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Chemical emission speciation profiles influence on PM10 composition modelling

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Models are always simpler than the real phenomena they represent and there are many areas of uncertainty due to both theoretical aspects (processes not fully understood) and empirical and parametrical aspects (too simplified physical or chemical underlying schemes). PM behaviour in atmosphere represents an open challenge for dispersion modelling due the highly non-linear complex physical and chemical processes that act on different temporal and spatial scales. In PM simulations, the uncertainties related to emission input data play an important role due to their influence on total mass and its chemical composition. The assessment of those uncertainties is not easily achieved, as many factors can act simultaneously and thus numerous model runs needs to be performed. The chemical and transportation model FARM (Flexible Air quality Regional Model -developed by ARIANET s.r.l), has been applied to a test case with different emission input data in order to compare the resulting sulphates, nitrates, ammonium, organic carbon (OC) and elemental carbon (EC) concentration in total PM. For this purpose two sampling periods were chosen one during summertime and one during wintertime. The sampling was carried out in Milan for PM10 fraction and using quartz fiber filters. The samples were fully characterized for both main ions (by ionic chromatography) and carbonaceous fraction, i. e. OC and EC (using a TOT – thermal optical transmittance- instrument). The emissions total mass have been derived from the regional INEMAR emission inventory and chemical speciation profiles from both bibliography and local studies. The obtained results confirm the importance of sound emissions chemical speciation, since different hypothesis on the emitted PM composition can lead to not-so-small shifts of modelled results, especially when EC/OC ratio is involved. A sounder local representation of the EC/OC emissions ratio appears to be one of the key-figures to obtain a more accurate representation of measured data by CTMs (Chemical Transport Model).