A ten-year (2006-2016) record of NMHCs at the Cape Verde Atmospheric Observatory

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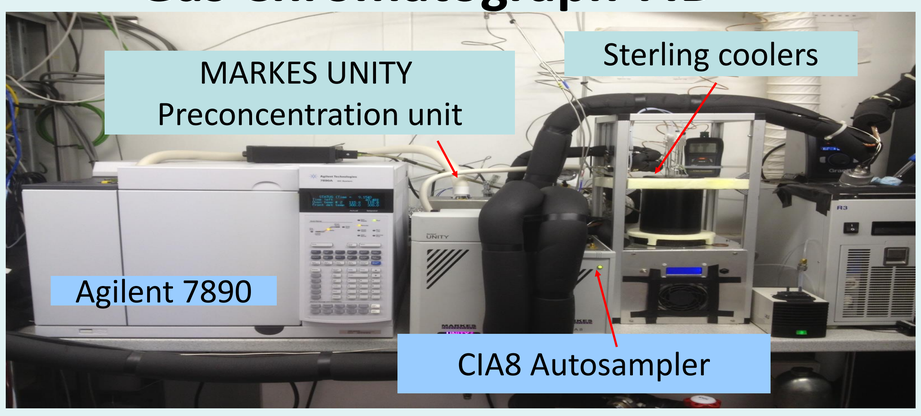
Abstract: In-situ VOCs measurements from Cape Verde Observatory (16° 51‘ 49N, 24° 52‘ 02W, a WMO-GAW global station, https://www.ncas.ac.uk/index.php/en/cvao-home) situated in the marine tropics, are presented to show the standardized and comparable procedures implemented in achieving high quality long term observational data. The observations began in October 2006 and data are available to the research and modelling community via EBAS. We have observed upward trends in ethane and propane from 2009 - 2015, which have apparently stabilized more recently, and observe a summer maxima in OVOC concentrations.

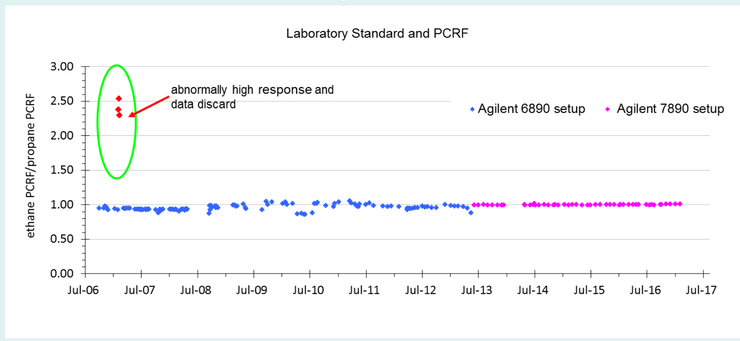
Gas Chromatograph-FID



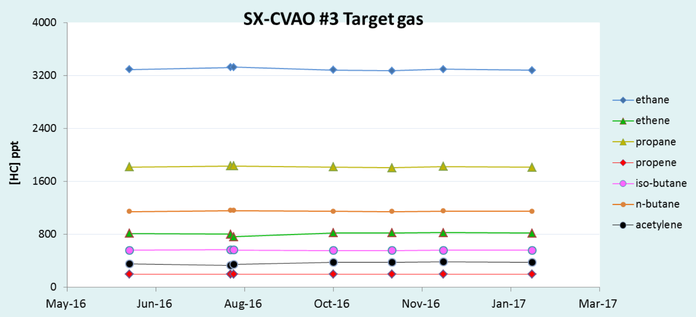
Hourly NMHCs (C_2-C_8), C_1-C_3 oxygenates and dms measurements are made from a 10 m tower using a dual-channel GC-FID.

