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Abstracts Volume

Talks

Theme 1: Carbonate Platforms

Carbonate Factories, Depositional Environments, Architecture and Modeling

T-1 to T-9

Evaporitic sedimentation recording a sea-level fall in the remnant of the Rheic Ocean during the mid-Carboniferous (N Spain)

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The Cantabrian Zone and western Pyrenees display excellent outcrops of the Variscan marine foreland basin succession that developed during the collision between Gondwana and Laurentia during the Carboniferous. During late Serpukhovian–early Bashkirian a homogeneous 450–70 m-thick succession composed of pelagic–hemipelagic, dark, laminated calci-mudstones (Barcaliente Fm in the Cantabrian Zone and Iraty Fm in the western Pyrenees) accumulated in the distal realms of the foreland basin over an area as wide as 300 km and covering more than 200,000 km^2. The upper part of the succession (upper Alportian, early Bashkirian) shows a gradual facies change, as the characteristic laminated calci-mudstones begin to contain calcite pseudomorphs after gypsum crystals, which increase gradually upwards, reaching 50% of the rock volume at the top. The pseudomorphs exhibit monoclinic equant prismatic habits and deform the surrounding matrix, suggesting a displacive growth of the gypsum crystals within the carbonate sediment at, or slightly underneath, the sediment–water interface. The upwards increase in pseudomorph abundance is accompanied by a decrease in crystal size and a change in crystal arrangement: crystals evolve from being up to 1 cm in size and randomly distributed in the lower part, to becoming smaller than 2 mm in size and forming continuous laminae in the upper part, which is indicative of a salinity increase. The presence of evaporites in these pelagic–hemipelagic deposits suggests that large areas of the marine foreland evolved into evaporitic conditions. This interpretation is also supported by organic geochemistry results, which show biomarker parameters (low pristane/phytane, high C35 homohopane) consistent with hypersaline conditions in the basin.

In the distal realm of the basin, in areas closer to both the foredeep and the foreland, in addition to the evaporitic facies, microbial features (crinkly laminae with filamentous microstructures, fenestral porosity, stromatolites) and other structures (desiccation cracks and flat-pebble breccias) suggestive of a shallow environment, are present in the upper part of the succession. Furthermore, in other sections close to the foredeep, the upper part of the evaporitic interval is absent and instead an edaphic nodular breccia occurs in the same

stratigraphic position. The edaphic breccia is composed of calci-mudstone clasts (commonly containing calcite pseudomorphs after gypsum), showing sutured contacts and a clayey matrix and, locally, root-like structures. All these sedimentary features indicate that important changes occurred in the basin during the latest Alportian likely linked to an important sea-level fall that has been recorded in other basins. The distinctive evaporitic and shallow-water features of the upper part of the studied succession were probably caused by a significant sea-level fall, which led to the restriction of large areas of the distal realm of the basin with the development of evaporitic conditions, and eventually caused subaerial exposure. Marly limestones with diverse marine biota and coeval microbial bioconstructions were deposited atop of the evaporitic interval, suggesting that normal marine salinity conditions were restored in these areas of the basin during the subsequent sea-level rise.