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Petrology And Microstructures Of The Deep Crust From The North Patagonian Massif, Given By Meta-Igneous Granulite Xenoliths.

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The North Patagonian Massif (NPM) crust (Rio Negro Province, Argentina) has recorded many magmatic events since Neoproterozoic times, giving it a wide outcrop diversity. However, the mineralogical and geochemical composition and the deformation of the modern lower crust remain elusive. To characterize the processes structuring the lower crust of the NPM, a petrological, geochemical and microstructural study has been performed. A suite of 21 pyroxene granulite xenoliths and 4 websterite xenoliths has been studied. It was brought up by alkaline lavas from 5 volcanic centres erupted between Oligocene and Pleistocene. Electron microprobe and LA-ICPMS have been used to obtain in-situ geochemical data on minerals, while microstructural data have been acquired through Electron Backscatter Diffraction (EBSD). Both granulites and websterites display a granoblastic texture and sometimes a weak inherited magmatic foliation. Granulite xenoliths show an assemblage of plagioclase + clinopyroxene ± orthopyroxene commonly associated with spinel or titanomagnetite. Websterites xenoliths show an association of clinopyroxene + orthopyroxene + spinel, along with accessory plagioclase. Granulites and websterites have a SiO_2 content ranging from 44 to 53 wt % while their Mg# varies from 39 to 67. Clinopyroxenes are characterised by weak upward convex chondrite-normalised REE patterns (LREE </<< MREE > HREE), patterns which are similar to intra-plate basalts. Two-pyroxene (Fe-Mg) thermometers and pseudosection calculation define P-T conditions of the main paragenesis at 760-1120°C and 7.2-10.3 kbar, following a geotherm about 30°C/km. Granulites and websterites can display a weak shape preferred orientation (SPO) of minerals related to the magmatic foliation. The clinopyroxene show a weak internal deformation, and (100)[001] or (001)[100] slip systems can be activated, but their orientation is not clearly linked with the inherited magmatic SPO. Our results indicate that the studied xenoliths could represent witnesses of an underplating process of the large igneous province magmas at the origin of the basaltic plateaux characterizing the investigated area. The lower crust thus would have undergone sub-solidus equilibration and low plastic deformation in an inactive tectonic context. These xenoliths allow defining a precise Cenozoic geotherm for the NPM lower crust together with a re-consideration of the Moho depth, which could be 40 km.