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Synthetic SKS splitting at subduction zones: reconciling observations with mantle flow

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The type of mantle viscous flow associated with the sinking of rigid oceanic plates is still poorly understood. One way to determine the geometry of the deformational field at subduction zones is by measuring shear wave splitting. The azimuth of the fast shear wave component is thought to be parallel to direction of mantle flow. However, recent studies have shown that this is true only in the case of simple shear deformation and that, hence, a more accurate analysis is needed. We compute the seismic anisotropy due to strain-induced lattice preferred orientation (LPO) in mechanical models of a rigid plate subducting in a non-newtonian mantle. Subsequently we compute seismogram synthetics and compare the SKS splitting parameters with those observed at subduction zones.
Synthetic data reproduce quite well the observations, suggesting that the interpretation of seismic anisotropy, based on coupled flow models and LPO calculations, may be used to constrain the kinematic and dynamic behavior of the Earth's interior.