

Chemical characterization of PM2.5 belonging to a port city

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Air emissions from the maritime transport sector account for a significant portion of total emissions, affecting air quality, climate change and human health. The design and application of effective policy actions to abate such emissions require that air emissions and their geographic location be robustly estimated. (Contini et al., 2011; Miola et al., 2011)

At the beginning of 2012 it was started the research project CESAPO (Contribution of Emission Sources on the Air quality of the PORT-cities in Greece and Italy), within the framework of Interreg Italy-Greece 2007/2013. The general objective of the project is to quantify the contribution of emission sources to the air pollution of the port cities, giving more emphasis on the maritime transport and the activities within the harbour, and link the scientific outcomes with integrated proposed actions for sustainable urban development in the Mediterranean Region. In particular in this work the chemical characterization of PM2.5 is reported and the aim is to investigate the contribution of the emissions of ships and of the harbour to the particulate matter in Brindisi.

The experimental campaign was carried out every day from June to October 2012 and globally 148 PM2.5 samples were collected on quartz filters and 148 on Teflon membrane of 47 mm.

Soluble ionic species were determined on teflon filters via High Performance Ion Chromatography (HPIC, Dionex DX-500 System), for SO_4^{2-} , NO_3^- , NH_4^+ , Cl^- , Na^+ , K^+ , Mg^{2+} and Ca^{2+} while the quartz filters were analysed via Graphite Furnace Atomic Absorption Spectroscopy (GF-AAS, Perkin Elmer Analyst 600 System) for determination of 8 elements (Ni, Cu, V, Mn, As, Pb, Cr, Sb) and by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES, Varian Liberty 110 spectrometer) for 4 elements (Fe, Al, Zn and Ti). Each filter has been extracted in Milli-Q water: two successive extractions of 20 min in an ultrasonic bath have been used for a nearly complete recovery, with the renewal of the water at each step. In each of the 2 extraction steps 10 ml of Milli-Q water has been used. It has to be put in evidence that two extractions were sufficient to extract more than 98% of the measured ions. The extracted solutions have been analysed by HPIC for major ionic species. Anion determination has been performed by means of a Ion Pac ®AS14A column (Dionex) using 1.8 mM Na_2CO_3 /1.7 mM NaHCO_3 as eluent at 2 ml/min flow-rate and, for the detection, a conductivity system equipped with a ASRS ®-ULTRA suppression mode (Dionex). Cations determination has

been performed by means of an Ion Pac ® CS12A column (Dionex) using 20 mM H_2SO_4 as eluent at 1 ml/min flow-rate and, for the detection, a conductivity system equipped with a CSRS ® -ULTRA suppress.(Contini et al., 2010)

The secondary non-sea-salt-sulphate was essentially ammonium sulphate and accounted for about 32% of PM2.5, while the metal concentration take into account 2-3 %.

The content of OC/EC has been carried out by the carbon analyzer (Sunset, USA).

Preliminary results of OC/EC concentration will be presented.

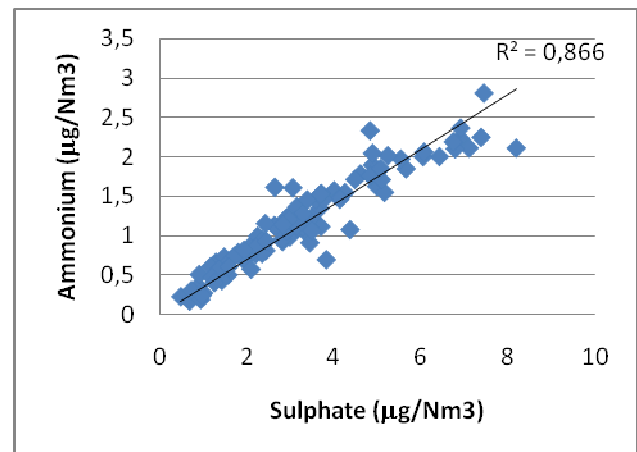


Figure 1. Secondary ammonium sulphate.

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