MAGNETIC STUDIES APPLIED TO AN INVESTIGATION OF VEHICLE-DERIVED POLLUTION ON A ROAD FROM ARGENTINA

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Studies of traffic-derived pollutants from primary sources (vehicles), on roads (paved area), road borders and surroundings areas (soils) were carried out. The study is focussed on the identification, distribution and concentration of pollutants and magnetic carriers, comprising the road Autovia 2, which is located in the eastern part of the Buenos Aires province.

Results of rock-magnetic parameters and their analyses suggest that the magnetic signal of vehicle-derived emissions is controlled by a magnetite-like phase. Although all collected samples: scraped, swept, soil, asphalt material, brake lining and soot samples show a similar magnetic behaviour, it is possible to discriminate among them according to their magnetic concentration and features. Magnetic grain size estimations from our study are in most samples below 5 μm, and finer (0.1-2 μm) for soot samples. The presence of fine particles is important because they can be inhaled and therefore are dangerous to human health.

Results of magnetic susceptibility (κ) show higher magnetic concentration in the central area of the tollbooth line that is related to higher traffic; moreover, κ on several roadside soils along 120 km indicates that magnetic particles emitted by vehicles are accumulated in a couple of meters from the road. Thus, magnetic susceptibility parameter seems to be a suitable indicator of traffic-related pollution. This magnetic enhancement is interpreted as a consequence of deposition and/or movement of pollutants into the asphalt surface and roadside soils.

Non-magnetic studies show an enrichment of some trace elements –such as Ba, Cr, Cu, Zn and Pb– associated to traffic pollution. A couple of samples were examined by scanning electron microscopy (SEM); and their composition –analyzed by x-ray Energy Dispersive Spectroscopy (EDS)– reported the presence of C, O, Fe, Mg, Al, Si, S, Ca, Pd, Ti, Ba, Cr, Mn, Pb, Cu and Zn.

The co-existence of both metal and magnetic particles is supported from correlation analysis, selected magnetic and chemical variables show moderate and strong correlations. Hence,κ, anhysteretic remanent magnetisation (ARM), and κ_{ARM}/κ parameters are potential indicators to map some toxic trace elements.

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