Estructuras de paleocolapso kárstico en plataformas carbonatadas: el ejemplo de Mallorca

Paleocollapse karstic structures in carbonate platforms: the example of Mallorca

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ABSTRACT

Carbonate rocks of the upper Miocene outcrop in the cliffs on the eastern coast of Majorca, which enables a detailed study to be made of the facies architecture, of its diagenetic evolution and of associated processes. In the Balearic archipelago (Majorca, Minorca, Ibiza, Formentera and other, smaller, islands), these rocks are post-orogenic and overlie the deformations of the lower and middle Miocene, the Palaeogene and the Mesozoic. These deposits correspond to tabular, calcareous-dolomitic shelves presenting subhorizontal sedimentation, and which have undergone the deformations and fracturing associated with both normal and slip-strike faults, as well as with slight tilting, which occurred during the upper Neogene and middle Pliocene. The karstic palaeocollapses that outcrop on the carbonate shelf of the upper Miocene on the southern and eastern coasts of Majorca form an important system of structures within the geologic record. They were formed by epigenic processes of dissolution, sinking and subsequent burial, compactation and diagenesis. The genetic processes, forms and products of the palaeocollapse structures are directly related to the high frequency of sea-level fluctuations, which also influenced the facies architecture. The vast majority of palaeocollapse systems that have been studied are defined in the bibliography as forms arising from epigenic dissolution processes that are not physically related in time and/or space to active karst processes. The palaeokarst associated with the mixing zone is considered to be a complex system. The effects of marine fluctuations on the mixing zone (both concerning the chemical composition and the temperature) lead to changes in the aggressivity of the dissolution waters, which in turn may produce intense variations in porosity and diagenesis.

The carbonate platform of eastern Majorca is a good example of a progradant reef platform in the western Mediterranean. It is constituted of three main sedimentary units, of which only two have been affected by palaeocollapse structures: (1) a progradant reef platform attributed to the upper Tortonian - lower Messinian; (2) a transgressive lagoon system attributed to the Messinian. The spatial complexities of palaeocollapse structures result from dissolution processes taking place in the most continental zone of the fresh water - salt water interface and from the ensuing sinking. Variations in the phreatic level caused an alternance between phreatic and vadose domains, and also between fresh and salt water at the interface, thus determining the subsequent differential dissolution of the rock. During sea-level low stands, a system of epigenic cavities developed, by the differential dissolution of the aragonite (mainly corals) in the facies of the reef front and overlapping layers of the lagoon. Subsequently, during rises in sea levels, the erosion surface of the reef was oversedimented by shallow-water carbonates, which led to the collapse of cavity roofs. This phenomenon arose as a result of the increased weight induced by the consequential accretion of sediment, and when the layers were as yet imperfectly consolidated. The geographic distribution of palaeocollapse structures on the Miocene carbonate shelf is not homogeneous, due to the heterogeneous distribution of patches of aragonitic coral. This latter fact could be related to the forms of the palaeocollapses, although their geometry and size seem to be related to the geometry and size of the cavity. The different types of collapse breccia, based on Loucks' classification, are associated with different heights and compositions within a single structure. In some specimens, both a vertical and a lateral type-grading can be observed within structures.