Deciphering the geohistory of Armenian ophiolites based on Radiolarian biochronology

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A good understanding of the age and geodynamic evolution of ophiolite complexes is of key significance for the reconstruction of the past oceans. Since most extrusive events (i.e. lava flows) are often covered or intercalated with pelagic siliceous sediments, their dating provides a relatively detailed time frame to describe the magmatic events that took place in parts of the Tethyan oceanic realm. Radiolaria are often the only fossils preserved in these sediments. Therefore, Radiolarian biochronology has become an important tool to investigate the complex geodynamic evolution of Alpine mountain belts.

The main aim of our project is to specify the geohistory of ophiolites preserved in the Lesser Caucasus, a key area of the Alpine-Himalayan mountain belt. Improved knowledge on this subject will allow better lateral correlations of possibly equivalent suture zones and will help deciphering the geodynamic evolution of the greater area between Eurasia and the South-Armenian Block. The latter was a micro-continent that has become detached from Gondwana during the Late Palaeozoic – Early Mesozoic. It is considered as a part of the eastward extension of Taurides-Anatolides continental microplate.

Two main ophiolitic zones are recognised in the Lesser Caucasus:

- The Amassia-Sevan-Akera ophiolites (running from NW Armenia, through East of Lake Sevan to western Karabakh) represent the main suture zone in the Lesser Caucasus, including extensive outcrops of peridotites (often serpentinized) and gabbros. The geochemistry of lavas suggests the presence of two distinct extrusive systems; i) a contaminated MORB series of basalts, bearing a slight calc-alkaline signature, is considered to be the result of a slow spreading ridge in a back-arc setting; ii) an alkaline OIB series of lavas considered to be the expression of a mantle plume event.

- The Vedi ophiolite, in the SE of Yerevan, is also composed of serpentinites, gabbros and a thick pile of massive and pillowed lava flows. It is considered as a folded klippe sequence that was thrusted over Cenomanian-Turonian shallow water carbonates and flysch of the South Armenian Block.

New and revised radiolarian data point to the following working scenario:

(1) the initial phase of sea floor spreading took place during the Late Triassic (Carnian). Evidence for this comes from a single locality.

(2) The bulk of oceanic crust, preserved today in both the Sevan-Akera and Vedi ophiolite complexes, was formed during the Middle Jurassic (Bajocian, Bathonian-Callovian) in a supra-subduction zone (SSZ) setting;

(3) Submarine volcanic activity continued occasionally during the Late Jurassic and Early Cretaceous, as this is suggested by reliable radiolarian ages obtained on cherts intercalated with tholeitic lavas from both the Vedi and Sevan ophiolites.

(4) Preliminary results on radiolarian cherts intercalated with alkaline lavas of the Sevan ophiolite suggest that a hot spot event took place during the Late Jurassic.

(5) Several tuffite levels, intercalated within the radiolarite sequence of the Sevan ophiolite, reflect a Late Jurassic subaerial volcanic. At the moment, it is unclear whether they are related with the emplacement of the SSZ ophiolites or with the mantle plume event.