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# Magnetic signature of selected soils in Austria

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In a number of previous projects the suitability of magnetic measurements (especially the magnetic susceptibility) as a proxy for anthropogenic pollution was shown. In this ongoing study, funded by the Austrian Science Fund (FWF P16314), samples of selected polluted and unpolluted Austrian soils are examined to find the physico-chemical- link between magnetic proxy methods and pollutants and to set up threshold values for polluted soils.

The methods applied include standard magnetic and mineral magnetic measurements, such as susceptibility, isothermal remanent magnetization (IRM), alterning field (AF) demagnetisation, high temperature susceptibility analysis ($\kappa$(T)) and 3 axis- coercivity/unblocking temperature spectra (IST$_{3D}$).

Since IST$_{3D}$ experiments are common in rock magnetic studies but rarely performed on loose material, it was first necessary to find a matrix to create a cubic, heat resistant sample where the soil could be embedded. Several materials have been tested in advance for their suitability for this experiment. All of the materials, mainly different types of gypsum, failed the test because although they had very low susceptibilities, the SIRM$_{1450mT}$/NRM ratios varied between 155 and 8208. $\kappa$(T) analysis showed that all of the materials contained a magnetite-like phase.

Filling the soil sample loosely in a plastic cube and hardening it with silica-acid-ester finally produced the samples for the IST$_{3D}$ experiment. After removing the plastic cover from the hard soil cubes, they were painted with alumina cement to prevent abrasion in the furnace.

$\kappa$(T) analysis was performed on magnetic separates; all other measurements were done on compressed soil in 8 cm$^3$ plastic cubes.

For discrimination among groups of polluted and unpolluted soils the following parameters showed to give the best information: $SIRM_{2500mT}$and susceptibility (in agreement with Lecoanet, et.al., 2003), $AF_{rest}SIRM$ (representing the remaining of $SIRM_{1450mT}$ after AF demagnetization with 150 mT [%], similar to Larrasoana, et.al.,2003 ) and the $IST_{3D}$ plots.

Polluted sites are represented by medium to high SIRM, high susceptibility and low $AF_{rest}SIRM$ values ($<$5%). $IST_{3D}$ plots show dominance of the soft component (saturated with 70 mT) with corresponding unblocking temperatures around 570˚C. Unpolluted sites are indicated by low SIRM and susceptibility values and medium (5-10%) to high ($>$ 10%) $AF_{rest}SIRM$ percentages. The main component derived from $IST_{3D}$ experiment is also the soft component, but medium (70-500 mT) and hard (500-2500 mT) components contribute to a higher degree.

References:

Lecoanet, H., Ambrosi, J.-P., Lévêque, F., 2003. Combination of magnetic parameters: An efficient way to discriminate soil-contamination sources (South France). Environmental Pollution 122 (2), 229-234.

Larrasoana, J.C., Roberts, A.P., Rohling, E.J., Winklhofer, M., Wehausen, R., 2003. Three million years of monsoon variability over the northern Sahara. Climate Dynamics 21, 689-698.