Science Highlights at the Cape Verde Atmospheric Observatory (CVAO)

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Into its fifth year, the Global Atmosphere Watch international monitoring facility in Cape Verde is now well established. Measurements of the trace gases O_3, CO, NO_{xy} and VOCs continue to be made regularly and will be presented at the ESRL GMAC meeting. Ozone (O_3) depletion is observed almost every day in this region, and this is due to low Nitrous Oxide (NO) concentrations and a low but significant presence of halogen oxides such as Bomine Oxide (BrO) and Iodide Oxide (IO) (< 2.5 and 1.5 pptv respectively) (Read et al., 2008i). Generally NO levels continue to be low (typical 11:00 – 15:00 average < 10pptv) but days with higher NO_x are observed more often in 2008 and 2009 than in previously published data. Comparison of measurements with the output of the Goddard Earth Observing System (GEOS)-Chem global chemistry transport model show good agreement for O_3 (see figure 1), but much more varied agreement with NO and NO_2. Possible reasons for this apparent discrepancy are discussed.

Comparisons of the seasonal cycles of various Non-Methane Hydrocarbons, and Oxygenated Volatile/Organic Compounds (OVOC) with CO indicate that although primary continental sources contribute to the concentrations in this region, the impact of secondary chemistry on the remote tropical marine environment is thought to be highly significant both in terms of year-round OVOC production and in the production of CO during summer (Read et al., 2009ii). This may not be fully understood in global models such as that of GEOS-Chem because of previously sparse measurements of VOC in the marine environment.

Aged air masses from North America, Europe, and Africa influence the measurements at the observatory, but fresh emissions from coastal Africa and the ocean may also play a major role. Through the use of the UK Met Office's NAME model it has recently been possible to classify the air received by the site and this has since been employed in further interpretation of the datasets (Carpenter et al., 2011iii). Ongoing analysis of the trace gases using these classifications will also be presented here including the potential influence of dust on NO_{xy} levels and the impact of different air masses on the primary and secondary sources of OVOC such as acetone and methanol.

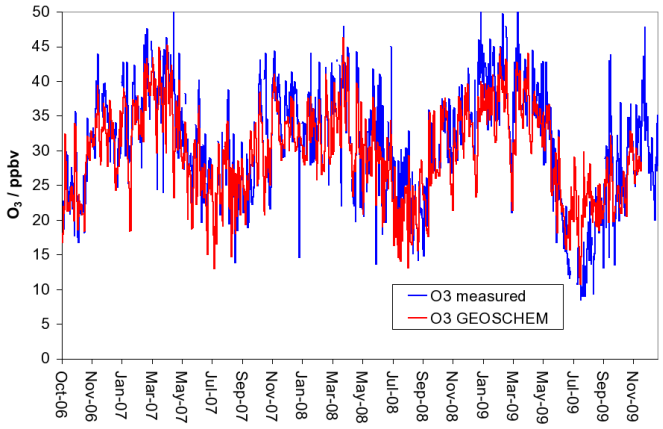

Figure 1. Time series of daily averaged O_3 mixing ratios measured at the CVAO and modeled using the GEOS-Chem global Chemical Transport Model.