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Characteristics of mantle sources in Jurassic to Quaternary magmatic history of the territory of Armenia, as a guide to diverse geodynamic settings

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Complex geological mosaic of the territory of Armenia is presented by units consisting by fragments of continental blocks of Gondwanaland origin, Mesozoic Tethian island arc and Mesozoic ophiolitic complexes. Extensive magmatic activity traced from Early Jurassic to Holocene developed in diverse geological settings, such as Jurassic Tethyian MORB lavas, Upper Cretaceous and Eocene rift-related magmas and post-collisional Pliocene-Quaternary volcanic series.

Despite the remarkable existence of subduction, obduction and collisional orogenic processes, accompanied by extensional and compressional tectonics, little is known about the relation between geodynamics and magma generation conditions, as mantles sources types and primary melts characteristics during the evolution of the region. Current study is intended to get new information that help to fill the gaps between the geodynamical puzzle and conditions of the mantle sources melting within the selected key areas of the territory of Armenia and Lesser Caucasus in general.

In this contribution we focus on discussion of results of detailed geochemical and petrological studies of representative, highest-MgO samples of Jurassic picrites within Vedi ophiolites, picrite dyke of Alaverdi cutting Mesozoic Tethian island arc complexes, Upper Cretaceous rift-related sub-alkaline/alkaline basaltic series of Idjevan and Gochas, Late Eocene alkaline basaltic dyke of Jajur cutting Eocene volcanic and sedimentary complexes and Pliocene – Quaternary post-collisional volcanism, presented by 1) rifting-related flood basalts (dolerites); 2) HKCA basaltic series of Aragats stratovolcano and Gegham monogenetic volcanic upland and 3) high-alkaline, silica-undersaturated basaltic series of Syunik and Kapan.

Geochemical signatures of most studied samples are characterised by enrichments in LILE and LREE, but depleted in HFSE, reflecting to OIB/MORB-type mantle source that may have been modified by subduction-related processes. Exceptions are the Jurasic Vedi and Alaverdi picrites reflecting the typical Tethyan MORB-type mantle, as well the Late Cretaceous Gochas, Martuni and Idjevan and Late Eocene Djajur showing absence of pronounced subduction-related modification of OIB-type mantle sources.

Detail mineralogical study of early liquidus assemblages demonstrates that most studied samples consist high-Fo (>88) olivine that are considered to have crystallized from primary mantle-derived melts. Exceptions are low-Fo olivines characterized for Quaternary Aragats, Gegham and partially volcanoes of Syunik upland, those probably crystallized from crust contaminated AFC melts and/or melt resulting from the mixture of primary and crust-melted (adakite-type) melts. Spinel inclusions trapped in high-Fo olivine contain variable amounts of Ti, Al, and Cr, pointing to involvement of heterogeneous (MORB-type, OIB-type and subduction-type) mantle sources, that well agree with differ mantle-lithosphere domains and geodynamic controls during magma generations within the region from Jurassic to Quaternary time.

Geochemical signature of melts, those could be maximally close to the primary or parental magmas, we obtained from LA-ICP-MS analyses of melt inclusions trapped in high-Fo olivines from all studied samples. Wide heterogeneity of melts within the individual and between differ magmatic systems, as well the link with geodynamical control and mantle sources melting scenarios will be discussed.