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An unusual Jurassic extensional magmatism in the central and western Pontides, Northern Turkey: a geochemical and isotopic evaluation

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The Lower to Middle Jurassic Mudurnu formation of the Pontides (Northern Turkey), deposited on an horst-graben topography which is interpreted to a continental rift environment (Gorur et al, 1983). Outcrops of this formation extends along the southern Pontide range and consists of shallow marine siliciclastics with abundant blocks and olistostromes at the base. Up the section, this clastic part is gradually replaced by a lignite-bearing clastic unit alternating with basic and acidic volcanics and volcanoclastics. In places, *ammonitico rosso* horizons also associate this alternation. In this study we collected and analyzed systematic samples of the volcanic rocks of this unit for the first time from the Central and Western Pontides (1) to describe the whole rock geochemistry together with the Sr and Nd isotope data, (2) to interpret the petrological nature of the volcanism, and (3) to make an approach to the magma source(s), origin and the tectonic setting(s) in the light of the geochemical as well as the present stratigraphic and structural data.

Magmatic rocks of the Mudurnu formation include basaltic lavas and related pyroclastic rocks together with the silicic pyroclastics and their hypabyssal equivalents such as diabase - microgabbro and granite porphyries. In contrast to lavas and pyroclastics covering large volumes within the formation, the hypabyssal rocks are only found as small and isolated stocks and dikes.

Magmatic rocks of the Mudurnu formation are subalkaline in nature and display a calc-alkaline affinity. As expected from an extensional magmatism, they display a

bimodal character, and a significant gap between the basic and silicic members (i.e. “Daly Gap”). On the other hand, they display enrichment in LILE and depletion in Nb, Ta, P and Ti indicating a subduction -related magmatic signature which is not usual for the extensional magmatism. Melting modeling of the basic rocks shows that these rocks were originated from sub continental litospheric mantle (SCLM).

The initial isotope values of the silicic hypabyssal rocks ($^{87}Sr/^{86}Sr(i)$= 0.704809 – 0.705584; $^{143}Nd/^{144}Nd(i)$= 0.512593 – 0.512622; eNd(i)= 3.8 4.3) are more or less encompass those of the basic magmatic rocks ($^{87}Sr/^{86}Sr(i)$= 0.703855 – 0.705073; $^{143}Nd/^{144}Nd(i)$= 0.512479 – 0.512602; eNd(i)= 1.5 – 4.3). Although the isotope data indicate a possible genetic relationship between the silicic and basic members, they are not indicative to discriminate whether silicic rocks are formed through fractional crystallization or partial melting of basalts. Fractional crystallization (FC) modeling of incompatible versus compatible trace elements, combined with the evidence from chondrite normalized REE distribution, exclude the possibility of FC processes.

As a consequence all of the geochemical and isotope studies, we propose that the volcano-sedimentary rocks of the Mudurnu formation formed in a continental extensional basin behind an active and/or newly finished subduction. The subduction signature in the magma genesis is attributed to this possible subduction zone. The Jurassic magmatism of the Pontides is bimodal in nature as expected from the extensional environments, but it is not a typical OIB like magma characterizing the rift environments.