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The Unbearable Slightness of Splitting

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Active subduction of the Pacific plate under the NW-trending Kamchatka volcanic arc ceases at the intersection with the Aleutian Island arc. The geometry of subduction in this region should produce a strong mantle flow field with consequent strong seismic anisotropy. No observable splitting, however, is found in SKS phases recorded at the station PET in Petropavlovsk-Kamchatsky. The portable Side Edge of Kamchatka Slab network provides data across the entire peninsula, allowing a regional characterization of the mantle flow field. Broadband data yield small but significant split times for some of the network stations. Preliminary results from SKS phases generated by two teleseismic events suggest a fast shear direction of 25^{o} NE and a delay time of approximately 0.5 seconds. This indicates trench-parallel flow of the mantle either above, within, or below the subducting slab. We will examine shear phases from local events in conjunction with teleseismic shear phases to constrain the vertical distribution of anisotropy. Trench roll-back is a mechanism which may produce trench-parallel flow of the mantle under the Kamchatka peninsula. The geometry of the Kamchatka-Aleutian Arc intersection may cause the mantle to flow north towards the intersection, aligning the flow field parallel to the trench. Anisotropy measurements provide information on the strength of the mantle flow field. Small values for shear-wave splitting indicate a small degree of lattice-preferred orientation in the mantle, implying that the flow field is weak, or that the presence of slab-derived fluids inhibits dislocation creep in olivine in the mantle wedge. Alternatively, part of the flow field could be vertical, and thus invisible to shear-wave splitting.

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