

Initial results from high-volume air sampling of industrial organic contaminants at Cape Verde, Africa.

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Introduction

• Elevated concentrations of polychlorinated biphenyls (PCBs) and some halogenated flame retardants (HFRs) in air have recently been reported off the coast of West Africa. It has been hypothesized that the sources could be releases of PCBs and HFRs from contaminated wastes exported to African countries [1,2].

• Objective: Track atmospheric sources and source regions of selected industrial organic contaminants in West Africa.

Methods

• Weekly 24 hour sampling commenced in May, 2012, with an active high-volume air sampler on the Cape Verde Atmospheric Observatory (CVAO: 16.848°N, 24.871°W, Figure 1).

• Data from the first 12 months from Cape Verde will be used to establish a baseline without any *a priori* consideration of the origin of air masses.

• The samples were extracted and analyzed with GC/MS.

• Potential source regions affecting these measurements were evaluated using the Lagrangian particle dispersion model FLEXPART [3,4].



Figure 1: The active high-volume air sampler at CVAO.

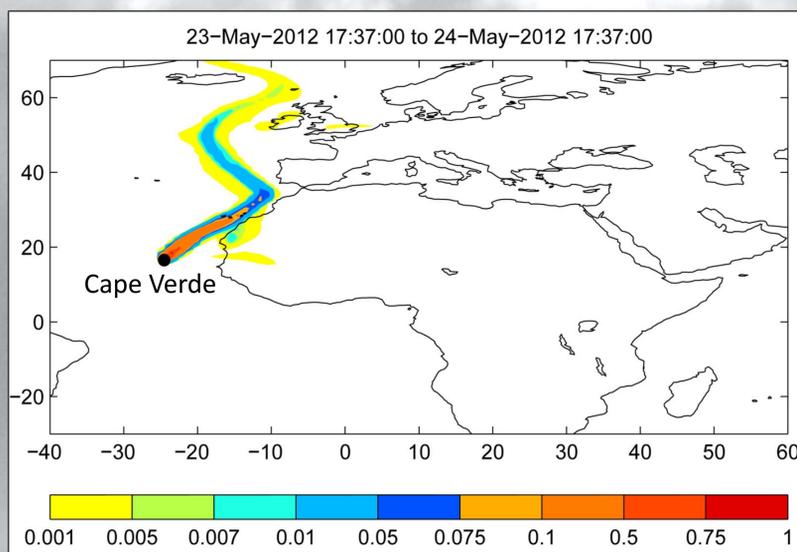


Figure 2: Footprint ES (emission sensitivity) map [ns/m³] from the FLEXPART model [3,4] for the air sample with the highest concentrations of Σ_7 PCBs and Σ_5 PBDEs measured thus far. The map illustrates where the air mass had the ability to collect pollutants from sources 0-100 m above ground.

Results

• The mean concentration of Σ_7 PCBs (PCB-28, -52, -101, -118, -138, -153, -180) in air for the first 12 samples measured at Cape Verde was 1.5 (± 0.4) pg m⁻³.

• The mean concentration of Σ_5 PBDEs (PBDE-47, -99, -100, -153, -154) was 0.9 (± 0.3) pg m⁻³.

• A preliminary comparison shows that the mean concentrations of Σ_7 PCBs and Σ_5 PBDEs at Cape Verde are slightly lower and higher than the yearly average concentrations measured at European background stations (Figure 3).

• None of the samples analyzed indicate a strong influence from the African continent (see example in Figure 2).

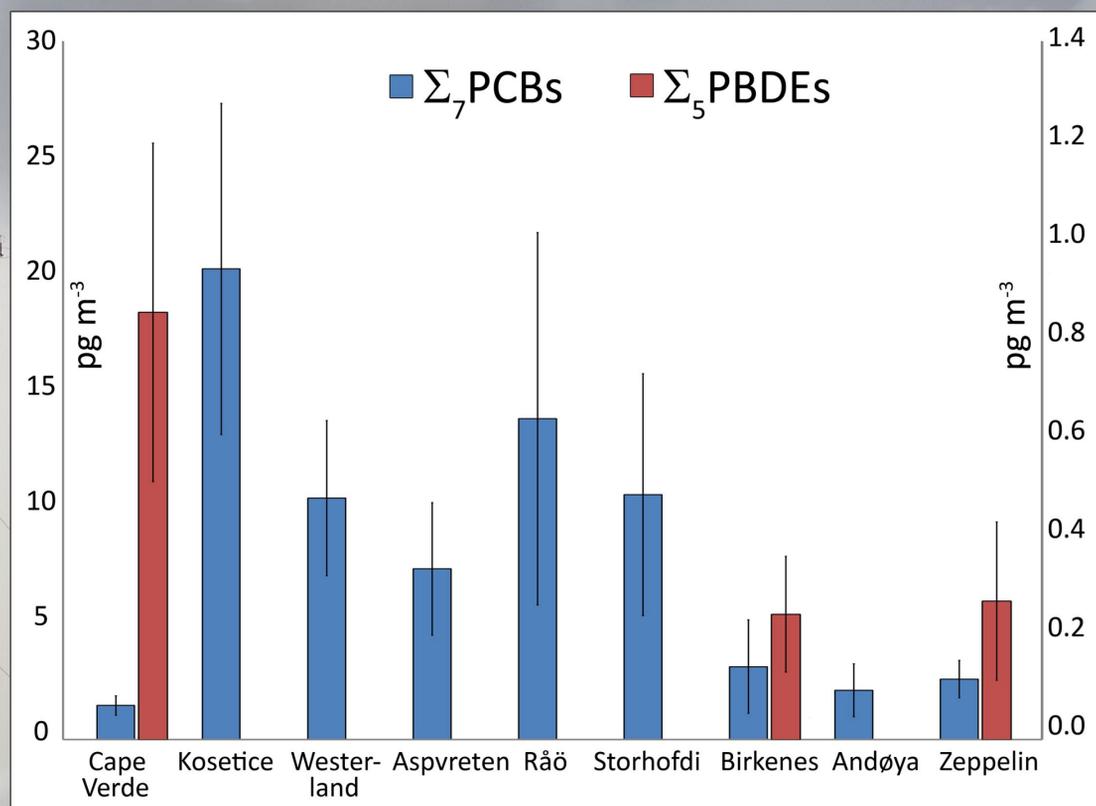


Figure 3: Mean concentrations of Σ_7 PCBs (blue columns, left y-axis) and Σ_5 PBDEs (red columns, right y-axis) in air [pg m⁻³] from Cape Verde compared to the 2010 average at other European background stations [5]. Error bars show standard deviation. Samples below the method detection limit (MDL) were given values of MDL/2 in calculations of mean and standard deviation.

Acknowledgments

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Further work

• The FLEXPART model will be used to forecast episodes with transport from the West African continent to allow for a targeted sampling strategy towards suspected source regions.

• Results obtained on the basis of targeted sampling will be compared with the baseline monitoring.

• The FLEXPART model will be used to retrospectively evaluate the principal source regions affecting measured levels of PCBs and HFRs in air at Cape Verde.

References

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