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Vertebrate Migration in the Mediterranean & Paratethys

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ABSTRACT BOOK

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TERTIARY EVOLUTION OF THE APULIA PALEOGEOGRAPHIC DOMAIN

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Apulia is a carbonate platform domain which during the Mesozoic was part of a complex platform-and-basin system a palinspastic reconstruction of which is provided in Figure 1.

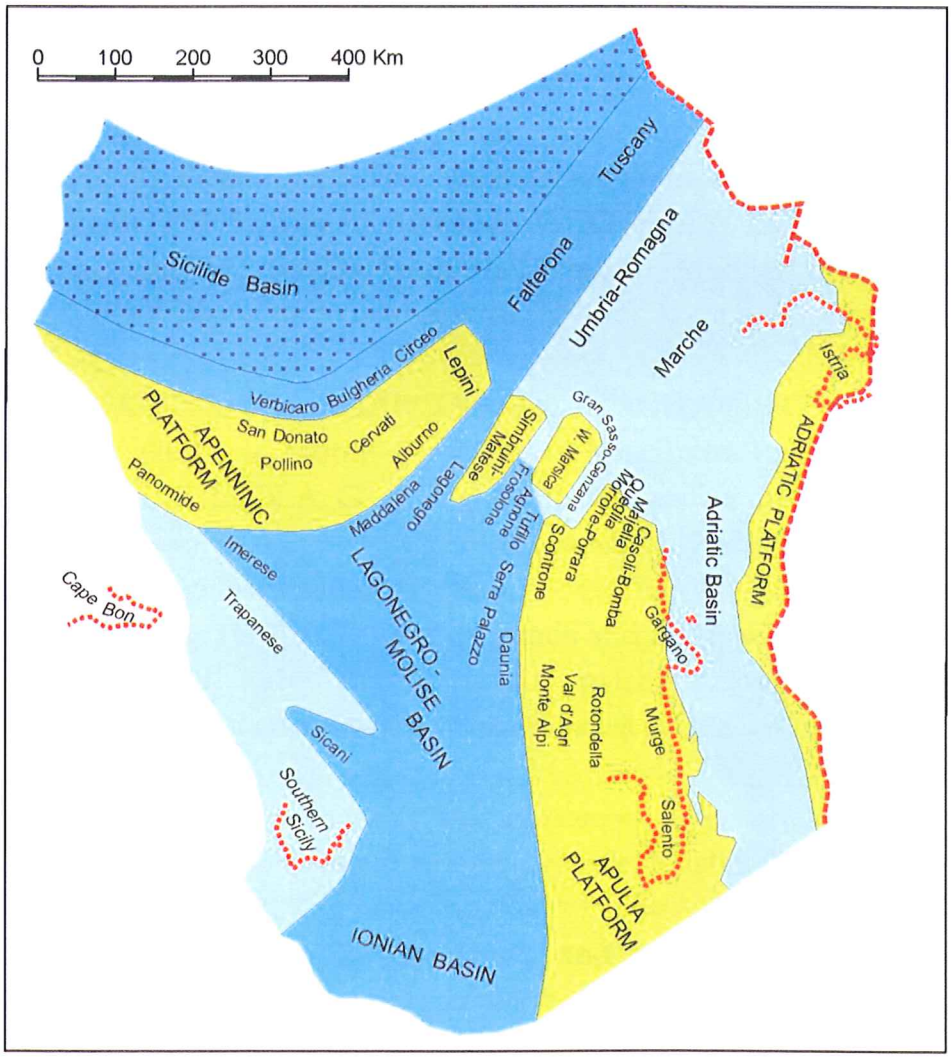

Figure 1. Palinspastic restoration of the Apulia Platform and surrounding platform-and-basin system in late Jurassic times (about 150 Ma). Green areas are Bahamian-type carbonate platforms separated by more or less deep basins (dark blue and light blue, respectively). The Sicilide and Lagonegro basins are supposed to have been floored, at least in part, by oceanic crust.

