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Peridotite and pyroxenites from the mantle-wedge underneath the Northern Andes (Mercaderes area, Colombia)

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In the Mercaderes – Rio Mayo area of Southern Colombia, the Pleistocenic Granatifera tuff contains peridotite and pyroxenite xenoliths offering a direct view of the supra-subduction mantle underneath the Northern Andes [1-2-3]. The xenoliths are heterogeneous and range from subordinated garnet peridotite to dominant garnet websterite and clinopyroxenite. A few xenoliths display slightly deformed granular structures (evident in garnet pyroxenite) that retain evidence of melt-rock interaction (e.g., anhedral interstitial garnet and pyroxene overgrowing coarse, deformed pyroxene grains). In most peridotite and pyroxenite xenoliths, the coarse granular assemblage is overprinted by porphyroclastic to mylonitic textures, characterized by ortho-, clinopyroxene and garnet porphyroclasts in a mylonitic orthopyroxene + clinopyroxene ± olivine matrix.

Overall, mineral compositions define large intervals in terms of Mg-value (82-92) and Na contents in clinopyroxene (0.70 - 1.60 wt%). On the other hand, within a single xenolith, the compositions of rock-forming minerals are very homogeneous without core-to-rim or porphyroclast-matrix variations. The Pressure-Temperature estimates from a selected number of peridotite and pyroxenite samples range between 1150°C-1250 °C and 27-35 kbar (two pyroxene and garnet-pyroxene calibrations). The homogeneous porphyroclast and matrix compositions indicate the pervasive re-equilibration of all xenoliths during mylonitic deformation. Overall, the rock textures combined with mineral thermobarometry indicate that the Mercaderes xenoliths derive from a highly deformed mantle-wedge domain near the lithosphere-asthenosphere boundary, according to a recent geodynamic model of the area [4]. Despite the geodynamic location of the studied xenoliths, no modal metasomatism has been yet observed.

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