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Facies Analysis and Depositional Environment of the Late Carboniferous (Stephanian) Souss Basin, Morocco

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Abstract : The lithofacies analyzed herein were reported from the interbedded fluvial and lacustrine deposits of the Oued Issene and El Menizla formations. These formations are part of the sedimentary fill of the Carboniferous (Stephanian) submontaneous Souss basin. The latter is situated in the western High Atlas Mountains, south-central Morocco, about 50km east of Agadir. The Souss basin started as a single basin but was separated into sub-basins called Ida Ou Zal and Ida Ou Ziki by sinistral displacement along the west branch of the Tizi N'Test Fault during the end of the Mauritanid phase of the Variscan orogeny in Morocco, after the early Stephanian (Kasimovian) and before the late middle Permian (Capitanian). The studied succession is a monotonous finning-upward sequence of 1800 m thick. It consists of fine-grained sandstone, finely bedded siltstone and thinly laminated claystone, and black shale. Herein we provide a detailed characterization of lithofacies of the upper El Menizla and Oued Issène formations, with a focus on the prevailing overbank to flood plain fine-grained lithofacies. The studied facies are capping the Stephanian alluvial fan basal clast-supported conglomerates that are intercalated bedded coarse-grained sandstones of Ikhourba Formation in the Ou Zal subbasin and Tajgaline Formation in the Ida Ou Ziki subbasin, respectively. Within the fluvial elements, only two main facies have been observed. It comprises channel-fill and channel-bar deposits, mostly occur as lenticular –shape sand bodies or sheet-like sand greenish to gray fine-to medium (Fm), massive internally structureless, or very locally exhibits a medium to large scale trough-cross bedding medium to coarse sandstone (St), observable in relatively thicker bed. These facies are laterally extensive, with a thickness varying from a few to several meters. Finer-grained sediments such as mud can be present as drapes over bedforms. Whilst the fluvial association FA1, the overbank elements are represented by a relatively wide range of 5 facies. This exhibit mostly a cm scale horizontally bedded greenish fine- to medium sand and silt, and mm scale fossiliferous thinly laminated dark gray- black Corganic-rich clays to siltstone associated with black shale. Thus, FA2 includes flood plain fines (Fh, R) associated with the paleosols and back swamp coaly clay facies (C). The floodplain lake element comprises only laminated organic-rich dark gray facies of claystone, black shale, and graded siltstone. Bedsets are dm to several meters thick (typically < 1 m thick). They are intercalated between several m-thick fluvial sandstone, extend over a few meters, and are poorly bioturbated. The lacustrine facies described in this study have been divided into two sub-facies (Fl, B) based on field observations that indicate differing environmental conditions of formation. Thus, the thorough analysis of the lithofacies of the Souss basin units allows us to reconstruct the original environment that was interpreted as a typical fluvial-dominated braided to anastomosing wide distributary channel system and surrounding deep to shallow freshwater floodplain lakes and back swamps.

Keywords : Souss, carboniferous, facies, depositional setting
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