Apart from the deep-marine seaways of Lagonegro in the Apennines and of Budva-Pindos in the Dinarides-Hellenides (the latter out of the represented region), which are both related to middle Triassic tectonic events, the bulk of the platform-and-basin system in the peri-Adriatic region set up as a consequence of a lower Jurassic extensional tectonics that dissected an original upper Triassic-lower Liassic shallow epeiric area. During the Jurassic and during the greatest part of the Cretaceous, the peri-Adriatic platforms grew as isolated Bahamian-type carbonate platforms surrounded by basinal realms. Around the end of the Cretaceous the platform edge turned into a carbonate ramp characterized by overall prograding internal geometries. The new physiographic configuration of the platform-and-basin system brought to a paleogeography more articulated than the previous one, strongly influenced by global sea level changes. During sea-level drops widespread seaward progradation of shallow-water carbonates over deeper-marine deposits determined an enlargement of the shallow-marine/subaerial areas and favoured connections between the previously isolated platforms.

Starting from the early Miocene, the platform-and-basin depositional system underwent severe compressional deformation and was progressively incorporated into the Apennine and Dinaride-Hellenide thrust belts. Figure 2 shows the spatial distribution of the platform and basins in the undeformed (or slightly deformed) foreland areas, as well as the distribution of the platform-derived and basin-derived tectonic units in the Apennines, Dinarides and Hellenides.

The portion of the Apulia Platform that has escaped tectonic shortening forms today a segment of the foreland of the peri-Adriatic mountain chains about 700 kilometres long and up to 250 kilometres wide. The original transition between the Apulia Platform and the adjacent Adriatic Basin is preserved in offshore for about 450 kilometres between Central Italy and Southern Albania. The geology of this area is well known thanks to the extensive petroleum exploration. A short segment of this platform-to-basin transition crops out in the Gargano Promontory. In addition, the transition from the platform to the basin in its northern portion is preserved, in some cases with spectacular expositions (Scontrone, Morrone, Majella) in the Central Apennines. In the Southern Apennines, the deformed Apulia carbonates form a buried duplex system that extends toward the west as far as the Tyrrhenian coast beneath a stack of rootless nappes.

From the latemost Cretaceous to the Miocene until the early Messinian, the Apulia Platform was not significantly influenced by tectonics and its paleogeographic evolution was entirely controlled by climate conditions and by global sea-level changes. The sedimentary record evidences several

disconformities separating different depositional sequences. In the most continuous sections (e.g. northern Majella), major gaps fall in the Paleocene (Danian and great part of the Selandian), early Eocene (Ypresian), middle Eocene

