

Mineralogical composition and paleoclimatic records of the Quaternary clay deposits in the Saïis Plain

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The Saïis Plain is located in the oriental part of the foreland basin of Saïis, it's limited to the north by the mountains of the rif, and the Middle Atlas mountains to the south. This basin was filled with a marine sedimentation of Miocene-Early Pliocene age represented by marls and sandstones, and a series of continental deposits of Pliocene-Quaternary, represented by diverse deposits referring to palustrine, lacustrine, fluvio-lacustrine and fluvial environments.

The Quaternary fluvial deposits of the Saïis plain are dominated by fine clays and silts interbedded with lenses of conglomerates. These deposits represent floodplain and barrier deposits of the fluvial system that functioned during the Quaternary.

The aim of this study is to deduce the paleoclimatic records of the Quaternary from the results of the mineralogical composition of these clays using X-ray diffraction on oriented and glycolated specimen, the SEM observations, the EDS spectra for semi-quantitative chemical composition, as well as Carbon and Oxygen isotopic signatures.

The clay minerals assemblages in the studied area showed the dominance of smectites, associated to other clay minerals such as chlorite, kaolinite, illite and palygorskite. These clay assemblages suggest the dominance of a Mediterranean climate with periods of high humidity and short periods of cold and/or desertic climate.

The isotopic signatures of carbon oscillate between -9 and -9,4 ‰VPDB, these signatures suggested the dominance of C3 plants. Therefore, C3 plants growing in arid environments tend to have more positive carbon isotopic values compared to those growing under less water-stressed conditions.

These values are close to the isotope values typical for soil carbonate formed from organic CO₂ produced by predominantly C3 type vegetation cover and support pedogenic or probably shallow groundwater origin. The calculated isotopic signatures of CO₂ vary between -21,78 and -21,3 ‰VPDB suggesting a biogenic carbon related to organic processes.

The isotopic signatures of δ¹⁸O vary between -4,4 and -5 ‰VPDB. These variations depend on soil moisture, evaporation, the temperature of precipitation and the isotope composition of the downward percolating soil water from which it was precipitated. However, these signatures suggest a higher evaporation during Early and Middle Pleistocene.