Geophysical Research Abstracts
Vol. 16, EGU2014-1885, 2014
EGU General Assembly 2014

Progress in understanding the geodynamic and palaeoenvironmental evolution of the Tethys in the Lesser Caucasus

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The remnants of a Mesozoic oceanic realm exist in the Lesser Caucasus (mainly in Armenia and Karabagh); this realm was once part of the Tethyan oceanic branch positioned between Eurasia and the South-Armenian Block, a Gondwana-derived terrain that can be considered as part of the Tauride-Anatolide plate. The existing Tethyan rocks of Lesser Caucasus are part of an over 2,000 Km long suture zone, running through the northern part of Turkey towards Iran. Biostratigraphic studies of the aforementioned rocks contribute vastly to get a better understanding of the geodynamic, paleogeographic and paleoenvironmental evolution of this geologically complex area.

When radiolarites are the sedimentary cover of submarine ophiolitic lavas their dating provides important time constraints for the evolution of the complex Mesozoic oceanic realm. In spite of extensive sampling during the last ten years across the Sevan-Hakari (Akera) suture zone and the Vedi ophiolite we found no Triassic or Lower Jurassic radiolarites. However, as testified by some previous studies, it is likely that oceanic floor spreading was initiated during the Late Triassic.

Radiolarian biostratigraphic results we have obtained establish that radiolarian ooze accumulated, and it was occasionally interrupted by lava flows, during (at least) the Bajocian to Cenomanian time interval. The Bajocian is widely established (Vedi, Sevan and Hakari ophiolites), while we have recently obtained a Cenomanian radiolarian fauna from Amasia (NW Armenia).
Two late Tithonian – Valanginian radiolarian assemblages, recovered from the NE of Lake Sevan (Dzknaged and Dali sections) are of particular significance, as radiolarites are intercalated with mafic rocks formed after episodes of submarine volcanic activity. The Dali basaltic sequence overlies (with a contact displaying cataclastic structures) layered dioritic cumulates with a few plagiogranites representing the crust of an intra-oceanic island arc. Both radiolarite sequences accumulated around the Jurassic/Cretaceous transition contain rounded blocks of oolitic grainstones with fragments of crinoids; they provide evidence for shallow water platform carbonates in the neighbourhood, fragments of which slid into a bathymetrically complex oceanic sea floor.
New radiolarian ages obtained recently on numerous tuffites intercalated in siliceous sequences along the Amasia-Sevan zone (Amasia, Sarinar, Old Sodk pass sections) suggest that subaerial volcanic activity was underway for most of the Middle Jurassic to Lower Cretaceous (Bajocian/Bathonian to Albian).
The Vedi area (SE of Yerevan) is important in many ways, especially because it allows the detailed study of the obduction of ophiolites to the South-Armenian carbonate sequence; the latter is overlain stratigraphically by a flysch that ends with an olistostome containing a large variety of ophiolite-derived blocks. Microfacies observation of the last 150 m of the carbonate sequence suggests a back-reef inner platform depositional environment, with the presence of benthic foraminifera characteristic of a Cenomanian age.
Results from the Amasia ophiolite and the Vedi carbonate sequence point to a major geodynamic change that took place during the Cenomanian, involving both the late stage of submarine oceanic magmatic activity and the obduction of ophiolites onto the South-Armenian Block.