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Phosphorite series from Maastrichtian to the Lutetian cover of Tadla Plain, Morocco: New insights from lithofacies analysis, granulometric and mineralogical compositions

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The Ouled Abdoun sedimentary basin in Morocco contains the largest phosphate reserves in the world. In the southeastern parts of the basin, the phosphorite deposits lay from the Maastrichtian to the Lutetian sediments of the Tadla Plain. This section has a thickness of ~ 30 m and generally protected from erosion by a relatively strong Turritella slab cover. The phosphorite deposits are distributed in horizontal strata interbedded with levels of limestone, marl and clay, that present various silicifications from the Ypresian. This work aims to study and determine their petrographic, granulometric and mineralogical compositions. A multidisciplinary approach was adopted to achieve these objectives. First, the use of sedimentology and the application of sequence stratigraphy allowed the definition of three depositional sequences in this deposit. Second, the granulometric analysis of the phosphate facies reflects a dominance of well classified medium grains. Furthermore, the analysis of the Visher curves revealed up to three major modes of transport: traction, saltation and suspension. Based on their mineral composition, the microfacies are classified into two phosphate families (or types): Coprolite Intraphospharenite type and Granular Pelphosphalrenite type. Finally, the mineral parageneses recognized by the XRD analyses revealed that phosphorits consist mainly of carbonate, silica and apatitic phases in the section of Tadla.

Keywords: Phosphorite deposit, Tadla plain, Maastrichtian-Lutetian.