Geophysical Research Abstracts,
Vol. 11, EGU2009-4154, 2009
EGU General Assembly 2009

Spatial and Temporal Evolution of the Tertiary Magmatism and Extension in the Aegean Region in Response to Collision-Driven Mantle Dynamics

Y. Dilek (1) and N. Bonev (2)

(1) Miami University, Department of Geology, Oxford, 45056 OH, USA (dileky@muohio.edu), (2) Sofia University "St. Kliment Ohridski", Department of Geology and Paleontology, 1504 Sofia, Bulgaria (niki@gea.uni-sofia.bg)

Tertiary extension has played an important role in shaping the crustal architecture of the Alpine mountain belt in the Aegean region by unroofing the orogenic stack that was created during the late Mesozoic-Cenozoic convergence between Africa and Eurasia. Exhumation of metamorphic core-complexes started as early as the Paleocene-early Eocene in the Rhodope (Bulgaria-Greece) and Kazdag (NW Turkey) massifs in the north, and continued during the Oligocene-Miocene in the south involving the north-central Aegean region (Greek mainland and islands) and northwest-central Anatolia. This extensional deformation was spatially and temporally associated with voluminous magmatism derived from both mantle and crustal melts. We focus on the interplay between lithospheric-scale extensional tectonics and magmatism during the Eocene-Miocene, and evaluate the mode, nature and tempo of tectonic and magmatic events and their relations in time and space during this time period. Following the latest Cretaceous closure of the Vardar-Izmir-Ankara Ocean, the inherited subduction-zone component in the continental mantle lithosphere influenced the Eocene (56-38 Ma) magmatism, which produced I-type, medium to high-K calc-alkaline, and LILE and LREE enriched arc to syn- and post-collisional granitoids and their extrusive counterparts. This magmatism migrated across from the Rhodope-Serbo-Macedonian massifs in the Balkan Peninsula and the Sakarya continent in western Anatolia in the north, to the Aegean islands and the Menderes massif in the south through the Oligo-Miocene (30-14 Ma). The younging of the granitoid magmatism and the increase in its K2O/SiO2 ratio occurred progressively southwards in the Aegean through time. The decreasing influence of subduction component was accompanied by a progressive increase in crustal component, with involvement of assimilation and fractional crystallization processes in the granitoid petrogenesis. The coeval volcanic suites generally have the same geochemical signatures as the plutonic bodies and are represented by high-K shoshonitic series. We suggest that following the latest Cretaceous ophiolite emplacement and the Paleocene-Eocene continental collision, slab-break off and subsequent lithospheric delamination events triggered regionwide magmatism and attendant extension in the broad Aegean region. Subduction-metasomatized and enriched mantle melts in the source region evolved through crustal contamination and associated processes, and contributed to the thermal relaxation of the orogenic crust. This mantle-crust interaction was coupled with core complex formation and ductile-brittle thinning in middle to upper crustal levels. Emplacement of the Eocene-Miocene granitoids occurred in the footwalls of extensional detachments in the exhumed core complexes and hence temporally overlapped with crustal extension. The early Cenozoic post-collisional magmatism was therefore crucial for providing the necessary heat that thermally weakened the crust and worked in tandem with the slab rollback-induced tectonic processes to drive the regional extension in the Aegean Province.