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Seasonal, interannual and synoptic variability of long-lived atmospheric trace gases and O2 at the Cape Verde Atmospheric Observatory (CVAO)

Elena Kozlova (1), Thomas Seifert (2), Reimo Leppert (2), Luis Neves (3), Armin Jordan (2), Willi Brand (2), and Martin Heimann (2)

(1) University of East Anglia, School of Environmental Sciences, Norwich, UK, (2) Max-Planck Institute for Biogeochemistry, Jena, Germany, (3) Instituto National de Meteorologia e Geofisica, Esparagos, Cape Verde

The Cape Verde Atmospheric Observatory (CVAO) was established on Sao Vicente Island in the north-eastern subtropical Atlantic (16.86° N, 24.87° W) within the frame of the Surface Ocean Lower Atmosphere project (SOLAS) in 2006. Since March 2007 air flask samples have been collected bi-weekly and subsequently analysed at Max-Planck Institute for Biogeochemistry for CO2, O2, CH4, CO, N2O, H2, and SF6 concentrations. October 2008 marks the start of the continuous atmospheric measurements of these gases.
The Observatory is exposed to strong and predominant N-E trade winds. Back trajectory analyses demonstrate that air sampled at the top of the 30 m tower carries the signature of the air masses flowing along the West African coast including the upwelling region off the Western Sahara and Mauritania. This allows us to attribute the short-term synoptic variability of CO2, O2, CH4, CO and N2O concentrations to their outgassing and/or uptake in the coastal upwelling areas characterised by high marine productivity as further indicated by remote sensed surface ocean chlorophyll data. Seasonal cycles and interannual variability reflect larger hemispheric scale changes in sources and sinks of the measured gas species. We compare the CVAO observations with measurements from other stations in the Atlantic sector (e.g. Shetland Islands., Mace Head, and Ascension). As our observations are not currently used in global inversion models they can provide additional and independent validation for modelled time series. We present the model-observation comparisons with the global Jena CO2 inversion of atmospheric transport (Rödenbeck, 2005) and CarbonTracker (Peters et al., 2010).

Peters et al. Seven years of recent European net terrestrial carbon dioxide exchange constrained by atmospheric observations. Global Change Biology, 16 (4), pp. 1317-1337, 2010.

Rödenbeck, C. Estimating CO2 sources and sinks from atmospheric mixing ratio measurements using a global inversion of atmospheric transport, Technical Report 6, Max Planck Institute for Biogeochemistry, Jena, Germany, 2005.