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Measurement of differential P-wave travel time between two BBOBSs with Correction for crustal reverberation

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Seismic observations under the ocean are very important to investigate three-dimensional structure of the whole mantle. However, it is difficult to pick up arrival times of P-waves because noise level of broadband ocean bottom seismometer (BBOBS) is in general high in the period range more than 5 sec. Instead of picking arrival times, differential travel times between two BBOBSs have been measured by cross-correlating the waveforms at a period of around 10 sec or more (e.g. Toomey et al. 1998, Tanaka et al., 2009).

The resolution of P-wave tomography become high effectively by taking dispersion of P-wave travel time into account with the finite frequency theory (e.g. Obayashi et al. 2013 JpGU meeting), and its effect is expected to be significant under the ocean where the observations have been sparse. Obayashi et al. (2004) showed dispersion of PP is generated by interference of crustal reverberations under its bounce point. The reverberation under the station also affects a direct P-wave. Especially the effect of the seawater reverberation is significant.

Obayashi et al. (2013) proposed a method of correction for such reverberations to measure differential travel times between any two stations. In this method a waveform is convolved by the response calculated for the crustal structure under the other station.

We applied this method to the BBOBS array at French Polynesia. In the case of the measurement between a BBOBS and a island station, the waveforms of the two stations become similar each other after the correction, suggesting the correction is effective. We report the characteristics of the observed dispersions and the very first result of P-wave tomography using the new observations.

Keywords: crustal reverberation, broadband ocean bottom seismometer, tomography