Neogene and Quaternary volcanism along the Taurus belt : inferences for a geodynamic model

by

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Along the inner margin of the Taurus range, from the Aegean Sea to the Lake Van, Neogene and Quaternary volcanism outcrop to form en almost continuous belt. Most of the volcanic products have been recognized to show a well established calc-alkaline affinity, while sodic alkalic products are recurrent along the volcanic belt in well defined and isolated episodes, from the western coast of Turkey to the Lake Van region.

The occurrence in a continental margin environment of the alkaline volcanism of sodic affinity, which usually characterizes tensional structural settings, appears therefore worth investigating.

The outpouring of calc-alkaline volcanics in Western Anatolia came to an end approximately at the limit between Lower and Middle Miocene, while in Central and Eastern Anatolia it was lasting up to recent times. Moreover, in Central and Eastern Anatolia, alkalic products were emitted during Pliocene and Quaternary, contemporarly to the most recent calc-alkaline volcanics.

This peculiar alternate succession of calc-alkaline and alkaline products call for a specific explanation. Looking more carefully to the Van region, in the East of Turkey, where such a volcanic setting is better evidenced, it is observed that the alkalic volcanism became manifested around 6 m.y. ago, going on up present times. Contemporarly in the same area calc-alkaline volcanics were emitted (the youngest calc-alkaline products show an age of 0.37 m.y.).

On the other hand the actual tensional setting of the region shows a marked coherence with the outpouring of alkalic products, typical of continental rifted areas, in contrast with a continental margin environment.

An explanation of the observed features in the evolution of the Turkish segment of the contact between the Eurasian and the Afro-Arabian plates, is accordingly suggested.

The calc-alkaline volcanism along the entire Taurus range can be ascribed to the subduction of the Afro-Arabian plate under the Eurasian one [SMITH, 1971; DEWEY *et al.*, 1973]. The fact that this volcanism ends at different times in different sectors of the Taurus suggests that the plate consumption did not end at the same time along the Anatolian southern margin. Also the chronology of the major tectonic phases in the Taurus shows a similar pattern. The principal tectonic episode in Western Taurus is older that Burdigalian [BRUNN *et al.*, 1971], whereas in Eastern Anatolia compressive movements up to the beginning of Pliocene are reported [RIGO DE RIGHI & CORTESINI, 1964].

The above mentioned facts indicate that between the Afro-Arabian and the Anatolian plates a diachronous collision took place. It is probable that the original geometry of the Anatolia southern margin was responsible for such a collision. In particular we suggest that the concavity of the Eastern Taurus (from the Gulf of Iskenderun to the Lake Van) reflects an original enbayment of the Anatolia continental margin.

Basically in our reconstruction we envisage that the collision between the Afro-Arabian continental mass and the Anatolian plate began in Oligo-Miocene in the zone corresponding to Western Taurus. At that time the Dead Sea Rift became active [FREUND *et al.*, 1970], separating the Arabian from the African continental mass. The northward motion of the Arabian plate continued, with the subduction of oceanic crust in the Lake Van region, at least up to beginning of Pliocene.

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Since the fracture between Africa and Arabia developed not at the eastern end of the collision zone of the Western Taurus, but farther to the East, where the Anatolian southern margin shows a northward concavity, we speculate that some oceanic crust was left at the northeastern corner of the African plate. The consumption of this small wedge of oceanic material is responsible, in our reconstruction, for the persistence up to Quaternary of calc-alkaline volcanism in Central Taurus [INNOCENTI *et al.*, 1975].

This can also explain in our opinion, why in Central Taurus, from Kayseri to the Mediterranean Sea, no evidence is found of strong compressional movements, such as large overthrusts and crustal thickening [BLUMENTHAL, 1952].

After the continental collision between the Afro-Arabian and Anatolian plates was accomplished, the Arabian platform, detached from the African mass along the Dead Sea Transform Fault, continued its northward pushing, producing the breaking apart of the Eurasian continent and the E-W spreading of the Anatolian and Iranian microplates. At that time the Lake Van area underwent to a tensional stage, producing continental rifting and uprising of typical alkalic magmas. The westward drifting of the Anatolian microplate along the North Anatolia transform fault, determined also the fracturing of the plate itself with the production of alkalic volcanism in Central and Western Anatolia.

The appearence of alkaline magmas in the Lake Van region and the beginning of the spreading phase pushing apart the Iranian and Anatolian microplates, preceded the last Red Sea spreading phase, which is belived to be 4-5 m.y. [GIRDLER & STYLES, 1974].

It is therefore tentatively suggested that in consequence of the break-down of the Eurasian obstacle to the northward motion of the Arabian plate, a paroxysmal Red Sea opening phase took place, or, in an alternative solution, that the Pliocene spreading phase of the Red Sea caused the northward pushing of the Arabian plate and the breaking apart of the Eurasian continent.

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