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A database for the seismic properties of slow spreading mid-ocean ridges gabbros

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Gabbros are the main component of the oceanic crust and represent ~2/3 of the total magmatic crustal thickness. At the interface between magmatic, tectonic and hydrothermal processes, gabbros from slow spreading ridges may have a complex mineralogy and microstructural evolution. This includes structures that vary from purely magmatic fabrics, with layering and magmatic alignment of minerals, to rocks deformed from subsolidus temperatures to the lower-T brittle-ductile conditions. Such a variation is normally accompanied with changes in mineralogy, microstructures and crystallographic preferred orientations (CPO) of the main phases of these rocks, which in turn affect their seismic properties. Here we present a database of the CPO-derived seismic properties of 70 samples collected during the IODP Expedition 360 (site U1473). Initial results show that the dominant phases are plagioclase and clinopyroxene[MOU1] , and different samples may have different contents of olivine, enstatite, magnetite, ilmenite, chlorite and amphibole. Maximum velocities can be either parallel to the strongest concentration of (010) poles of plagioclase or olivine/clinopyroxene [001], depending on the proportions between these phases. Anisotropy of P waves vary from ~5% in the more isotropic gabbros with weak magmatic fabric to a maximum of ~10% in more mylonitic terms. A similar effect is observed for the S-waves. Destructive interference between plagioclase CPO vs. clinopyroxene/olivine reducing anisotropy is possibly observed. This is because the maximum Vp in a foliated gabbro is parallel to the maximum concentration of poles to (010), and perpendicular to olivine and clinopyroxene. As the lineation in our gabbros is generally marked by olivine and clinopyroxene [001] (instead of the fast direction [100]), this possibly cause anisotropy reduction. When present in the more mylonitized gabbros, amphibole has strong CPOs and help to increase the general anisotropy of P and S waves. The elastic constants calculated from these aggregates will be used as input for more physically robust calculations using differential effective medium approaches to better understand the effect of melt inclusions in these rocks by the time of their deformation in the lower crust.