# Comparison of PMx collected at sites with different level of air pollution using iron oxides as magnetic tracers

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Iron oxides of both natural and anthropogenic origin form significant part of atmospheric dust and, depending on the source, transport pathways and deposition, may coexist with harmful substances, such as heavy metals. In case of specific situation, e.g. close neighbourhood of steel works, they may serve as magnetic tracer of the particular major source of air pollution. Therefore, knowledge on their form, concentration and grain size and shape may provide useful information in assessing the character and source of pollution. Methods developed in rock and environmental magnetism are very sensitive to minute amount of ferrimagnetic iron oxides (magnetite and maghemite) and have potential to provide this information (e.g., Sagnotti et al., 2006, 2009; Górka-Kostrubiec et al., 2012).

In our contribution we show typical differences in PMx properties collected at Czech sites with different level of air pollution during different periods. Sampling sites include industrial site (Bartovice – close to major steel works and Branany – close to open mine pit), traffic site (next to outer highway circle around Prague), urban site (Prague downtown) and rural site (town of Nove Hrady). Sampling periods include typically summer and winter period, one sampling campaign at Bartovice was during smoggy period when concentrations of PM10 significantly exceeded the daily limits. We typically sampled total suspended particles (TSP), PM10, PM2.5 and PM1. In addition to standard data on PMx concentration a range of laboratory magnetic measurements was carried out in order to reveal the type of iron oxides, their concentration and grain size. These measurements were complemented by scanning electron microscopy and Mossbauer spectroscopy. In all the cases, particles of typical spherical shape, rich in iron oxides, were observed (Fig. 1). Concentration of iron oxides reflects well general trends in air pollution, reflected by the concentration of PM10. Magnetic parameters sensitive to grain-size distribution of Fe-oxides are different for summer and winter PM10 samples in articular in the rural site, with clear shift towards finer particles in summer. This may reflect different source of PM, with dominant natural particles from agriculture and land-use activities in summer, compared to those produced by domestic heating in winter. No clear differences in grain size distribution of iron oxides were observed in the case of industrial site of Bartovice.

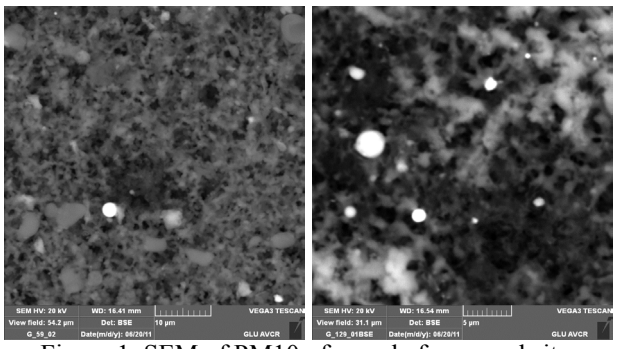

Figure 1. SEM of PM10 of sample from rural site, collected in non-heating (left) and heating (right) period.

Our results suggest that magnetic minerals (ferrimagnetic iron oxides – magnetite and maghemite) reflect well specific site and seasonal characteristics of air pollution and provide additional information related to relative contribution of major pollution sources.

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