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Editorial

Tectono-Sedimentary Evolution of Cenozoic Basins

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The study of the tectono-sedimentary evolution of basins is a capital topic with many scientific and economic derivations. Usually, basin studies are focused on the evolution of sedimentary patterns of sedimentary basins and based in classical geology. In other cases, the goal is the study of the articulating structures allowing the basin development. In many cases, 2D and 3D models are presented for each kind of sedimentary basin, even including corrections of deformation and compaction with the help of specialized software. In many cases, the studied basins show characteristics outside of the standard presented in the published models of the reference basins. For this purpose, this Special Issue seeks to improve the general knowledge of the tectono-sedimentary formation and evolution patterns of Cenozoic sedimentary basins by adding the study of the generating and articulating structures allowing the basin development, together with classical sedimentary basin studies. The following collection of recent studies on the tectono-sedimentary evolution of several Cenozoic basins is provided in this Special Issue.

Guerrera et al. (2021) [1] performed a study of shoreline changes due to erosion in the West Africa margin of the Atlantic Ocean (Togo: Bight of Benin). The main problem was the marked erosion of large coastal sectors with maximum retreat rates of the order of 5 m/year. The continuous loss of territory caused a progressive impoverishment of activities and human resources and an increase in geological risk factors. The coastal erosion was induced both by natural and anthropic causes and can be controlled only by means of prevention programs, detailed scientific studies and targeted technical interventions.

The tectono-sedimentary Cenozoic evolution of the El Habt and Ouezzane Tectonic Units (External Rif, Morocco) belonging to the western North African margin was studied by Martín-Martín et al. (2020) [2]. This was an interdisciplinary study that reconstructed the depositional architecture and related sedimentary processes of the considered units. The Cenozoic successions were biochronologically defined, allowing, at the same time, identification of unconformities and associated stratigraphic gaps. Several tectofacies were found in some stratigraphic intervals, indicating synsedimentary tectonics.

Cañaveras et al. (2020) [3] studied the tectono-sedimentary evolution of the Madrid Basin (Spain) during the Late Miocene. They obtained data from paleokarst profiles in diagenetically complex continental carbonates. The paleogeographic reconstruction for the intra-Vallesian paleokarst using profiles revealed relative topographic highs to the north and topographic lows to the south, drawing the paleokarst landscape. Immediately overlaying the paleokarst surface, fluvio-lacustrine facies belonging to the Miocene Upper Unit (Late Vallesian to Late Turolian) were found.

The paleoceanographic characteristics of the sea surface at the western Mediterranean (Balearic area) during the Pliocene and Gelasian with data from planktonic foraminifer assemblages of the sediments of the Ocean Drilling Program (ODP)-Site 975 (Balears) were studied by Serrano (2020) [4]. The paleoceanographic frameworks deduced from the combination of the paleoceanographic parameters suggested that the current water deficit regime in the Mediterranean was clearly predominant throughout the Pliocene and Gelasian. However, since the Piacenzian, this regime alternates with stages of water surplus, which were especially frequent in the late Piacenzian. By the middle of the Early Gelasian, the regime became more predominantly in deficit again.

Cruz-Ceballos et al. (2020) [5] performed a geochemical characterization and thermal maturation of the Cerrejón Formation, allowing implications for the petroleum system in the Ranchería Sub-Basin in Colombia. The geochemical characteristics of the Cerrejón Formation were classified as a source rock, particularly in the central area of the sub-basin. Additionally, based on the interpretation of seismic reflection data, numerical burial history models were reconstructed using PetroMod software, in order to understand the evolution of the petroleum system and to infer the potential times of the generation and expulsion of hydrocarbon from the source rock in the sub-basin.

Di Capua et al. (2020) [6] treated the volcanism and volcanogenic submarine sedimentation in the Paleogene Foreland Basins of the Alps. In this paper, source-to-sink systems were reassessed with an actualist view. The progradation of volcanogenic sequences in the Northern Alpine Foreland Basin was subsequent and was probably favored by the migration of the magmatic systems to the north and to the west. At around 30 Ma, the Northern Apennine Foredeep was also fed by large volcanogenic inputs, but the palinspastic reconstruction of the Adriatic Foredeep, together with stratigraphic and petrographic data, allows us to safely exclude the Alps as volcanogenic sources.

The tectono-sedimentary evolution of the Cenozoic basins in the Eastern External Betic Zone (SE Spain) was reviewed by Martín-Martín et al. (2020) [7]. Four main unconformities were recognized in the Cenozoic sedimentary record of the eastern External Betic Zone (SE, Spain). They are located at the Cretaceous–Paleogene boundary, the Eocene–Oligocene boundary, the early Burdigalian and the middle Tortonian. These unconformities corresponded to stratigraphic gaps of different temporal extensions and with different controls (tectonic and/or eustatic), which allowed recognizing minor sedimentary cycles in the Paleocene–Miocene time span. A huge amount of tectofacies were found in the stratigraphic record, indicating important synsedimentary tectonics.

Guerrera et al. (2021) [8] performed a review on the evolutionary models of the Cenozoic basins of the central-western Mediterranean, focused on the methodological approaches. In the last 40 years, several models based on very different methodological approaches have been proposed to interpret the complex geodynamic evolution of the central-western Mediterranean area during the Cenozoic. The persistence of numerous interpretations and still-open problems resulted in the proliferation of very different models. The reconstructions presented are highly influenced by different methodological approaches. After some considerations about different types of literature models based on specific investigation methodologies, the updating of a recently presented evolutionary model is proposed by attempting to integrate as much data as possible about the Cenozoic basins of the central-western Mediterranean area.

The editor wishes that the mentioned papers of this Special Issue be of interest and benefit to readers.

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