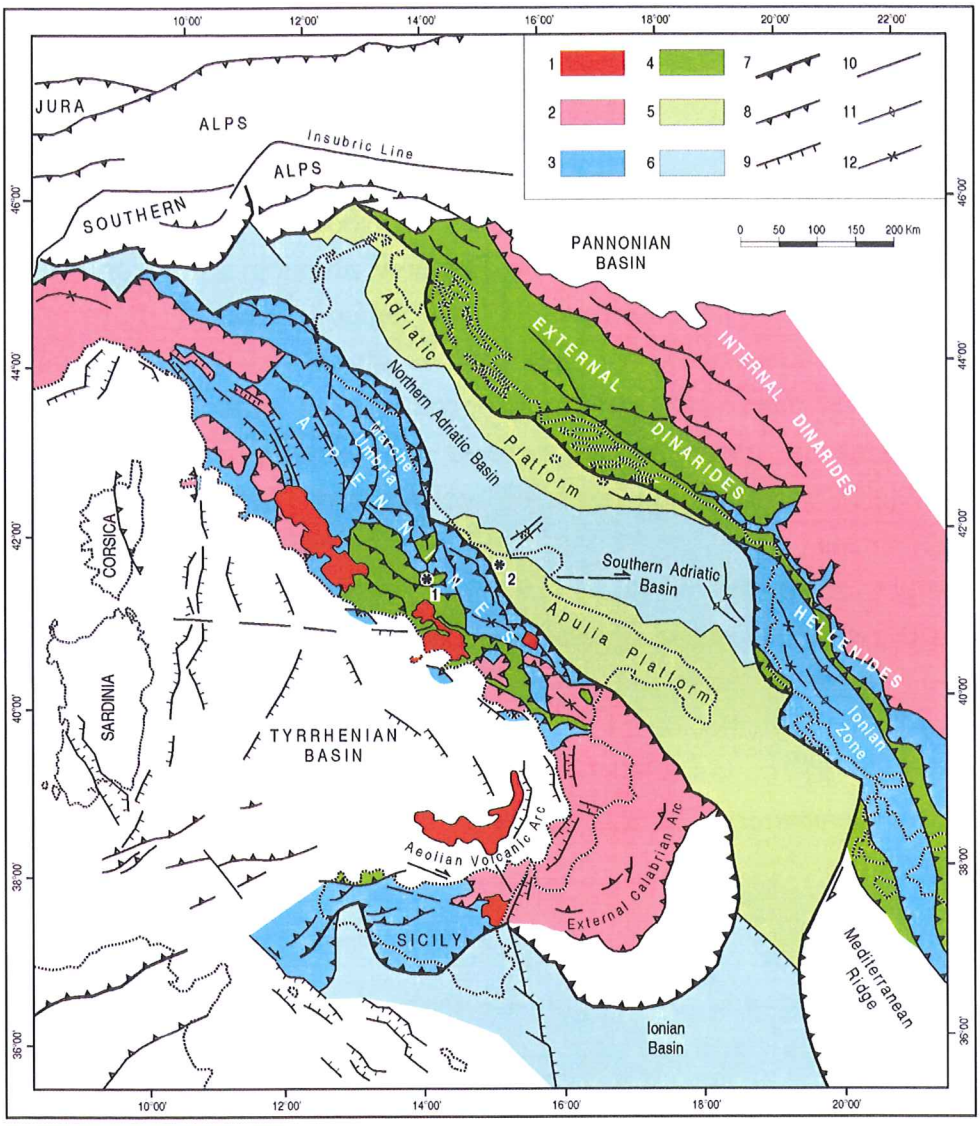

Figure 2. Tectonic lineaments of the peri-Adriatic region with the distribution of the platforms and basins in the foreland areas and the distinction between platform-derived and basin-derived tectonic units in the Apennines and Dinarides. Asterisks indicate the Scontrone (1) and Gargano (2) fossil sites. 1 Major subaerial Quaternary volcanoes. 2 Undifferentiated internal units of the Apennines, Calabrian Arc and Dinarides-Hellenides. 3 External units of the Apennines, Sicilian Maghrebides and Dinarides-Hellenides chiefly represented by Mesozoic-Tertiary basinal and pelagic carbonate sequences. 4 External units of the Apennines-Sicilian Maghrebides and Dinarides-Hellenides chiefly represented by Mesozoic-Tertiary shallow-water carbonate sequences. 5 Foreland areas characterized by Mesozoic-Tertiary basinal and pelagic carbonate sequences. 6 Foreland areas characterized by thick Mesozoic-Tertiary shallow-water carbonate sequences. 7 Front of the Sicilian Maghrebides, Apennines, Alps, Southern Alps and Dinarides-Hellenides. 8 Major thrusts. 9 Normal faults. 10 High-angle faults, mostly strike-slip faults. 11 Anticline axis. 12 Syncline axis.

(top Lutetian and Bartonian *p.p.*), Oligocene around the Rupelian-Chattian boundary (29 Ma "Mid-Oligocene" unconformity), early Miocene around the Aquitanian-Burdigalian boundary and finally in the Tortonian. In the westernmost areas of the Apulia Platform, where the hiatus reaches the maximum amplitude, lower Messinian shallow-ramp limestones directly overlie deeply karstified lower Cretaceous carbonates. In some places, a horizon of "terra rossa" deposits is present at the base of middle-upper Miocene limestones which unconformably overlie uppermost Cretaceous or Paleocene-Eocene ramp carbonates.

In the early Messinian the western margin of the Apulia Platform underwent flexural subsidence and became part of the Apennine foredeep basin. This tectonic evolution is documented by the flysch deposits of Scontrone that conformably cover hemipelagic marls with *Turborotalia multiloba* lying on top of the Tortonian-Messinian *Lithothamnium* Limestone Formation. Starting from this moment, the Apulia Platform was progressively involved in the time-space migration of the thrust belt-foredeep-foreland system and huge volumes of Mesozoic-Tertiary carbonates referable to several paleogeographic realms from Scontrone to Majella were scraped off from their original substratum and were incorporated in the mountain chain. The forward migration of the compression front, which lasted from the early Messinian to the early Pleistocene, is very well documented in the Abruzzi region by surface sections exposed between Scontrone and Majella (Apulia-derived thrust sheets) and in the other Central-Southern Apennine regions by numerous commercial wells that have reached the Apulia Platform beneath the allochthonous sheets.