

Concentration and the chemical characterization of PM10 and PM2.5 in all the Italian territory

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In order to studying the concentration and the chemical characterization of atmospheric particulate in the different season in all the Italian territory, inside the SITECOS project (PRIN 2004), a gravimetric sampling campaigns have been conducted. The PM10 and PM2.5 samplings were placed at the same time in different sites along the Italian peninsula. The sampling sites were: Bari, Taranto, Pollino (m.1800, remote site), Catania, Sesto Fiorentino, Florence, Arezzo, Grosseto, Capannori-LU, Prato, Montale-PT (rural site), Bologna and Monte Cimone (m.2100, remote site on Italian Apennines), Padua, Milan, San Colombano (m.2300, remote site on Italian Alps), Trieste and San Rocco a Muggia (TS).

Daily PM2.5 and PM10 samples have been collected, to do a "sampling bank", available for a further chemical / physical / toxicological characterization of atmospheric particulate. Samples have been chemically characterized according to their main species: PAHs, inorganic ions and EC/OC in the PM2.5 samples; elements in the PM10 samples.

In the Padana plain (Milan, Bologna, Padua) the PM concentration is uniform and a strong seasonal trend is observed, with the highest values in winter time and the lowest values in summer while PM concentration in S. Colombano and Monte Cimone sites show an opposite seasonality, with the highest values in summer and the lowest ones in winter.

These data show a slight evolution during the winter's day because of the height of the dispersion layer, in connection with microclimatic parameters; for example in Milan city during acute cases of pollution, the height is no more than 300m (Ferrero *et al.*, 2006). Remote sites of S. Colombano and Monte Cimone in the winter time are above the boundary layer while during summer period they are on it.

In the center of Italy PM seasonality concentration is less important while in the South Italy and in Sicily there is any seasonal trend. The reasons are, in part, linked to the different meteorological features present in the Italian peninsula.

Chemical composition data show a significant differences. In the North of Italy there is a strong seasonality of ionic component; in particular, during the winter, the Nitrate concentration is higher than the Sulfate one while the situation is opposed in summer. Ammonium does not show a strong seasonality, but it remains pretty constant; the same applies to Carbon. In the South of Italy cities, SO_4^- , NO_3^- and NH_4^+ , primary component of inorganic ions, they do not show a seasonality with a Sulfate concentration that is always higher than Nitrates. In the center of Italy the seasonality is less marked thanks to the inorganic ions. Sulfate and Nitrate are similar from a percentage point of view.

Also PAHs (expressed in weight/weight, quality of particulate), in the Padana plain, shows a strong seasonality, with a high percentage in the winter season and a lower one in summer (Ravindra *et al.*, 2006). Over the year concentrations are constant in South of Italy, while in the center area, the seasonality is less strong.

The vehicles traffic source is estimated to be one of the main PM source in the Padana plain, while in the South of Italy there are other sources like photochemistry reactivity, Saharan Dust events, etc.

These results show a different role of PM sources along the Italian peninsula and they carry fundamental information for a correct management of the complex problem on a national scale.

Ferrero, L., Lazzati, Z., Lo Porto, C., Perrone, M.G., Petraccone, S., Sangiorgi, G., Bolzacchini, E., (2006) *Vertical distribution of particulate matter in the urban atmosphere of Milan*. Poster. International Aerosol Conference 2006.

Ravindra, K., Bencs, L., Wauters, E., Hoog, J., Deutsch, F., Roekens, E., Bleux, N., Berghmans, P., Van Grieken, R., (2006) *Seasonal and site-specific variation in vapour and aerosol phase PAHs over Flanders (Belgium) and their relation with anthropogenic activities*. Atmospheric Environment 40 (2006) 771-785.