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Lattice preferred orientation and seismic fabric of metabasites deformed under medium-to-high temperature conditions from the Aracena metamorphic belt (SW Spain)

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The mechanical properties of the lower continental crust and, more precisely, its seismic anisotropy (SA), are intimately related to the rheology of hornblende and, to a lesser extent, plagioclase. In addition, due to the pseudo-orthorhombic seismic symmetry of hornblende, it is possible to deduce not only the kinematics but also the actual style of any imposed deformation. Eleven samples of metabasites deformed under medium-to-high temperature metamorphic conditions from the Aracena metamorphic belt (SW Spain) have been analysed via SEM/EBSD to obtain the crystal lattice preferred orientation (LPO) of the main constituent minerals (Pl+Hb$\pm$Qtz). Amphiboles from all samples have developed a strong LPO that can be attributed to different deformation mechanisms (rigid body rotation, dissolution-precipitation creep, cataclastic flow and recovery-subgrain rotation dynamic recrystallization accommodated dislocation creep) depending on deformation temperature, fluid content, structure and phase-strength contrasts (Díaz Azpiroz et al., 2007). In contrast, plagioclase LPO strength is variable. Also, the SA characteristics of these rocks have been derived from the LPO of the main constituent minerals, combined with their elastic properties according to their modal proportion in the rock. The orientation of the maximum P-wave velocity (Vp-max) is parallel to the [010] direction of plagioclase (Vp anisotropy ranging from 2.0 % to 2.6 %) only if (1) the hornblende modal proportion is low (typically $< 40\%$) and (2) the plagioclase LPO is strong. Otherwise, Vp-max is parallel to the [001] direction of hornblende, which lies systematically parallel to the tectonic X-direction, and the Vp anisotropy is significantly higher (4.4 % - 7.0 %). In any case, Vp-min

is poorly defined. In contrast, S-wave velocity and anisotropy is mainly controlled by hornblende LPO irrespective of its abundance in the rocks sampled. Vs1-max is parallel to the [010] direction of hornblende and the tectonic Y-direction whilst Vs1-min is parallel to hornblende [100] direction and the pole to the mylonitic foliation (tectonic Z-direction). Vs anisotropy (dVs = 2.72-5.84) is maximum parallel to the [001] direction of hornblende.

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