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Forearc Ophiolites: Archives of Subduction Initiation and Melt Evolution in Convergent Margin Settings

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The internal structure-stratigraphy and geochemical signatures of most forearc - suprasubduction zone ophiolites display structural, petrological, geochemical and geochronological evidence, recording different stages of subduction initiation-related magmatism, material flux, metasomatism and deformation. There is a well-developed magmatic stratigraphy in the extrusive sequences of these ophiolites from older MORB-like lavas at the bottom towards younger island arc tholeiite (IAT) and boninitic lavas in the upper parts. A similar progression of the lava chemistry also occurs in crosscutting dike swarms and sheeted dikes, indicating increased subduction influence in the evolution of ophiolitic magmas through time. Lherzolitic peridotites in structurally lower parts of the upper mantle sequences of these ophiolites represent the residue after MORB melt extraction. Harzburgite and harzburgite-dunite associations higher up in the mantle sequences and below the transitional Moho are crosscut by networks of orthopyroxenite (opxt) veins, which include hydrous minerals (amphibole). These orthopyroxenite veins represent a reaction product between the host harzburgite (depleted, residual peridotite) and the migrating Si-rich (boninitic) melt at shallow mantle depths. These types of reactions and boninitic melts are also responsible for dissemination and deposition of chromitites with their dunite envelopes in the highly depleted harzburgites. The harzburgite-dunite-opxt suites characterize melt-residua relationships and melt migration patterns in the mantle wedge during the initial stages of subduction and incipient arc construction. Forearc - SSZ ophiolites show, therefore, a lateral and vertical progression of melt evolution in their crustal and upper mantle components that traces different stages of subduction initiation-related magmatism, reminiscent of forearc magmatism in some of the modern arc-trench rollback systems as in the Izu-Bonin-Mariana and Tonga-Kermadec subduction factories. The Troodos (Cyprus) ophiolite, where the next year's IGCP-649 Field Workshop will be held, represents one of the best archives of subduction initiation magmatism in the Cretaceous Neotethyan realm.

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