



The use of total susceptibility in the analysis of long term PM10 (PM2.5) collected at Hungarian air quality monitoring stations

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Air monitoring stations in Hungary are operated by Environmental, Nature Conservancy and Water Pollution Inspectorates, according to the CEN/TC 264 European Union standards. PM10 samples are collected on a 24-hour basis, for two weeks in February, in May, in August and in November. About 720m³ air is pumped through quartz filters daily. Mass measurements and toxic metal analysis (As, Pb, Cd, Ni) are made on each filter (Whatmann DHA-80 PAH, 150 mm diameter) by the inspectorates. We have carried out low field magnetic susceptibility measurements using a KLY-2 instrument on all PM10 samples collected at 9 stations from 2009 on (a total of more than 2000 filters). One station, located far from direct sources, monitors background pollution. Here PM2.5 was also collected in two-week runs, seven times during the period of 2009-2012 and made available for the non-destructive magnetic susceptibility measurements. Due to the rather weak magnetic signal, the susceptibility of each PM-10 sample was computed from 10, that of each PM2.5 sample from 20 measurements. Corrections were made for the susceptibility of the sample holder, for the unpolluted filter (provided with each of the two-week runs), and for the plastic bag containing the samples.

The susceptibilities of the PM10 samples were analyzed from different aspects, like the degree of magnetic pollution at different stations, daily and seasonal variations of the total and mass susceptibilities compared to the mass of the pollutants and in relation to the concentrations of the toxic elements. As expected, the lowest total and mass susceptibilities characterize the background station (pollution arrives mostly from distant sources, Vienna, Bratislava or even the Sudeten), while the highest values were measured for an industrial town with heavy traffic. At the background station the mass of the PM10 and PM2.5, respectively for the same period are quite similar, while the magnetic susceptibilities are usually higher in the first, indicating that a sizable part of the magnetic grains is coming from nearby capitals rather than from more distant sources. We found no correlation between magnetic susceptibility and toxic metals. On the other hand the weaker vehicle traffic during week-ends, especially on Sundays is evident in the total susceptibilities, although it is also seen as a tendency in the mass of the pollutants and in the mass susceptibilities. While the generally used mass susceptibility seems to be useful as an indication for the heaviness of vehicle traffic in the area of the studied monitoring stations, it is a total failure for expressing correctly seasonal variations. The reason is that much more non-magnetic than magnetic pollutants are produced during heating season, especially by household heating with coal and wood. The consequence is that in the total susceptibility the higher production of the magnetic particles during heating season is evident, while in the mass susceptibility the trend is opposite, i.e. the magnetic pollution seems to be less intensive during heating season than otherwise.

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