

STRATIGRAPHIC ANALYSES OF UPPER CENOZOIC SEQUENCES IN THE CALABRIAN ARC

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Stratigraphic analyses of Upper Cenozoic sequences of the onshore parts of the 'Crotone - Spartivento Basin' in Calabria, south and north of the Catanzaro line, demonstrate great differences in age and facies distribution patterns. The most important characteristics of the southern and northern segments can be summarized as follows:

Southern Calabria

1. Three groups of formations are distinguished in the Upper Oligocene - Lower Miocene. The oldest sediments of the generally fining upwards sequences can be assigned to the early Late Oligocene, while the youngest are of late Early Miocene, probably Burdigalian age. It can be proved that in some places the Upper Oligocene - Lower Miocene deposits (Capo d'Orlando Flysch of Ogniben, 1973; Formazione di Stilo - Capo d'Orlando of Bonardi et al., 1981) together with their Paleozoic crystalline or Mesozoic limestone substrates form a part of a pile of nappes, which originated in late Early Miocene, probably Late Burdigalian time. The overthrusting was directed towards the southeast, the zone of decollement was located close to the Tyrrhenian coast line and may have been bordered by the 'Reggio - Badolato line'. Palinspastic reconstructions suggest that the Late Oligocene - Early Miocene basin configurations were defined by roughly SW-NE and NW-SE trending faults. Platform carbonates accumulated on relative highs during the Late Oligocene; depressions in between were filled with terrigenous clastics. A pronounced rejuvenation of the relief must have occurred in the Oligocene - Miocene boundary interval; everywhere the Lower Miocene consists of terrigenous clastics which in some areas closely resemble the lithology of the 'Numidian Flysch' and the 'Numidian Sandstone'. The Oligo-Miocene successions are in tectonic contact with the overlying 'first generation of the argille scagliose.

2. The argille scagliose became overlain by a fairly 'complete' younger Miocene sedimentary cover, the basal part of which is of latest Burdigalian Age. The uppermost Burdigalian and the lower Middle Miocene sediments accumulated in a large basin. This basin was open to the south, its northern margin was located close to the present Catanzaro depression. The basin was subjected to an increasing degree of fragmentation in the course of the Middle and Late Miocene. Intra-Messinian tectonics caused the erosion of much of the older Middle- Upper Miocene cover, while parts of the remaining successions were incorporated in allochthonous units during the Pliocene. The intra-Messinian tectonics caused a fundamental reorganization of the basin configuration. Locally Upper Messinian and younger sediments cover faults that had been active since at least the early Late Oligocene.

3. Shortly after the beginning of the Pliocene the fairly uniform accumulation of calcareous muds (Trubi) came to a close. This is explained as having been caused by a rapidly increasing differentiation in uplift and subsidence rates of larger and smaller fault blocks, which movements continued into the Pleistocene. This differentiation along NW-SE and SW-NE trending faults was connected with the overall uplift of the central axis of Calabria and the rapid subsidence of the Ionian Basin in the course of the late Early Pliocene - Pleistocene time span. These processes triggered the downslope transport of Mio-Pliocene sediments and of the underlying 'first generation' of the argille scagliose, resulting in the origin of the 'second generation' of the argille scagliose and in the stepwise development of nappe-like units.

Northern Calabria

1. The distributional area of Neogene sequences outcropping east of the Sila ('Crotone Basin') can be subdivided into three megasegments, each displaying a different sediment succession. The segments are separated by NW-SE running fault systems. The position of the system separating the northern and central segments corresponds to that of the 'surface trace of the deep shear zone' of Ghisetti et al., 1982, the boundary between the central and southern segments is formed by the Petilia - Rizzuto (shear?) zone. The oldest sediments of the 'post-orogenic' sequences are of Late Serravallian Age; as a rule, however, they belong to the Lower Tortonian.

2. The differences between the sequences of the three megasegments mainly concern the depositional depth, thickness and facies distribution patterns of the Tortonian and the Lower Messinian, the presence or absence of Upper Messinian coarse clastics and the composition of allochthonous units formed in Late Messinian to Early Pliocene times. The direction of transport of these allochthonous units was to the southwest. These units include the argille scagliose/Cariatides Complex (Anti-Sicilides / Crotonides of Ogniben, 1973), a unit which is confined to the northern segment. Until late Early Pliocene time basin configurations and sedimentation patterns were dominated by movements along roughly NW-SE trending faults.

3. The present Crotone Basin originated at about the transition from the Early to the Late Pliocene: as a rule early Late Pliocene sediments unconformably overlie Miocene successions or allochthonous units. In the surface record Lower Pliocene sediments are mainly confined to the disturbed successions of the Petilla - Rizzuto zone. The Late Pliocene to Pleistocene history of the three segments was controlled by movements along pre-existing NW-SE and SW-NE fault systems and by N-S and E-W trending faults and flexures that developed or became reactivated in connection with the uplift of the Sila.

General aspects

1. The results of our stratigraphic analyses suggest that the southern and northern parts of the Calabrian arc were geographically widely separated in Late Oligocene and Miocene time. Similarities in facies distribution patterns of the Upper Pliocene and younger successions indicate that the two major parts of the arc only became linked after the Early Pliocene .

2. In both parts the Late Cenozoic basin development was primarily controlled by vertical and horizontal movements along roughly NW-SE and SW-NE directed faults. In northern Calabria horizontal displacements along the NW-SE faults were of a left-lateral character, which is in accordance with the results of neotectonic studies by Moussat (1983). For southern Calabria the direction of relative horizontal displacements could not yet be ascertained.

3. Tensional regimes prevailed throughout most of the Late Neogene. However, compressional tectonics in late Early Pliocene time caused a considerable

shortening by thrusting from the northeast to the southwest in both the northern and southern parts of the arc. In southern Calabria thrusting towards the south east played an important part in (Late) Pliocene - Pleistocene time) and, much earlier, in the Burdigalian). Southeast-directed thrusting also occurred in northern Calabria during the Late Pliocene - Pleistocene, but seems to have been of less importance than in the south.

Selected references

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