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Halocarbons in the marine boundary layer of the tropical Atlantic Ocean: observations and modelling for the Cape Verde atmospheric observatory

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We present halocarbon measurements made at the Cape Verde Atmospheric Observatory (16.848˚N, 24.871˚W) in late May/June 2007. An in-situ gas chromatograph (μ-Dirac) was installed at the observatory by the Cambridge group; this ran almost continuously for a period of about 15 days. A number of halocarbon species were measured, with a variety of lifetimes and sources, ranging from long-lived anthropogenic CFCs through to shorter-lived trace gases of biogenic origin (i.e. CH_2Br_2, $CHBr_3$, CH_3I). The observatory at Cape Verde is considered to be a coastal 'background' site, ideal for ground-based measurements of clean marine air in the tropical Atlantic Ocean. The prevailing north-easterly trade winds blow air directly off the ocean to the observatory.

The data for each of the days was analysed with respect to 5-day back trajectories obtained from the BADC (using ECMWF analyses) to infer possible sources of the air to the observatory. The back trajectories show that the air encountered during the 20-day period had generally travelled from either the northern mid-Atlantic region or

the West Atlantic/North America region, before encountering the north-easterly trade winds. On some days, air had also passed over parts of Spain, Portugal and north-west Africa a few days before arriving at the observatory. In one instance, the air skimmed a large stretch of the Mauritanian/Western Saharan coast, the location of the biologically active Mauritanian upwelling. On this occasion, there were high levels of bromoform, dibromomethane and methyl iodide observed.

Measured results have been analysed in conjunction with an offline 3D tropospheric chemical transport model (p-TOMCAT), which has been extended by including a detailed chemistry scheme. The measurements cannot be reproduced without addition of a substantial local source. Similarly the observed ozone loss at the site can only be reproduced when the model includes high concentrations of active halogens. It seems likely that sea salt aerosol must also be a very important local source.