Geophysical Research Abstracts
Vol. 17, EGU2015-5766, 2015
EGU General Assembly 2015

Properties of waves reflected off the Earth's core boundaries

Dmitry Bobrov (1), Petr Kaazik (2), Ivan Kitov (2), Dmitry Krasnoshchekov (2), and Vladimir Ovtchinnikov (2)
(1) CTBTO, Vienna, Austria (dmitry.bobrov@ctbto.org), (2) Institute of Geosphere Dynamics, Russian Academy of Sciences, Moscow, Russia (ikitov@mail.ru)

Growing availability and quality of digital seismic data in the recent 20 years leads to a significant improvement in our knowledge of the Earth's core and enables resolving more complicated issues of its structure and dynamics. Recent studies of the PKiKP and PcP waves pre-critically reflected off the inner core/outer core and outer core/mantle boundaries, respectively, reveal the complexity of the transition from the liquid outer to the solid inner core and the fine texture of the latter. These studies have a severe limitation – routine observations of the PKiKP are not often because their amplitudes making 1000 times as small as P. We have collected a new dataset of PKiKP waveforms generated by underground nuclear explosions and earthquakes in Asia and Pacific region. The appending data mostly come from several seismic arrays of the International Monitoring System of the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO). Some of these arrays had also worked prior to 2001. Detailed analysis of the obtained PKiKP waveforms demonstrates multimodal distribution of periods and anomalously high amplitudes in the transparent zone where the standard models of the Earth predict extremely low amplitudes. These measurements of amplitudes and periods and the PKiKP-PcP differential travel times confirm the hypothesis of complex structure of the inner/outer core boundary that likely consists of thin layers at local level. Such layers in the bottom of the liquid core or in the roof of the inner core are capable of causing the observed features of the PKiKP. To extend the dataset of PKiKP observations available for the analysis of the outer/inner core boundary we apply various methods of detection. The IMS seismic arrays allow the use of beamforming with linear and weighted summation and application of cross correlation techniques when high-quality template waveforms are available.