Standard and scale

Laboratory standard



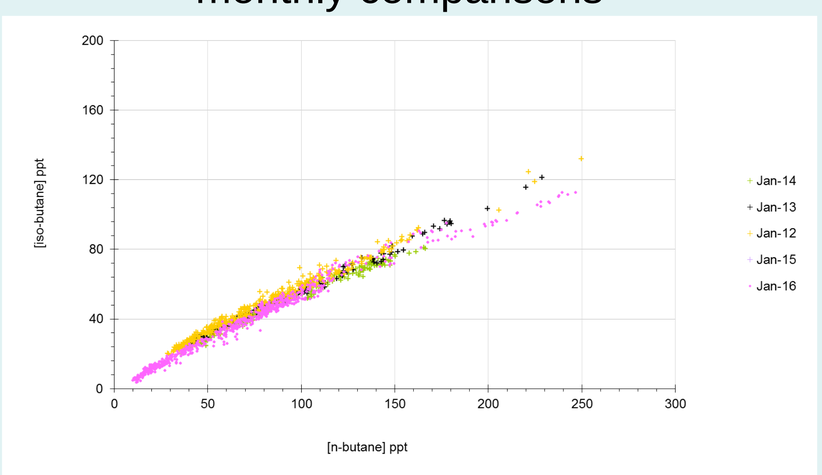
Home made target gas



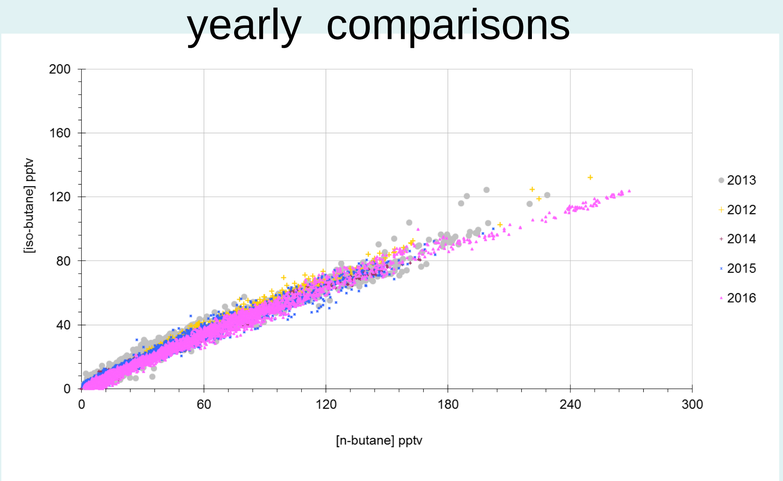
Station has laboratory NPL-30 component standard, certified multi component working standard (NOAA) and home made target gas to test the quality of measurements.

