

A preliminary report on a time-lapse analysis of multi-channel seismic reflection data using seismic attenuation profiling

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Multi-channel seismic reflection (MCS) data is often used for the interpretation of faults based on lateral discontinuity of reflections. It is, however, almost impossible to use MCS data within poorly reflective areas such as igneous oceanic crust because seismic reflections are inherently invisible there. Therefore, we have been trying to apply seismic attenuation profiling (SAP) to image faults within poorly reflective oceanic crust.

The study area of the present study is located on the outer rise of the Japan Trench, where several previous studies have discussed about the role of plate bending-related normal faults as pathways of fluid migration. Park et al. (2021) showed anomalously high helium isotope ($^3\text{He}/^4\text{He}$) ratios in sediment pore water and seismic reflection data which suggest fluid infiltration into the upper mantle and subsequent outflow through bend-faults across the outer slope of the Japan Trench.

To investigate temporal changes in fluid activities along faults, we applied SAP to two kinds of MCS data, which were acquired on locationally the same seismic line with different survey periods: 1997 and 2011. The former MCS survey was conducted by *R/V Kairei* of Japan Agency for Marine-Earth Science and Technology (JASMTEC) on line SR101 in November, 1997. The latter MCS survey was done by the same vessel on line D19 in August, 2011, about five months after the 2011 Tohoku earthquake (Mw9.0). Both lines SR101 and D19 overlap each other over the seaward slope of the Japan Trench.

The resulting SAP sections, although they are tentative, appear to suggest a temporal change in seismic attenuation property at a fault zone. The fault zone was imaged with relatively higher attenuation property on line D19 than on line SR101. In the present study, we would like to demonstrate a tentative time-lapse analysis by SAP for temporal variation in fluid migrations along faults in the outer rise of Japan Trench off Sanriku.

Keywords: seismic attenuation, fault, fluid migration