediterranean.

- **References**

Gros, V., Williams, J., Aardenne, J.A., Salisbury, G., Hofmann, R., Lawrence, M.G., Kuhlmann, R., Lelieveld, J., Krol, M., Berresheim, H., Lobert, J.M., Atlas, E., 2003. Origin of anthropogenic hydrocarbons and halocarbons measured in the summertime European outflow (on Crete in 2001). *Atmospheric Chemistry and Physics* 3, 1223–1235.