

## **Facies architecture and depositional model for the Coimbra Group, Lusitanian Basin (Portugal)**

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A depositional model is proposed for the Lower Jurassic shallow-marine carbonate succession (Coimbra Group) of the Lusitanian Basin, in the Coimbra-Penela region (western-central Portugal). Detailed field information from 21 stratigraphic sections (among several dozens of other observations) and from structural-geology surveys, was mapped and recorded on graphic logs showing the lithological succession, including sedimentological, palaeontological and structural data. Facies determination was based on field observations, petrographic and X-Ray diffraction analysis. Vertical distribution of clay mineral assemblages (especially the relative abundance of illite, kaolinite and smectite) served as paleoclimate indicator. Lateral and vertical facies trends were evaluated.

A formal lithostratigraphic framework is proposed for the Coimbra Group cropping out in the eastern part of the basin (more landward zone of the Lusitanian Basin - i.e. in the proximal domain), ranging in age from the early Sinemurian to the early Pliensbachian and recorded in two distinct subunits: the Coimbra formation, essentially dolomitic; and the overlying S. Miguel formation, essentially dolomitic-limestone and marly-limestone. Locally, the Coimbra formation may be subdivided into 3 subunits, with a thickness in the order of  $20\pm 10$  m in Coimbra and  $45\pm 10$  m in the Penela region. In turn, the S. Miguel formation may be subdivided into others 4 subunits, with a thickness in the order of  $50\pm 10$  m in Coimbra and  $60\pm 10$  m in the Penela region. The lithostratigraphic boundary between the two formations correspond to a local disconformity with very short-term subaerial exposure evidences (intermittent/ephemeral, with local micropalaeokarstic dissolution) linked to possible syndepositional intra-Sinemurian tectonic pulses.

The 15 identified facies were subsequently grouped into 4 genetically related facies associations indicative of sedimentation within supra/intertidal, shallow partially restricted subtidal-lagoonal, shoal and more open-marine (sub)environments.

The integration of the results obtained by facies and sequential analysis allow to presenting an evolutionary palaeoenvironmental framework - at local scale. A general long-term transgressive phase is evidenced by the progressive deepening of the carbonate system, with environments ranging from tidal flat-protected lagoon to high-energy and low-energy open-marine, suggesting a general back-stepping of a coastal/peritidal system (during the Hettangian-lower Sinemurian, possibly to the base of the upper Sinemurian) and a very shallow, inner part of a low-gradient, carbonate ramp system that begins to develop in the second half of the upper Sinemurian.

Two types of dolomitization are recognized: one (a) syndepositional (or early diagenetic), massive-stratiform, of "penesaline type", with the concurrent action of microbial activity; another (b) later, localized, common during diagenesis (sometimes with dedolomitization), particularly where fluids followed discontinuities such as joints, faults, bedding planes and, in some cases, pre-existing palaeokarstic features.