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D ”不連続面上下における異方性の地震波解析及び鉱物物理モデリング
Seismological and mineral physical joint modeling on seismic anisotropy above/below D”

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Many studies have reported a $V_{SV} < V_{SH}$ anisotropy in various places of the D” layer. Shear wave splitting in the D” layer beneath the Antarctic Ocean regions was observed by analyzing broad-band seismographs recorded at several recent permanent and temporary seismic stations in Antarctica. The lattice preferred orientation (LPO) of post-perovskite (PPv) and MgO phases are thought to be a major source of the D” anisotropy. However, we detected the anisotropy even above the D” discontinuity in these regions unlike previous studies. Perovskite (Pv) and MgO should be instead considered to explain the anisotropy above the D” layer. Although the deformation mechanisms of the mantle minerals under high-P,T condition are still under debate, mineral physics modeling helps us to know likely LPO directions. In order to clarify the origin of the anisotropy, the seismological and mineral physical (in particular first principle calculations) joint modeling would be an important approach. We first construct new transverse isotropic (TI) shear wave velocity models by the seismic waveform modeling, which have a velocity discontinuity atop the D” layer and some anisotropy even above the discontinuity. Then we calculated the elastic anisotropy of polycrystalline aggregates (Pv + MgO) and (PPv + MgO) in several different LPO directions with a different degree by means of ab initio high pressure elasticities. Preliminary results suggest that a transversely isotropic aggregate (TIA) of Pv with [100] and MgO[100] vertical directions with unexpectedly small LPO can reproduce the observed anisotropy above the D” discontinuity. TIA of PPv[001] is possible to be an origin of the anisotropy below the discontinuity. Although PPv[010] is thought to be the major cause in previous works, our results suggest that only complete TIA of PPv[010] can explain the observations. The most likely case is TIA of MgO[100] model. Though the amount of MgO is much smaller than that of PPv and Pv, significantly small LPO can reproduce the anisotropy, indicating MgO is much anisotropic. We conclude that MgO is highly possible to be an origin of the anisotropy. Regional variations will be also demonstrated.

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