Downward continuation of multichannel seismic data for full waveform inversion -Synthetic modeling-

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In order to constrain the physical properties of fine scale crustal structure, it is necessary to integrate borehole-scale physical property data and regional-scale seismic data. Recently high-resolution reflection images and detailed seismic velocity structures have become available by using a combination of a synthetic ocean bottom experiment (SOBE) method [Harding et al., 2007] with pre-stack depth migration and/or full waveform inversion, in addition to the conventional data processing of multichannel reflection data [e.g., Arnulf et al., 2012; 2014; Harding et al., 2016]. The SOBE method is based on the downward continuation [Berryhill 1979], which is a technique to extrapolate the observed wavefield to an arbitrary surface by applying Kirchhoff' s integral extrapolation, for the purpose of improving the imaging condition. However, most previous studies using the SOBE method are limited to data from mid-ocean ridges, where the seafloor depth is shallow, with few exceptions [Ghosal et al., 2014]. Here we present the results of synthetic modeling tests to evaluate the effect of the downward continuation to multichannel seismic data obtained in other tectonic region (e.g., subduction zone). At first, we redatumed both shot and receiver gathers from synthetic streamer data (up to 12 km offsets) to a depth close to the seafloor, and confirmed that the refraction phases from shallow part of the crust become first arrivals at near offsets. As a next step, we plan to a travel time tomography using the first arrivals, and compare the spatial resolution with that of original data. In this presentation, we will discuss the effect of the downward continuation and application methods to real seismic data and geometries.

