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On the reliability of PKIIKP phase identification at a single station

Olga Usoltseva and Vladimir Ovtchinnikov

Sadovsky Institute of Geosphere Dynamics, Russian Academy of Sciences, Moscow, Russia (kriukova@mail.ru)

Study of the contact zone between the inner and outer core represents considerable interest for understanding of properties, structures and dynamic of the Earth's core. One of the sources of the data about the processes proceeding in the top part of the inner core is the seismic wave PKIIKP once reflected from an undersize inner core boundary. Amplitudes of these waves are sensitive to the shear velocity in the top part of the inner core and are small. Therefore their identification at a single seismic station is not reliable without application of additional methods of analysis. Significant in this regard is the discussion about the source (in inner core or in mantle) of anomalous arrivals detected at the TAM station in North Africa [1,2] in the time range of PKIIKP phase.

To estimate influence of model parameters (S and P seismic velocity) on the characteristics of PKIIKP wave (amplitude and travel time) we calculated sensitivity kernels for upper mantle and inner core for dominant period 1.2 s, azimuth step 0.2 degrees and radius step 20 km by using DSM Kernel Suite algorithm. It was revealed that PKIIKP amplitude is more sensitivities to mantle heterogeneities than to inner core ones. For reducing the effects of the overlying structures we suppose to use a joint analysis PKIIKP and pPKIIKP waves. With this approach, an incorrect identification of the PKIIKP wave is most likely excluded. We demonstrate the effectiveness of the approach on the example of processing the seismogram of the 11.02.2015 earthquake recorded at the GZH station in China at a distance of 179.4 degrees.

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