Comparison of Elemental Carbon (EC) and Black Carbon (BC) Measurements derived by Thermo Optical and Filter-based Light Transmission Techniques at North Atlantic

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INTRODUCTION

The TERCEIRA-NARE observatory is an experimental site on the Terceira Island (38.691º; 27.354º; 50 m altitude) in the Azores Archipelago, developed to provide a base for remote marine boundary layer measurements at a location near the PICO-NARE (Honrath & Fialho, 2002) (Figure 1). In order to determine a long term carbonaceous component of atmospheric aerosols in North Atlantic, measurements of aerosol BC and EC were begun in 2002.

EC and BC define similar fraction of the carbonaceous component of atmospheric aerosols and are supposed to be comparable, but have a delicate different thermal, optical and chemical behaviour in most cases (Lavanchy *et al.*, 1999).

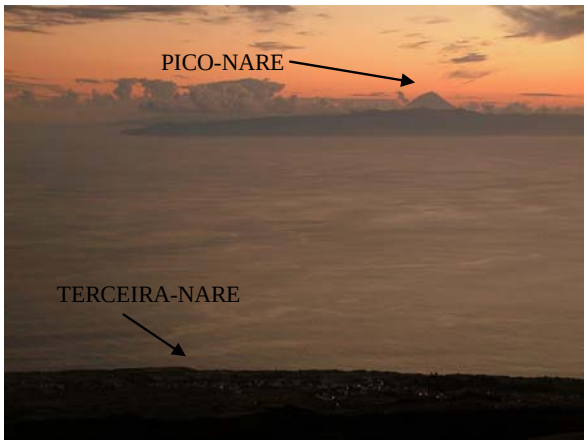

Figure 1. Experimental stations

METHODS

The EC mass concentrations were determined with a thermo-optical technique (Pio *et al.*, 1994), by analyzing the aerosol fine fraction ($PM_{2.5}$) collected in a quartz filter (Whatman QM-A) - High Volume system, equipped with a PM_{10} (Sierra-Andersen model SSI 12O) size selective inlet and a $PM_{2.5}$ cascade impactor (Tisch TE – 231F) (Figure 2a).

Figure 2a. High Volume Sierra-Andersen (model SSI 12O with a cascade impactor Tisch TE – 231F)

Figure 2b. Multi-wavelength aethalometer's (model AE-31)

The BC mass concentrations were estimated by using multi-wavelength aethalometer's (model AE-31) (Figure 2b). The attenuation signal measured, was corrected for the iron oxide contamination (Fialho *et al.*, 2006), and the calibration values suggested by Hansen, (2003) used to determine the BC concentration from it.

RESULTS

Forty three samples were selected during June, 2002 until June, 2004. The correlation between the two techniques was studied (Figure 3).

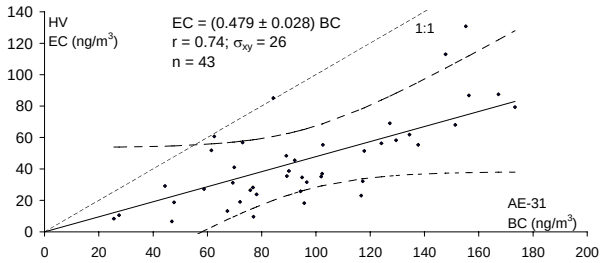

Figure 3. The dots represent EC/BC mass concentration measured by the two techniques; the dotted curve lines represents one standard deviation prediction interval; the black line represents the equation model fitted to the data; the straight dotted line represents the 1:1 ratio.

DISCUSSION

The EC data from thermal analysis tracked the data from AE-31 with numbers that were half the BC value.

Although the levels of BC are of the same magnitude of the ones measured by Lavanchy *et al.* (1999), the calibration ratio slope (0.479+-0.028) is in disagreement with their conclusion (~2).

In present work the attenuation signal measured was corrected for the iron oxide contamination accordingly to Fialho *et al.*, 2005, 2006, and the manufacture calibration value used for BC is K_{BC} = 14.625 μm m^2 g^{-1}, different conditions from the ones used by the others afore mentioned.

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