A systematic chemical and morphological characterization of particulate matter in the main cities of Umbria (Italy) in the years 2006-2009


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The aim of this work was to carry out a systematic chemical and morphological characterization of PM in the main cities in Umbria (Central Italy), and to evaluate the impact of biogenic and anthropogenic sources on the air quality at regional scale.

The first stage of the project was dedicated to optimize and integrate various analytical procedures and to plan the sampling campaign. In the second stage, developed between May 2006 and April 2007, sampling was carried out in different urban sites in the two main cities of Umbria, Perugia and Terni. More than 200 PM10 and PM2.5 samples were collected on PTFE filters using low volume air samplers. The samples were analyzed by different techniques of chemical and morphological analysis (ICP-AES, IC, UV-VIS, XRF, SEM-EDS). Considerable morphological and compositional differences among the PM collected in the two sites were evidenced. These differences delineate two different emissive contexts in Perugia and Terni, the former being strongly influenced by motor traffic and the latter resulting from a mixing of natural, roadside and industrial inputs. In addition, potential sources and modes of distribution of fine aerosol in the environment were outlined [1, 2].

In order to further deepen the understanding of these aspects a third stage of the project was planned. This third phase of the project started in December 2008 and will last till Dec 2009. At this stage sampling has been extended to other industrial (Gubbio, Narni Scalo, Spoleto) and to a regional remote background (Martani mountains) sites.

In addition to the equipments employed in the previous stages, herein, two high volume air samplers with cascade impactor are employed to obtain multi-stage particulate size resolution of fine and course fractions. Also, an optical particle counter is used to define the dimensional distribution of fine and ultrafine fractions.

The regional remote background site was located at an altitude of 800 m. on the ridge of a small mountain system (monti Martani) in the center of the Umbria region. The site was equipped with a SWAM 5a Dual Channel Monitor (FAI instruments) with PM10 and PM2.5 selective inlets. The apparatus is controlled remotely and allows to determine the mass concentration of PM by operating on operating and spy filters, comprising a beta radiation emitter and detector.

Seasonal samples on quartz fiber and polycarbonate filters will undergo similar chemical analysis as in stages 1 and 2 of the project.

Data will be presented at the conference also by means of results from multivariate statistical analysis.

Bibliography: