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Short term changes in magnetic properties of cultivated soils: preliminary field tests

J. Thiesson (1,2), P. Courtemanche (1), S. Seladji (1,2), and A. Tabbagh (2)

(1) I.N.R.A. Centre de recherche d'Orléans, UR 0272 Sciences du sol, 2163 avenue de la pomme de pin, CS 40001 Ardon, 45075 Orléans CEDEX 2, France , (2) Université Pierre et Marie Curie Paris 6, UMR 7619 Sisyphe, case 105, 4 place Jussieu 75252 Paris cedex 5, France

It is well known that, in addition to natural pedogenesis processes, both the biogenic and authigenic processes responsible for long term modifications of the soil's magnetic properties are influenced by agricultural practices. In fact, long term (secular or millennial) differences in agricultural techniques can be revealed by mapping the magnetic susceptibility of the fields. As a preliminary study of the DIGISOIL project, we have assessed the short term modifications (on a scale from one to several years) of these properties over two different test fields. Both sites have areas or plots uncultivated, cultivated for one year and for one decade. These two sites differentiate because one is fertilized with various kinds of manure and the other is not fertilized. As a consequence, they exhibit significant differences in organic carbon content.
Two main results have been obtained: (i) magnetic properties are sensible to the fertilization, (ii) absolute values of the apparent properties seem to be directly linked to the duration of cultivation.
Consequently, the magnetic properties, which are measured non-intrusively and rapidly, can be used to assess and map a series of pedological processes. In the two cases, they are correlated with the organic matter content which suggests that they could be used as a proxy for the mapping of organic carbon content in topsoils.