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Deformation study on alkaline basalt hosted upper mantle xenoliths from SE Iberian Volcanic Province (Spain)

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We present a detailed study on lithospheric mantle deformation beneath SE Iberian Volcanic Province (SEI-VP, Spain) based on petrographic and olivine LPO (Lattice Preferred Orientation) analysis of upper mantle xenoliths beneath this region. The Volcanic activity in SEI-VP is the surface expression of magmatism in a complex geodynamic setting characterized during the Cenozoic by a sequence of transpressional and transtensive stages in a "Mediterranean-type" back-arc system. The last stage in this geodynamical evolution was the Neogene alkaline basalt volcanism erupted at 2-3 Ma, which sampled xenoliths from the mantle beneath SEI-VP. It gives us a unique possibility to probe "young" lithospheric mantle beneath this region.
The studied samples came from the "Cabezo Negro" de Tallante (Murcia, S. Spain), which is one of the major xenoliths occurrences within SEI-VP, and from the adjacent Los Perez locality.
They are spinel peridotites (harzburgite, clinopyroxene-rich and clinopyroxene-poor lherzolite, wehrlite) with textures ranging from fine-grained equigranular to coarse-grained granular. In some samples, tiny plagioclase grains surround spinel and pyroxenes. The LPO of olivine is similar in all samples; it displays a strong [100] maximum, implying dominant activation of high temperature [100] {0kl} slip systems. The strength of the LPO varies in function of their texture and modal content in clinopyroxene. In coarse-grained peridotites, from harzburgites to wehrlites, the olivine LPO ranges from strong, characterized by alignment of [100] axes close to the lineation and a girdle distribution of [010] with a maximum normal to the foliation, to a weak LPO with a [100] maximum is still preserved close to the lineation and [010] one normal to the foliation. The olivine LPO in the fine-grained equigranular lherzolites is similar to the one in coarse-grained wehrlites. Altogether, stronger olivine LPO are observed in the coarse-grained refractory peridotites. Modal enrichment in clinopyroxene and development of a fine-grained equigranular microstructure are both accompanied by a dispersion of the olivine LPO. Based on these results, we suggest that the refractory coarse-grained samples are representative of a primary subcontinental lithospheric mantle that was later affected by re-fertilization that led to dispersion of the LPO, as well as an increase in the clinopyroxene content. This textural evolution may record thermal and chemical erosion of the subcontinental mantle during Cenozoic extension of western Mediterranean region.