

Application of seismic attenuation mapping to volcanic area

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Multichannel seismic (MCS) reflection data may not be generally effective in volcanic area where clear reflections are unable to be observed in general. It is, however, in the case that reflection amplitude is used to analyze tectonic structures or physical properties of rocks, while some authors report successful works from seismic reflection attributes, other than amplitude, such as frequency and phase. Here we show a seismic attenuation profile, on which we try to map attenuation characteristics, in order to discuss physical properties of rocks in volcanic area.

The study area covers Miyakejima, Kozushima and Niijima islands. The MCS reflection data for the present study was collected by Japan Agency for Marine- Earth Science and Technology, about three month after the Miyakejima eruption in 2000. The data acquisition has been conducted by using a 12,000 cu. in. airgun array and a 4,100 m streamer cable with shot spacing of 50 m and group spacing of 25 m. The trace length and sampling interval are 15 s and 4 ms, respectively.

The method used in the present study is to calculate attenuation from MCS reflection data by the spectral ratio method. Although application of this method using MCS reflection data is very limited, a successful example has been introduced in the oil industry (Dasgupta & Clark, 1998). Here we calculated seismic attenuation from poststack reflection data and then mapped resulting attenuation parameter on the profile. We call it seismic attenuation profile.

The provisional attenuation profile between Miyakejima and Kozushima shows clear difference in attenuation beneath the two islands. If we assume that the attenuation character has been correctively estimated, the provisional result may be suggestive of difference of magmas forming these volcanic islands, that of physical destruction by fracture and so on. In this paper, we would like to show a trial in rock property evaluation by seismic attenuation mapping.