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ELASTICITY OF ANTIGORITE AND GLAUCOPHANE: ANISOTROPY IN THE SUBDUCTION ZONES

Subduction zones are known for their recycling of hydrated materials (sediments, hydrated oceanic crust and upper mantle) that are subjected to metamorphic processes and deformation at depth. In order to detect these materials by seismology, knowledge of the elastic properties of these rocks is required. We studied serpentinites, blueschists and eclogites deformed in the high-pressure low-temperature context of subduction zones. These rocks suffer deformation, which creates anisotropy. To model the anisotropy of deformed rocks, single-crystal elastic properties of antigorite and glaucophane were measured using Brillouin spectroscopy under ambient conditions. In addition, lattice preferred orientations of antigorite and glaucophane were determined using an electron back-scattering diffraction (EBSD) technique. Antigorite and deformed serpentinites have a very high seismic anisotropy (ΔV_P=46% and 38%, respectively) and remarkably low velocities along particular directions. Glaucophane single-crystal presents a high anisotropy (ΔV_P=38%). Glaucophane-bearing eclogite is characterized by weak anisotropies (ΔV_P=2.9%) compared to those of blueschist (ΔV_P=15.7%). The shear wave splitting up to 1-1.5s for serpentinite is higher than the values calculated for the eclogite (<0.03s) and the blueschist (0.16s). These properties can be used to detect serpentinite, blueschist and eclogite and discuss the relationships between seismic anisotropy and deformation in the mantle wedge and in the subducting plate.

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