Levels and geochemistry of urban and rural atmospheric particulate matter in Spain

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A review of PM10, PM2.5 and PM1 geochemistry data collected in1999-2011 from 40 air quality monitoring data, each with 1 to 10 years of data coverage, is presented with the aim of describing major features of urban, industrial and rural source contribution, as well as describing the major concentration trends and their causes.

Ambient air PM levels have markedly decreased in the last decade by around 35%. Although EC limit values are exceeded only in a few hotspots, urban PM levels still exceed by far the WHO guidelines. Causes accounting for these trends are discussed according geochemical data.

Spatial gradients are very clear across Spain, especially levels of sulphate, nitrate, ammonia and mineral matter. Different emission patterns and climate features may account for these gradients. The incidence of African dust outbreaks on PM levels is also briefly described. Levels of carbonaceous aerosols are mostly influenced by vehicle exhaust emissions. Ranges of concentrations of levels of around 30 trace elements in the 40 sites are presented and discussed. The influence of major industrial hotspots is evidenced, but also the impact of vehicle wear emission in ambient levels of a number of relevant metals is evidenced. Results point to the very high impact of vehicle exhaust and road dust emissions on levels and composition of PM in urban areas. Biomass burning emissions may have local impact but not much at urban scale in the largest urban agglomerations in Spain. Finally, the relevance of specific industrial hotspots is also shown.

Multi-Wavelength Raman survey of IOM from primitive meteorites

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We report a survey of the structure of Insoluble Organic Matter (IOM) of a series of 27 CR, CM, CI and ungrouped C2 carbonaceous chondrites by means of Infrared and Multi-Wavelength Raman micro-spectroscopy (244, 514 and 785 nm laser excitations). The IOM in some of these chondrites displays Raman and Infrared signatures that point to the past action of short duration thermal metamorphism, presumably triggered by impacts (e.g. PCA 91008, QUE 93005, Tagish Lake). Interestingly, IOM from other chondrites also display Raman characteristics consistent with a thermal processing. In this regard, IOM and Soluble Organic Matter (SOM) could be considered as two byproducts of organic precursors decomposed by thermo-degradation. The place where this process occurred, within parent body or protosolar disk prior accretion, cannot be firmly identified given the lack of precise knowledge on the nature of the organic precursors and of the time-temperature history of the parent asteroid. Our data also confirm that IOM is structurally more homogeneous in chondrites than in stratospheric IDPs and Antarctic Micrometeorites (AMMs). This suggests IOM contained in these particles was formed under more varying conditions. However, other mechanisms as ions irradiation or atmospheric heating/oxidation cannot be fully excluded for accounting for these variations.

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