



PhD Thesis position at the Hydrasa team of the Institut de Chimie des Milieux et Matériaux de Poitiers (IC2MP), France.

Title: Organisation of clay matrix in soils: effects of mineralogy and physico-chemical conditions

Key words: soil, clays, mineralogy, soil structure, transfer

The organisation of minerals plays a crucial role in the storage or transfer of water, nutrients and contaminants in soils. Among the different constituents of soils, clay minerals play a pivotal role on these processes. Indeed, their sub-micrometric sizes and the associated large specific surface areas commonly enhance the adsorption of the elements while limiting the size of the pores where the transfer occurs. In addition, the specific platelet shape of clay particles commonly promotes a preferential orientation of these minerals in the material. This preferential orientation leads to a reorganisation of the clay matrix from isotropic to anisotropic according to the physico-chemical conditions of the soil. This clay matrix organisation participates and affects the macroscopic physical properties of the soil surface such as hydraulic conductivity or diffusion and consequently presents special interests. Moreover, the reorganisation of the soil surface due to rainfall is limited when vegetation cover is present, this work is thus targeted towards soils partially kept free of vegetation during the growing season. In this context, soil amendments (potassium or sodium chloride, calcium carbonates, nitrates...) lead to contrasting organisation of the clay matrix at the surface of soil, which are noticed in the field. The aim of this PhD thesis will be to quantitatively determine the variations of both clay mineralogy and clay matrix organisation in soils surfaces subjected to variable types of amendments.

The PhD thesis will include two parts:

- Identification and quantification of the clay mineralogy from the surface of a bare soil that was subjected to variable amendment for 90 years. The identification and quantification of clays will be obtained by X-ray diffraction profile modelling.
- Spatialized organisation of the clay matrix at the soil surface. Mapping of the mineral particles was obtained on 2018 using synchrotron beamline (2D X-ray diffraction) for the different types of amendments. Additional acquisition of complementary data from synchrotron beamline is intended during the PhD.

Conditions: PhD of 3 years. Expected beginning of the PhD on September 2019. Monthly net income: ~1430€ net/month. Opportunity of contractual teaching activity at the University (45h of teaching per year during the 2nd and 3rd year of the PhD, additional net income of ~110€ and exemption from tuition fees for these two years).

Contact: send a CV and accompanying letter to Fabien Hubert (fabien.hubert@univ-poitiers.fr).

Required profile: The candidate should have a Master 2 or equivalent degree in one of the following fields: soil sciences and/or earth sciences and/or material sciences and/or physic or chemistry of materials. Programming knowledge in Python and/or Matlab® and background in clay mineralogy could be additional assets. The candidate is expected to be proficient in English.

Application deadline: no later than May 15th 2019.