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地殻流体が関与した可能性がある秋田県森吉山周辺の地震活動
Possible geofluid driven seismic activity near the Moriyoshi-zan volcano in Akita prefecture, northeastern Japan

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1. Introduction

The great 2011 Off the Pacific coast of Tohoku (Tohoku-oki) Earthquake caused triggered seismicity in many areas apart from the source area. In the inland part of Tohoku district, the induced seismicity is quite high in Akita prefecture. Among the three activated clusters in the prefecture, the one to the north of Moriyoshi-zan volcano is quite interesting, because the earthquakes form an unusual vertical column with a height of about 5 km. Considering a possible existence of geofluid beneath the source area inferred from previous studies, the examination of activity of this cluster is important to clarify the relation of induced earthquakes to geofluid.

2. Seismic Activity

The Moriyoshi-zan volcano is a Quaternary volcano located to the west of the Hachimantai volcano along the volcanic front of northeastern Japan. The column-like earthquake cluster was formed from May 2011, about two months after the Tohoku-oki earthquake. The process of column formation is unique. The activity started at the bottom, then elongated vertically forming a central column, and extended horizontally with less seismicity in the central column. This process suggests the migration of geofluid from the bottom followed by horizontal permeation.

3. Reflected Phase

A prominent feature of the seismograms observed at stations around the volcano is a reflected phase that appears on tangential component. This SxS phase is commonly observed for earthquakes in the cluster. Similar phase has previously observed from an earthquake swarm in 1982 [1]. A plane of refection was estimated using the travel time data of SxS phase from the 1982 swarm [1]. The existence of reflector strongly suggests the concentration of geofluid in its location.

4. Discussion

Moriyoshi-zan area is one of the source areas of deep low-frequency microearthquakes occurring mainly beneath active volcanoes in the northeastern Japan [2]. The low-frequency earthquakes that occur well below the elastic plastic boundary are interpreted as the events generated by magmatic activity of mantle diapirs in the uppermost mantle [2]. In the cross-sectional view of seismicity, the westward bottom of reflector is close to the upper limit of low-frequency earthquakes and the eastward top seems to reach the bottom of column-like cluster. From this we can image a pathway of geofluid from the upper mantle to the source of column-like cluster. However, we should note that the horizontal location of reflector and column-like cluster is separated about 5 km. Thus, to conclude if the earthquakes that formed the column-like cluster were driven by geofluid, we need to estimate the present location of reflector using arrival times and waveform characteristics of SxS phase observed in 2011.

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References

[1] Hori, S, and A. Hasegawa, Zisin (J. Seism.Soc. Jpn.) 44, 39-48 (1991).
[2] Hasegawa, A. and A. Yamamoto, Tectonophysics, 233, 233-252.

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