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New P-T-t data on the metamorphic sole of the Amasia ophiolites and implications for the geodynamical process, NW of the Sevan-Akera suture zone, Lesser Caucasus (Armenia)

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The ophiolites of the Lesser Caucasus belong to the Tethyan Ophiolitic Belt. In the northwestern part of the Sevan Akera suture zone (Lesser Caucasus, Armenia) ophiolites correspond to a major obduction of oceanic crust over the South Armenian continental block. Near the locality of Amasia (NW Armenia), our mapping evidenced a series of (1) unmetamorphosed gabbroic oceanic crust, resting on (2) serpentinites and a greenschist grade tectonic mélange composed of deformed pillow-basalts, radiolarites and cherts, and (3) a basal slice of garnet amphibolites bearing similar compositional features as the ophiolite.
They are sliced by post Eocene thrusts related to the shortening of the suture after the collision of the South Armenian Block (Sosson et al., 2010). Structural observations allow us to consider these metamorphic rocks (garnet amphibolites and quartz-garnet-oligoclase-amphibole-chlorite schistes) to be the sole of the obducted ophiolite.

The metamorphic rocks allow the evaluation of pressure-temperature-time conditions endured by the base of the oceanic crust during the obduction of the Armenian ophiolite series. Pressure and temperature estimations were obtained by calculating equilibrium conditions between different mineral phases which coexist in the sample coupled with whole rock geochemistry using the software PERPLEX. The P-T data show a counterclockwise path with (1) a HT-LP peak of P = 6-7 kbar and T > 630°C, followed by MP-MT peak at P = 8-10 kbar and T = 600°C. In order to further constrain the evolution of the amphibolites and build a P-T-t path using 40Ar/39Ar dating on amphiboles and white micas (phengite). The ages obtained on both HT and MT peaks are similar within error (90.8 Ma $\pm$ 3.0 (2σ), and 90.8 Ma $\pm$ 1.2 (2σ), respectively), which suggests a very rapid cooling of the metamorphic sole during its stacking in the subduction zone.

The counterclockwise path determined confirms the observations made below the Oman ophiolite by Goffé et al. (1988). This path is also in agreement with a scaling process of oceanic crust during the obduction. In this scenario slices of oceanic crust would have been dragged under the obduction front below a relatively hot oceanic crust. Afterwards, these slices would then have been amphibolitized along a HT-MP geothermal gradient. Rapidly, a thickening of the system at c. 91-90 Ma, and underthrusting of amphibolites would have caused the conditions to change to MP-MT. This infers that the South Armenian Block enters the subduction zone at this date.

A recent study has shown metamorphic rocks in the same structural setting were affected by a HP metamorphism in the Blue Schist facies (Rolland et al., 2009). The age of this blue schist of Stepanavan, Armenia is slightly older (95-91 Ma) (Galoyan et al., 2009) than the amphibolites of Amasia (91-90 Ma). This assumes the occurrence of an active subduction just before the development of the HT-MP metamorphism of Amasia.

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