Observations of Trace Gas, Methane and Ethane at the Cape Verde Atmospheric Observatory

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Introduction

The Global GAW Cape Verde Atmospheric Observatory (CVAO) – Humberto Duarte Fonseca is situated in São Filipe on the island of São Vicente in Cape Verde (16.544°N, 23.921°W). Measurements were started in October 2006 to further our understanding of atmospheric chemistry within the tropical marine boundary layer. Funding for the UK trace gases is through the Atmospheric Measurement Facility (AMF) which is a subsidiary of NCAS (National Centre for Atmospheric Sciences) in the UK. Staff are provided through the Instituto Nacional de Meteorología and Geofisica (INMAG), Cape Verde and other measurements (e.g. of greenhouse gases and aerosol) are supported by our partners at Leeds-Institut für Troposphärenforschung, Germany, Max-Planck-Institut für Biogeochemie, Germany.

Here we give an overview of the measurements and some of the science presently coming out of the Observatory.

Understanding methane and ethane trends

Figures 6a, b, c) show the percentage difference between monthly concentrations and the average of 2007-2015. The increase is clearer to see in the methane (left) but in percentage terms the ethane (right) increase is more significant.

Figure 7 shows some modelled projections of fugitive shale gas emissions from the US. The Northern Hemispheric CH4 concentrations have been increasing steadily since 2009, a strong correlation with methane (Figure 5) may suggest the cause is due to man-made effects. Due to a shorter atmospheric lifetime and lower concentrations, the summer ethane levels are variable leading to a weaker correlation during the summer months.

Figures 8a, b, c) show the percentage difference between monthly concentrations and the average of 2007-2015. The decrease is clearer to see in the methane (left) but in percentage terms the ethane (right) increase is more significant.

Data quality and archiving: BADC and WDCGG

Data is submitted regularly on daily, monthly and yearly timescales to the World Centre for the Greenhouse Gases (WDCGG) http://www.kishou.go.jp/wdcgg/ and to the British Atmospheric Data Centre (BADC) http://badc.neodine.ac.uk/forecasts.html along with associated instrument metadata. Through GAW the CVAO CH4 and CO data is submitted to the MAEC (Monitoring atmospheric composition and climate) project. Data is submitted in near-real-time and global modelled gas concentrations are validated with this data: http://www.gaw-aerosol.eu/services/servlet/crgas/servlet

The CVAO performed well in a GAW audit for CO2 and the greenhouse gases species (CVO, 2012 pdf) and this and other relevant reports (in particular Nos 171, 195) are available at http://www.gaw.net/pages/lcpc/arap/gaw/document/

Future plans

- An interferometer will be installed in June to make upper atmosphere wind measurements (NCAR).
- The ice in Clouds Experiment-Dust (ICE-D) flying campaign is taking place around the Cape Verde islands in July-August 2015. The aircraft will be based on Praia but will do some flights around the CVAO. A bio-aerosol spectrometer will be installed at the CVAO.
- HORNET will be measured during a short campaign in the Autumn to try and understand some of the NOx questions.
- Investigation of NOy speciation and NOy budget.

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For access to the CVAO please go to: https://www.ncas.ac.uk/index.php/en/amf-menu