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Soil with Carbonate Accumulation in Tensift Al Haouz Lowland (Morocco): Characterization, Genesis and the Environmental Significance

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Abstract : The calcareous accumulations in the surface formations of the soil, are a very widespread phenomenon in the arid and semi-arid regions. Many aspects of physical and chemical evolution of these soils were debated for more than one century. The last two decades have witnessed a remarkable interest in the study of the calcrete. In Morocco, as in most Mediterranean countries, soils with carbonate accumulation cover large areas of the territory. The isohumic subtropical soils and red Mediterranean soils include always a horizon of calcrete accumulation. In the lowland of Tensift Al Haouz located in the central part of Morocco, the arable lands are underlain by indurate pedogenic calcrete of various thicknesses; this constitutes a serious handicap for agricultural development in the region. Our aims in this study is to analyze the characteristics of the crusts developed in this area in order to identify the various facies, their geographic distribution and the factors that played a significant role in the differentiation of these calcareous accumulations. The characterizations were based on various techniques including field observations, X-ray diffraction analysis (XRD) for both raw materials and clay fractions, SEM analysis, Calcimetry and Loss On Ignition (LOI). The analysis of encrusting calcrete in a rich and varied observation field as the region of Tensift Al Haouz enabled us to specify the important types of accumulations: diffuse, nodular and massive encrusting. The shape of encrusting as well as their consistency and hardness is clearly related to the contents of CaCO3 of the profiles. Among these facies, the hardpan which results from a complex succession of processes is certainly the most morphologically advanced form of encrusting. The vertical and lateral distribution of these forms in the Tensift Al Haouz area indicates that they do not appear randomly but seem related to well defined environmental conditions. The differentiation and evolution of encrusting is under the influence of two major factors: 1) the availability of carbonate rich solution which is controlled by the topography, the nature and texture of underlying host rock and the detrital processes; 2) the climate which is responsible for the evaporation and crystallization of carbonate.

Keywords : soil calcrete, characterization, morphology, Tensift Al Haouz, Morocco
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