

WIDESPREAD MANIFESTATIONS OF A LOWER MIOCENE VOLCANISM
AROUND WESTERN MEDITERRANEAN

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ABSTRACT - Extensive Mediterranean lower Miocene volcanism occurred in connection with crustal fracturing of European plate. Geological data indicate that the outward movement of the Sicilian and Apennine nappes was complementary to the Balearic Basin's volcanism, rifting and subsidence.

RESUME - Au Miocène inférieur sont été mise en evidence des importants manifestations d'un volcanisme méditerranéen calco-alcalin et rhyolitique, liées a une fracturation qui paraît répandu dans le domain européen. Les phases tectoniques de serrage que ont affecté la Sicile et l'Apennin sont pratiquement contemporain des phénomènes de volcanisme, d'effondrement et de distension dans le bassin algéro-provençal.

Simultaneous manifestations of lower Miocene volcanic activity have been observed in various land and sea regions of the western Mediterranean. They are: volcanic rocks (lava flows and pyroclastics), but often, volcanoclastic (mainly quartz-poor feldspatholithic sandstones) and siliceous strata (diatomites, "tripoli", cherts, etc.). Volcanism was explosive, mainly andesitic-dacitic-rhyolitic, similar to that of the calc-alkaline series presumed to originate along Benioff planes.

I studied the segments of two orogenic belts, i.e. Sicilian part of the Maghrebian and Northern Apennines, in order to detect relationship between magmatic and tectonic activities. In these orogenic systems an internal depression was, in large part, genetically coupled to the outward

advancement of the nappes. The first appearance of the andesitic volcanism occurred only in the late stages of the geosynclinal history, just before and during the final contact between the approaching continental blocks. Lower Miocene andesitic (flysch) sandstones are present in the external tectonic units, thrust towards the African and Adriatic forelands. Contemporaneous volcanic manifestations (diatomites and tuff-ash layers) were observed in many marginal zones of the forelands. The source terranes were both volcanic and plutonic rocks located on the internal crystalline massifs. In the Sicilian and Northern Apennine systems the andesitic volcanoes were located, respectively, behind the Calabro-Peloritan hinterland and on the Corso-Sardinian massif.

In Sicily three main calc-alkaline volcanic phases - I) 24 to 20 my., II) around 17 my. and III) around 15 my. - related to tectogenetic events were paleontologically dated. In the Northern Apennines, until now, only two of these phases (i.e., I and III) have been identified. The beginning of phase I corresponds to an extensive marine transgression which affected either the internal massif area (Sardinia, Tyrrhenian and Calabro-Peloritan blocks) or the carbonate platform of the African and Adriatic forelands. Moreover, the age of the climax of the marine invasion in Sardinia is the same as that of the orogenic compression (about 14 my.) in Sicily and Northern Apennines.

The onset of this Mediterranean transgression occurred in Sardinia following the emplacement of middle to late Oligocene andesitic rocks interbedded with continental deposits. Therefore, it is reasonable to expect that the Oligocene volcanism resulted from an initial fracturing of the crust in the Balearic Basin, rather than through crustal consumption. Tensional rifting and subsidence of the Balearic Basin with its fracturing episodes, accompanied by volcanic activity, started probably 24 my. ago. The progressive narrowing of the geosynclinal space and the crustal compression in the Sicilian and Apennine sectors occurred simultaneously with the tensional process (expressed by volcanism) in the Balearic area. Extensive manifestations of contemporary tensional fracturing and volcanism, also involving reactivation of old fractures, are known to have occurred during lower Miocene within the European plate (e.g., Cantalian volcanism, Rhinegraben, Bohemian massif, etc.).