Assessment of Air Quality on Basis of Particle Matter (PM) Measurement in North Atlantic

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INTRODUCTION

The European thematic strategy on air pollution and the accompanying proposal to revise the ambient air quality directive (1999/30/EC) would, for the first time, introduce controls on human expose to $PM_{2.5}$ to complement the existing limits on coarse particulate matter (PM_{10}) (EC, 2005).

The TERCEIRA-NARE observatory is an experimental site on the Terceira Island (38.691º; 27.354º; 50 m altitude) in the Azores Archipelago (Figure 1), developed to provide a base for remote marine boundary layer measurements at a location near the PICO-NARE (Honrath & Fialho, 2002). In order to determine a long term particulate matter ($PM_{2.5}$ and $PM_{2.5-10}$) component of atmospheric aerosols in North Atlantic, measurements of particulate mass concentration, based on gravimetric analysis of exposed filter and impaction surfaces, begun in 2002.

Figure 1. Azores Archipelago

METHODS

The PM mass concentrations were derived by gravimetric analysis (Gibertini model E42SB), at 50% of relative humidity and 25ºC of temperature, on filters (Whatman QM-A), pre-exposed in a high-volume sampler equipped with a PM_{10} (Sierra-Andersen modelo SSI 12O) size selective inlet and a $PM_{2.5}$ cascade impactor (Tisch TE – 231F), with a time resolution of one or two weeks. Between 06/2002–06/2004 53 samples were selected and studied by months (M) averages.

RESULTS

The average values of PM mass concentration are presented in figure 2. The PM seasonality average can be translated by:

$PM_{2.5}$ ($\mu g/m^3$) = (23 ± 2) + (10 ± 3) Cos ((Π/6)M) + (12 ± 3) sen ((Π/6)M), r = 0.84, σ_{xy} = 8 $\mu g/m^3$;

$PM_{2.5-10}$ ($\mu g/m^3$) = (40 ± 4) + (7 ± 5) Cos ((Π/6)M) + (4 ± 5) sen ((Π/6)M), r = 0.86, σ_{xy} = 13 $\mu g/m^3$.

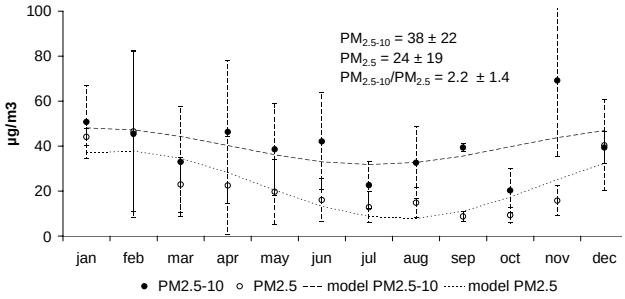

Figure 2: Particulate matter average values. The dots represent particulate matter mass concentration measured by the technique; the dotted vertical line represents one standard deviation interval; the dotted curve line represents the equation model fitted to the data

DISCUSSION

The values observed are higher than background levels indicated for Continental Europe (7 ± 4 $\mu g/m^3$ and 5 ± 2 $\mu g/m^3$, annual average concentrations, for PM_{10} and $PM_{2.5}$ respectively (Putaud *et al.*, 2002)).

The values observed are higher than the ones proposed as an input to the future integrated assessment procedure for particulate matter in European Community – 40 $\mu g/m^3$ as annual average for PM10 in 2005 (1999/30/EC) and 20 $\mu g/m^3$ for $PM_{2.5}$ (CAFE, 2004).

The results reinforce the evidence of the need to discount natural sources, like sea spray (responsible for the high values measured in our site), for compliance purposes.

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