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Rejuvenation of lithospheric mantle by thermal erosion and referlilization : case studies in Ronda and Lherz orogenic peridotites

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Orogenic peridotites display structural, petrological and geochemical characteristics which encompass the deformation styles and compositions expected for subcontinental lithospheric mantle and shallow asthenospheric mantle. In the past, the ambiguous character of these rocks led to somewhat conflicting views on their origin. Recent studies tend to converge on the idea that the orogenic peridotites represent thinned and/or rejuvenated lithospheric mantle, thermally eroded by asthenospheric mantle during continental rifting or early ocean initiation. Lithospheric rejuvenation is marked by annealing of deformation microstructures, overgrowth of mineral grains and km-scale modal/chemical variations resulting from partial melt redistribution.

From top to base of eroded lithosphere, melt processes vary from refertilization of aged, refractory (harzburgite) lithosphere to partial melting of previously refertilized material (lherzolite & websterite). Both processes are associated with narrow fronts where major microstructural, modal and chemical variations occur within a few meters to tens of meters. Melting and refertilization fronts display striking resemblances (e.g., annealing of textures and small-scale chemical heterogeneities) but also significant differences. The melting front observed in Ronda is a clear-cut structure that can be followed over $>$ 10 km in the massif, suggesting that is formation was thermally-controlled at regional scale. In contrast, the refertilization front of Lherz is extremely convoluted, suggesting its formation by coalescence of relatively narrow ($\leq$ 10 m) melt infiltration channels. Refertilization and melting fonts are considered as the upper and lower boundaries of transient, moving asthenosphere-lithosphere transition zones during thermo-mechanical erosion of the lithospheric mantle by upwelling as-

thenosphere. Further complexity arises during the waning stages of lithospheric erosion - upon conductive cooling - when partially molten lithosphere is traversed by the receding melting/refertilization fronts (Garrido et al., this session).