Petrogenesis of the Oligocene volcanics from the Central Rhodope massif (N. Greece)

GEORGE ELEFTHERIADIS

Department of Mineralogy-Petrology-Economic Geology, School of Geology, Thessaloniki University, 540 06 Thessaloniki, Greece

Abstract: The Oligocene volcanic rocks of the Central Rhodope massif range in composition from basalts to rhyolites, and belong to orogenie calc-alkaline and shoshonite series. These lavas were erupted during an extensive tectonic event, in a post-collisional setting. The eastern part of the massif, the Kotani-Kalotycho area, includes mainly basic to intermediate rocks (basalts, basaltic andesites, high-K andesites, latites, trachytes), whereas the western part, the Dipotama-Kotyli and Zarkadenia areas, is of larger extent and consists of acid rocks only (high-K dacites, rhyolites).

Mineralogical, petrological and geochemical data supported by isotopic data ($^{87}$Sr/$^{86}$Sr ratios 0.706-0.707 and $\delta^{18}$O values ranging mainly from + 6.2 to + 7.7%) indicate that the basic to intermediate rocks evolved predominantly by assimilation/fractional crystallization of a parental magma which originated at the mantle-crust boundary according to the MASH hypothesis of Hildreth & Moorbath (1988).

Geochemical data and Sr and O isotope ratios (0.708-0.709 and + 8.8 to + 12.9%, respectively), as well as the geological evidence, do not favour a genetic link between the acid and the basic to intermediate rocks that can be explained by simple fractional crystallization. Instead, disequilibrium phenocryst assemblages in the high-K dacites and many of the rhyolites lead to the conclusion that these rocks were mainly derived by mixing of a basic and an anatectic silicic magma. The basaltic magma which triggered the crustal melting is considered consanguineous with the parental liquid feeding the Kotani-Kalotycho basic to intermediate lavas.

Key-words: Oligocene volcanics, calc-alkaline, shoshonite, post-collisional, petrogenesis, strontium isotopes, oxygen isotopes, Central Rhodope, Thrace, N. Greece.

Introduction

The Oligocene volcanic rocks of the Kotani-Kalotycho (K-K) and Dipotama-Kotyli and Zarkadenia (D-K-Z) areas, in the Central Rhodope range, Thrace of northern Greece (Fig. 1), reflect the Paleogene magmatic activity which affected the whole Rhodope massif. During Neogene times, the magmatic activity migrated successively southwards to the Central Aegean and Western Anatolia, where it continued up until the Middle Miocene (Fytikas et al., 1984).

The Paleogene magmatism of the Rhodope massif, which is part of the widespread Alpine magmatic activity, was considered by Boccaletti et al. (1974) to be related to underthrusting of the oceanic crust of Southern Tethys during closure of the Subpelagonian zone. Dimitrova et al. (1979) suggested that these magmas were generated on an active Andean-type continental margin. Subduction-related models have also been proposed by Fytikas et al. (1984) and Del Moro et al. (1988). On the other hand, Aubouin (1977) considered this Paleogene magmatism to be a result of continental collision between the African and the European plates after the closure of Tethys.