Polyphase geodynamic evolution of heterogenous mantle beneath the Variscan Orogenic Belt (Moldanubian Zone, Bohemian Massif)

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The high-grade Gföhl Unit of the Moldanubian Zone (Bohemian Massif) hosts diverse (ultra)basic rocks derived from different mantle domains during the Variscan continental collision. The significant mantle heterogeneity is documented by the occurrence of contrasting peridotite types (suboceanic vs. subcontinental) closely associated with spinel- and/or garnet-bearing pyroxenites and eclogites within a relatively small subduction-related tectonic mélange (Kubeš *et al.*, submitted).

Spinel harzburgites, exclusively associated with HT anatectic gneisses, represent refractory suboceanic lithosphere, as suggested by whole-rock composition (low Al_2O_3, CaO), chemistry of spinel (Cr# <0.4) and Al-rich pyroxene (Al_2O_3 up to 9 wt.%). Garnet lherzolites, typically enclosed in HP granulites, correspond to fragments of the subcontinental mantle, considering their strongly fertile character (high Al_2O_3, TiO_2, Yb) and spinel chemistry (Cr# >0.5). Spinel-bearing pyroxenites usually form layers in harzburgites and likely represent products of decompression partial melting of the asthenospheric mantle with a variable input of crustal component, whereas garnet pyroxenite and eclogite layers solely hosted by lherzolites correspond to HP crystal cumulates from partial melts migrating through the mantle wedge.

During the Devonian subduction of the Saxothuringian ocean beneath the Teplá-Barrandian-Moldanubian block (≥380 Ma; Ackerman *et al.*, 2020), harzburgite was incorporated within the same subduction zone where lherzolite evolved. Concurrently, lherzolite was dragged from the shallow mantle section (≥10 kbar) into great depths within subduction channel and experienced UHP conditions (42 kbar, 1100 ^{o}C) closely followed by rapid mantle exhumation (~338 Ma; Kubeš et al., submitted). The polyphase mantle refertilization via melt-peridotite interaction included: 1) partial melting of the subducted slab involving sedimentary material that produced parental melts of garnet pyroxenites and eclogites ($^{87}Sr/^{86}Sr_{338}$ ~0.7109) penetrating and metasomatizing overlaying lithospheric mantle (lherzolite), and 2) decompression-induced melting of the upwelling asthenosphere with a contribution of crustal material generating spinel pyroxenites ($^{87}Sr/^{86}Sr_{338}$ ~0.7062) during rapid exhumation, which metasomatized subducted fragment of the oceanic plate (harzburgite). The extensive mantle refertilization is well-recorded by major and trace element geochemistry (elevated Al_2O_3/SiO_2, TiO_2, FeO_{tot}, HFSE, LREE, Li) and isotopic composition of peridotites ($^{87}Sr/^{86}Sr_{338}$ ~0.7051). The close spatial association of genetically contrasting mantle-derived assemblages thus provides a unique insight into the history of the Earth mantle that evolved during the Variscan collision within distinct geological settings, from ocean floor to great depths of subduction zone.

Ackerman, L., Kotková, J., Čopjaková, R., Sláma, J., Trubač, J., Dillingerová, V. 2020. Petrogenesis and Lu–Hf dating of (ultra) mafic rocks from the Kutná Hora Crystalline Complex: implications for the Devonian evolution of the Bohemian Massif. *Journal of Petrology* 61 (8).

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