Post-analysis quality checks

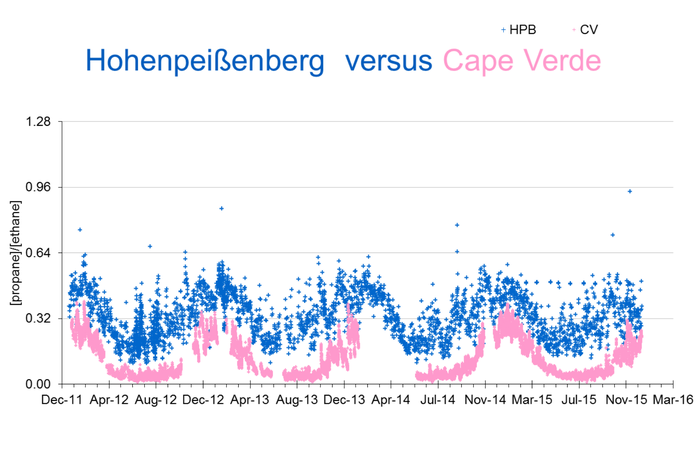
monthly comparisons



yearly comparisons



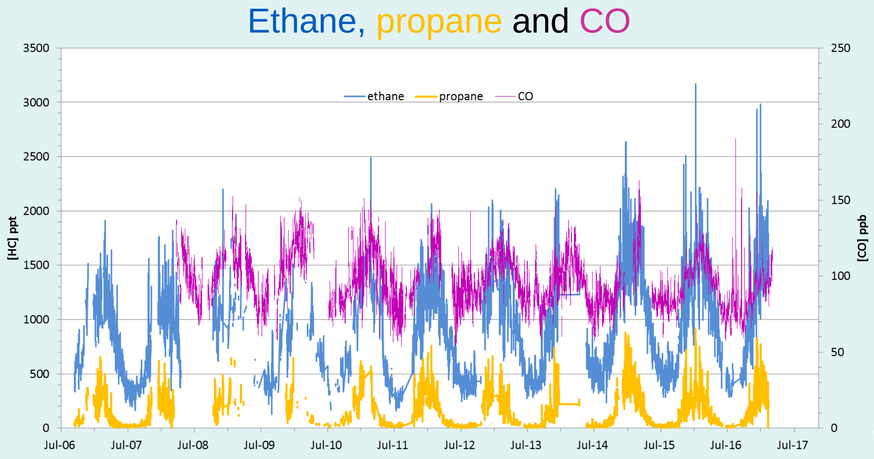
comparisons with reference station



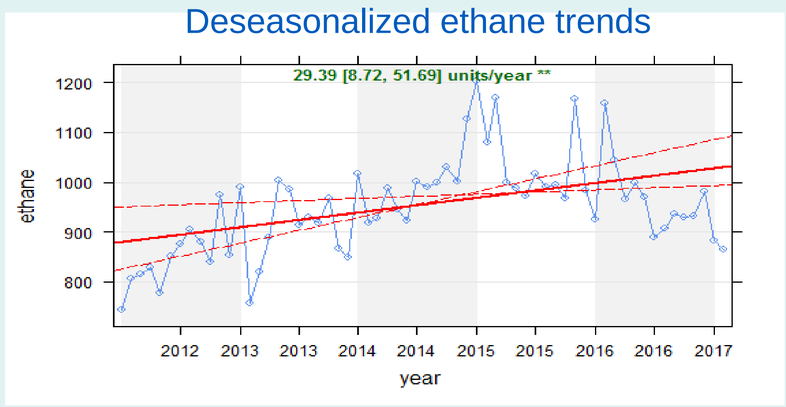
In addition to performing routine data and instrument checks, a set of additional post-analysis QA tools are now applied to all VOC data before submission to data repositories.

NMHCs time series and trends

Ethane, propane and CO



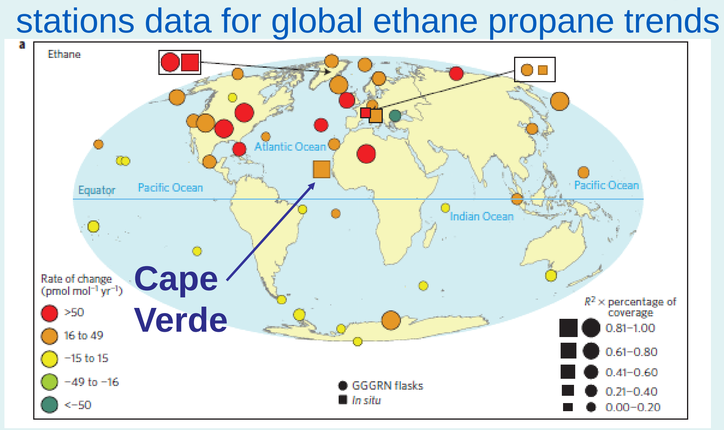
Deseasonalized ethane trends



Carslaw, D.C. and K.Ropkings, (2012). openair- an R package for air quality data analysis. Environmental Modelling and software. Volume 27-28, pp. 52-61.

Carslaw, D.C (2015). The openair manual- open-source tools for analysing air pollution data. Manual for version 1.1-4, King’s College London.

