

Precise ^{40}Ar – ^{39}Ar ages from the metamorphic sole rocks of the Tauride Belt Ophiolites, southern Turkey: implications for the rapid cooling history

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Abstract – The Tauride Belt Ophiolites in southern Turkey are located on both sides of the E–W-trending, Mesozoic Tauride carbonate platform. They comprise the Lycian, Antalya, Beyşehir, Mersin, Alihoca and Pozantı-Karsantı ophiolites from west to east. Each ophiolite has a metamorphic rock unit either at the base of the peridotites or in the mélangé units. The metamorphic sole rocks generally consist of amphibolite at the top and near the contact with the overlying tectonized harzburgite of the ophiolites, and mica schists mostly at the base, near the tectonic contact with the underlying ophiolitic mélangé. ^{40}Ar – ^{39}Ar measurements from the metamorphic sole rocks of the Lycian, Antalya and Beyşehir ophiolites are the first precise ages dating intra-oceanic thrusting and the cooling age history during the closure of the Neotethyan Ocean. Amphiboles and white micas from the metamorphic sole rocks of the ophiolites yielded ^{40}Ar – ^{39}Ar ages between 90.7 ± 0.5 Ma and 93.8 ± 1.7 Ma and between 91.2 ± 2.3 Ma and 93.6 ± 0.8 Ma, respectively. Hornblende plateau ages from the amphibolites of the Lycian ophiolites (near Köyceğiz) agree with those of Antalya, indicating that they were metamorphosed simultaneously in the Neotethyan Ocean. The white micas display plateau ages concordant with the amphiboles from the same units in Köyceğiz and Yeşilova (Lycian ophiolites) and from the Pozantı-Karsantı ophiolite, suggesting that the metamorphic sole rocks were rapidly cooled after their generation.

Keywords: geochronology, ophiolite, East Mediterranean, Neotethys, Turkey.

1. Introduction

The Tauride Belt in southern Turkey is one of the best regions to observe Cretaceous ophiolites in the Alpine–Himalayan mountain system. Ophiolites of the Tauride Belt are remnants of the Mesozoic Neotethyan Ocean in the Eastern Mediterranean. The Tauride Belt Ophiolites (Fig. 1) present many questions concerning their age, emplacement mechanisms, the tectonic setting of formation and their root zones. Ricou, Argiriadis & Marcoux (1975) suggested that all of the Cretaceous ophiolites were thrust from a single Tethyan ocean basin, located to the north of the Tauride carbonate platform, during Late Cretaceous–Early Tertiary times. Robertson & Woodcock (1980) and Şengör & Yılmaz (1981), on the other hand, suggested a southern and a multi-armed northern branch of the Neotethyan Ocean. They proposed that the Antalya ophiolite was derived from a southern branch of the Neotethyan Ocean basin while the Lycian, Beyşehir, Mersin, Alihoca and Pozantı-Karsantı ophiolites were derived from a northern branch of the Neotethyan Ocean basin.

Most of the ophiolites worldwide have metamorphic rocks at their base, which is very useful for their

interpretation, because the mineralogy and texture can be used to understand their metamorphic and deformational history. For this reason, many geologists have focused their attention on these rocks to interpret intra-oceanic thrusting and emplacement of the ophiolites. Previous geochronological studies on the metamorphic rocks associated with the Tauride Ophiolites focused on the metamorphic soles and their ages, most of which were measured using the K–Ar method. For instance, Thuizat *et al.* (1981) analysed two amphiboles from amphibolites (98 ± 4 Ma and 102 ± 4 Ma) and two micas from mica schist (91 ± 3 Ma and 93 ± 3 Ma) to date the metamorphic sole rocks of Lycian ophiolites. They obtained ages of 93 ± 3 Ma (amphibole) and 84 ± 3 Ma (plagioclase) from an amphibolite of the Beyşehir ophiolite. The same authors analysed amphibole from amphibolites and obtained ages of 98 ± 4 Ma and 95 ± 4 Ma for the ophiolites of Mersin and Pozantı-Karsantı, respectively. They also used the K–Ar method to date one garnet-amphibolite (Antalya ophiolite) at 94 ± 4 Ma (1σ) (hornblende) and 102.7 ± 7 Ma (plagioclase) and interpreted these as cooling ages. The same authors reported metamorphic ages for the whole Tauride Belt to be close to 95 Ma. Yılmaz & Maxwell (1982, 1984) measured three amphibolite samples from the Antalya ophiolite

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