EXTRUSION TECTONICS IN THE CENTRAL MEDITERRANEAN

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The central Mediterranean is an intricate geological puzzle in which extensional and compressional processes have developed in a short time span, from the Tortonian up to the Quaternary times. Stretched areas, crustal underplating and a thrust belt system forming tight arc-shaped structures are, in fact, the peculiar features of this region. Nevertheless, geophysical and structural data allow us to distinguish distinct crustal domains separated by large strike-slip faults whose kinematic evolution was strictly controlled by the N-S collisional processes occurring between the African and European plates. The main recognizable crustal domains of the area are represented by :
1) the Pelagian block that exhibits a normal continental crust affected by small rifting processes (Strait of Sicily Rift Zone),
2) the stretched areas of the southern Tyrrenian and Ionian domains characterized by a thinned continental or oceanic crust,
and 3) the orogenic belt represented by the Apennines and Maghrebian thrust system and by the Calabrian arc that shows a complex interaction between the crusts of different domains.

The structural pattern of different crustal blocks, the kinematics of the strike-slip fault boundaries together with a careful analysis of the timing of deformation, suggest that the Neogene to Quaternary tectonics of the central Mediterranean is the result of the lateral extrusion of the Calabrian arc towards East as a response of the progressive N-S impingement of the continental indenter of the Pelagian domain. Rates of deformation also suggest how this process may have triggered astenospheric domal uplift in the stretched areas of the southern Tyrrhenian sea, which brought a faster lateral extrusion of the Calabrian arc.

MUD VOLCANOES AND BRINE POOLS ON THE MEDITERRANEAN RIDGE SOUTH OF CRETE : SOURCES OF HIGH BACKSCATTER CONTRASTS IN SIDESCAN SONAR IMAGES

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Mud domes on the Mediterranean Ridge are observed by OKEAN long–range and MAK–1M deep–towed sidescan sonar systems as patches of seafloor with higher backscatter intensity than from surrounding areas. The cause of variations in backscatter intensity are determined from an analysis of sidescan sonar sonographs, subbottom profiler records, underwater TV, and geological bottom sampling data to be the distribution and physical properties of mud breccia associated with the mud domes as well as its relationship to seabottom roughness and topography. Mud breccia inhomogeneities represented by millimetric/centimetric clasts and free gas bubbles are considered to be significant sources of volume scattering of the sidescan sonar sound signal. Detailed mapping of mud domes using different sidescan sonar systems becomes important because of differences in physical properties between individual mud domes and mud flows; but for acoustical modelling and identification of the contributions made by the different sources to the backscatter, further investigation are necessary.

Small echo–free patches have been observed in MAK–1M sidescan sonar images of a region of mud diapirs on the Mediterranean Ridge. The unusual shape of these patches and the absence of any backscattered signal from them can be more easily explained by the presence of brine pools than by topographic or sedimentological effects. From the acoustic properties of brine (high salinity and its associated relative high sound velocity and density) and its smooth horizontal surface, a brine pool reflects and refracts sidescan sonar signals at low grazing angles away from the seafloor without backscatter. The brine pools are associated with faults and collapse structures as in some other parts of the Mediterranean Ridge. The presence of brine pools in this area could mean that Messinian evaporites are present at shallow depth or accessible through fluid conduits within the upper part of the ridge, and that they may therefore be related to the development of the mud diapirs and mud volcanoes.

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