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Is Coarse Enrichment Factor (CEF) a useful parameter to study Particular Matter?

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Keywords: PM10, PM2.5, coarse fraction.
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The mass fractions often used to study the behaviour and evolution of atmospheric particulate matter are PM_{10} , $PM_{2.5}$ and PM_{coarse} (PM_{10} -$PM_{2.5}$).

This work introduces a new parameter called CEF (Coarse Enrichment Factor) defined as:

$$CEF = \frac{(PM_{10} - PM_{2.5})}{PM_{10}} x100$$

This dimensionless factor varies from 0 to 100 % and can highlight peculiar seasonal patterns of coarse fraction (or fine fraction, complementarily) related to weather conditions and/or local emission sources.

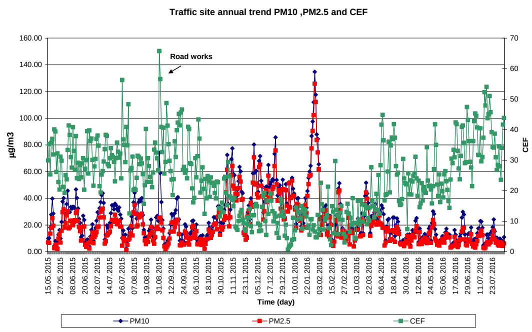

Figure 1. Traffic site: comparison between PM_{10},$PM_{2.5}$ and CEF.

CEF is an inverse factor compared to fine fraction that assumes smaller values when $PM_{2.5}$ fraction increases compared to PM_{10}, thus highlighting situations when the formation of secondary PM is favored by thermal inversions typical of winter months or episodes when there is a significant removal of coarse PM fraction due to the exchange of air masses during windy days.

The analysis of CEF at short time scales is useful as well. At weekly scale, CEF can point out episodes when PM is mainly related to local site specific activities (working day and week end day) while at daily scale CEF provides a useful information to understand the dynamics of the coarse particulate matter deposition and the formation of secondary fine particles.

The study shows the comparison between CEF index at a urban background site and a traffic site during a monitoring campaign that last for more than one year (2015-2016).

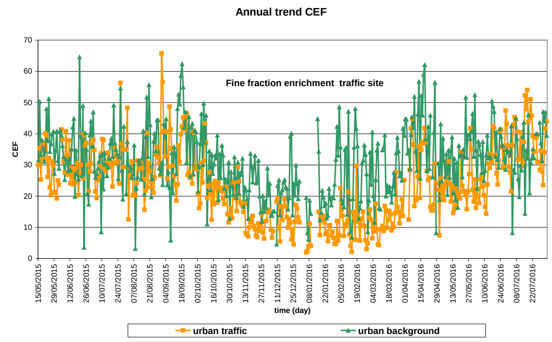

Figure 2. Comparison between CEF of urban background site and traffic site

In both sites, CEF has the same seasonal pattern but, while CEF during the spring-summer period has an overlapping behavior, during winter period the traffic site has a significantly lower CEF value probably related to the proximity of traffic source which emits secondary PM precursors.

To better evaluate the similarity at the two sites for the CEF profiles during spring and summer, daily trends are investigated at daily scale focusing attention at the 0.275 -0.290 µm particle size fraction (a representative class of fine fraction).

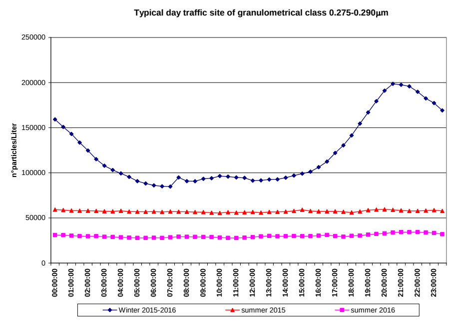

Figure 3. Typical day of fine granulometric class (0.275-0.290µm) on traffic site

In Fig.3 it is observed that while in summer the class investigated remains almost constant throughout the day (trend confirmed for two consecutive summers), during winter this size fraction presents significant variations with overnight peaks due to the accumulation of secondary PM.

This phenomenon can justify the performance of the CEF shown in Fig 2 during summer period, then it is assumed that similarity of the two profiles is favored by the lack of significant emissions related to domestic heating and related to a reduced traffic period.

Canepari1, S. , Astolfi, M., L., Marcovecchio, F.,. Maretto, M. and Perrino, C. *E3S Web of Conferences (2013) Seasonal variations in the concentration and solubility of elements in atmospheric particulate matter: a case study in Northern Italy*

Barmpadimos, I., Keller, J., Oderbolz, D., Hueglin, C. and Prèvot1, A., S., H. *Atmos. Chem. Phys., 12, 3189–3203, (2012) One decade of parallel fine (PM2.5) and coarse (PM10–PM2.5)particulate matter measurements in Europe: trends and variability*