Global flask network and in-situ monitoring stations data for global ethane propane trends

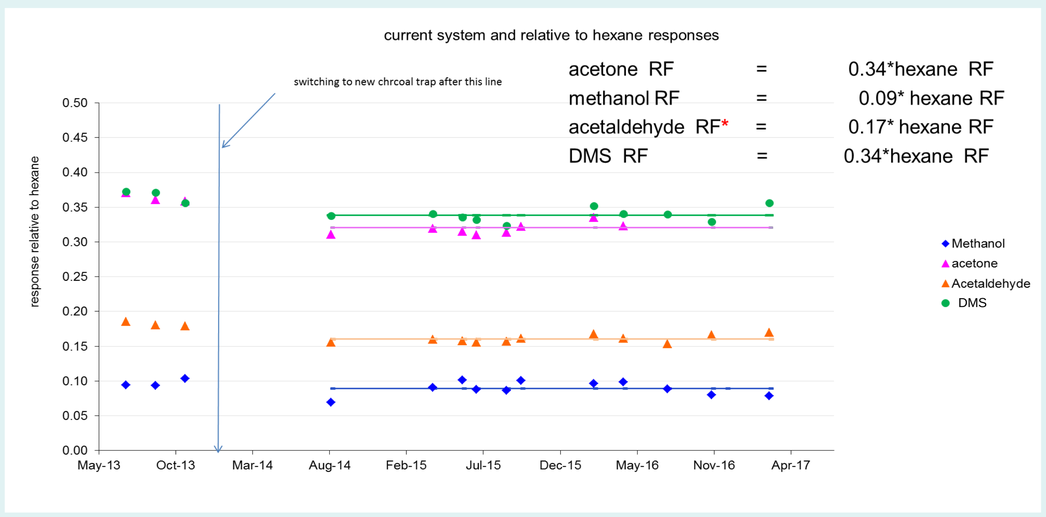


Reversal of global atmospheric ethane and propane trends largely due to US oil and natural gas production. Helmig, Detlev *et al.In*: Nature Geoscience 9, 490–495 (2016) .

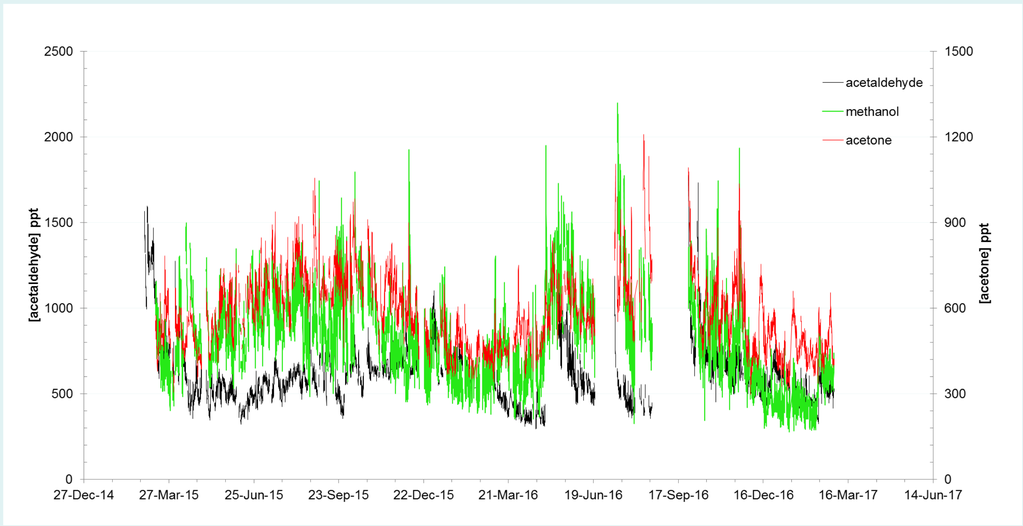
Light alkanes have showed well-defined seasonal cycles with winter maximum and summer minimum, consistent with the seasonal variation of the OH radical. Upwards trends in ethane and propane have been observed in recent years, consistent with other background locations in the Northern hemisphere.

oVOCs

Permeation Calibration and relative responses



First look data and time series



The instrument is unique in that it includes measurements of a small number of oxygenated compounds, although the calibration of these remains a challenge. Relative response factors for acetaldehyde, acetone and methanol have been evaluated using two different methods; i) Teflon permeation tube calibration sources and ii) a NPL 5 ppm gas standard in N_2. A good agreement has been seen between these two calibration approaches for acetaldehyde and acetone, but not for methanol where the theoretical and permeation tube values are in good agreement, but differ significantly from those obtained using the NPL gas standard. This highlights the need to perform further testing of methanol for transfer lines.

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