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Neogene to Quaternary evolution of the Calabrian Subduction System, (Central Mediterranean)

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We construct an ESE striking to WNW geological cross-section across the Calabrian Subduction System (Central Mediterranean) using seismic near vertical profiles and field data. The interpreted profiles were time-to-depth converted, merged and translated in a geological section stretching from the Marsili Oceanic Basin (Southern Tyrrhenian Sea) to the Ionian accretionary complex . Moving toward the east, the resulting section through the Paola, Amantea, and Crati basins, the Coastal Chain and Sila Massif and Crotone basin. The maximum elongation of these basins change progressively moving toward the east: from NNW in the Paola to NS in the Crati to the NNE in the Crotone basins. Data we present suggest that: Across the Calabria Tyrrhenian Continental Margin (CTCM), top of Kabilian-Calabrian Unit (KCU) is laterally variable in depth forming basins, which are separated by major structures with contractional or transcurrent kinematics, filled by Oligo-Miocene clastic to evaporitic deposits up to 1500m thick. Plio-Quaternary deposits display a remarkable variation in thickness from 4.5 km in the Paola Basin to less than 400m in the central sector of the margin. Plio-Quaternary sediments are internally sub-divisible into four sub-units (namely D1-D4) separated by tectonics enhanced angular unconformities. W-ward vergent reverse faults with limited vertical displacement offset the top of KCU as well as the Oligo-Miocene sedimentary and evaporitic units in the eastern side of the Paola basin. On land (Amantea – Crati) and farther to the east (Crotone basin) below a Messinian-Pleistocene deposits the top of KCU is variable structured and covered by a Oligo-Miocene clastic deposits with different thickness. The Plio-Quaternary deposits, unconformably overlay the Messinian and older deposits, show the maximum thickness in the Crotone basin. Two main tectonic unconformities within the Plio-Quaternary deposits have been recognised allowing the separation of this unit into three sub-units. In the offshore portion of the Crotone basin, SE-ward reverse faults dissect the KCU and the Oligo-Miocene up to the Messinian deposits. While the pre-Messinian tectonic history across the Calabrian Subduction System seems to be quite similar, a main reorganization of the system occurring during the (?) early and (?) middle-Pliocene. Geometrical and stratigraphic relationship show that several W-ward and E-ward vergent reverse faults in the Paola and Crotone basins, respectively, cut and offset Messinian evaporites and older sedimentary units, controlling the geometry of the basins. In the Paola Basin the amount of subsidence gradually increase during deposition of sub-units D2 and D3, which are probably Pliocene in age. On land, the evidence of the unconformities in the Crotone basin indicate that Pliocene deposition occurring during the uplift of the Sila Massif. Therefore uplift of the Sila range occurred during the strong subsidence of the Paola and Crotone basins.

The evolution of the overall structure can be then divided in two different steps: 1)the onset of subsidence started in the Late Miocene and covered a large areas presently occupied by the Paola and Crotone basins. This basin, was probably already separated into sub-basins but evolved in a slowly subsiding and poorly deformed area located between the active accretionary prism and the volcanic arc. Therefore in the Middle-Upper Miocene this basin could be defined as forearc basin. 2)In the Pliocene the structure of this large basin was fragmented due to the uplift of a central range (Sila Massif) with an overall pop-up like structure. 3)Uplift of the belt producing subsidence along the flanks and simultaneously formation of two distinct basins: the Paola and Crotone basins. This process probably occurred during episodes of fast roll-back of the subducting slab, as attested by the opening of two ocean floor basins in the back-arc region.