Upper mantle serpentinized peridotites at the north part of Wadi Allaqi district (Egypt): Implications for the tectono-magmatic evolution of fore-arc crust

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The Neoproterozoic Allaqi-Heiani suture (800-700Ma) in south Eastern Desert (SED) of Egypt is the northernmost linear ophiolitic belt that defines an arc-arc suture in the Arabian-Nubian shield (ANS). The Neoproterozoic serpentinized peridotites represent a distinct lithology of dismembered ophiolites along the Allaqi-Heiani suture zone. These serpentinized bodies and sheets spread in Gabal Shikeyit, Wadi Haimur and Wadi Umm Araka at the north part of Wadi Allaqi district. The abundance of bastite and mesh-textured pseudomorphic olivine in the studied peridotites suggests harzburgite protolith. The fresh cores of the chromian spinels are rimed by ferritchromite and Cr-magnetite. Spinel minerals show either a continuous transition from Al- and Cr-rich cores towards rims enriched in Fe3+ and Cr, or display an abrupt compositional change from a chromian spinel cores to ferritchromite and Cr-magnetite. The fresh chromian spinels have high Cr# (=[Cr]/([Cr]+[Al])=0.62 to 0.79), while a wider variation in Mg# (=[Mg]/([Mg]+[Fe2+])0.35-0.59). High Cr# in the relict chromian spinels and Fo in the primary olivines indicate that they are residual peridotites after extensive partial melting and originated by sea-floor spreading during subduction initiation process. The studied ophiolitic upper mantle peridotites are highly depleted and most probably underwent high degrees of partial melting at a supra-subduction zone setting. They can be produced by up to ~ 20-22% closed system dynamic melting of a primitive mantle source.