Chemical characterization of ambient aerosol over the Tyrrhenian Sea

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Marine aerosols significantly contribute to the global natural aerosol system, as the oceans cover more than 70% of the Earth's surface. Conversely, anthropogenic emissions from coastal areas may influence the concentration and chemical composition of particulate matter in the marine boundary layer, as a function of the distance from the coast and of the presence of industrial plants and/or urban areas. Particularly interesting is the situation in the Tyrrhenian Sea, a part of the Mediterranean Sea located off of the western coast of Italy, surrounded by many industrial and urban areas and characterised by a maximum distance between the coasts of no more than 400 km.

Chemical composition of the marine aerosol and its modifications due to the transport of continental aerosol were studied during a cruise of the oceanographic ship Minerva1, carried out in the Mediterranean Basin from 25 June to 13 of July 2015 in the framework of the project "Medoceanor 2015" (Figure 1).

17 samples of PM_{10}, $PM_{2.5}$ and PM_1 were simultaneously collected during the cruise; 4 of them were carried out far from the coast and can be considered as representative of open sea conditions. Sampling time varied from 9 to 48 hours, as a function of the wind direction and of the residence time of the ship in front of a specific source.

Figure 1. Ship's course over Tyrrhenian sea

Each sample was collected on two side-by-side membrane filters: the first one (quartz) was devoted to the determination of elemental and organic carbon by thermo-optical analysis, the second one (Teflon) was aimed at measuring the mass concentration by gravimetric method and at determining element concentration by energy dispersion X-ray fluorescence and ion concentration by ion chromatography.

The results of the chemical determinations were elaborated to obtain the mass closure and to evaluate the composition of different size fractions of the marine aerosol as well as the influence of the different sources located on the coast (industrial areas, volcanoes, large cities).

In Figure 2 we report the preliminary mass concentrations of PM_{10}, $PM_{2.5}$ and PM_1 during the campaign.

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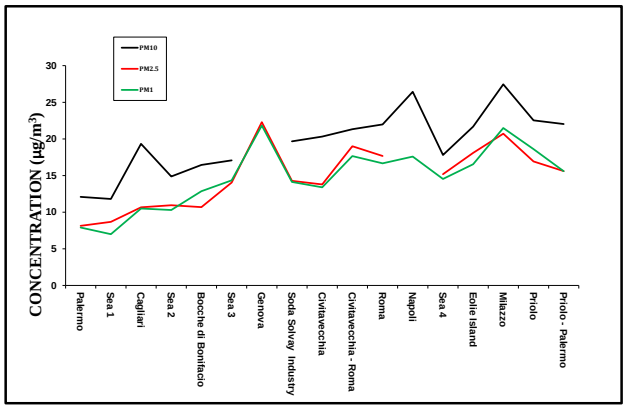

Figure 2. Mass concentrations of PM_{10}, $PM_{2.5}$ and PM_1