

Seismic activity around Kamikochi, Nagano Prefecture after the M5.5 earthquake on April 23, 2020

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Introduction

The southern part of the Hida Mountains is one of the areas where shallow earthquakes occur most frequently in Honshu. Among these activities since 1922, the series of seismic activities that started at 13:44 on April 23, 2020, around Kamikochi, Matsumoto City, Nagano Prefecture, triggered by the Mj5.5 earthquake, have been carried out so far. It can be said that this is the largest activity in the seismic record.

Seismic activity around Kamikochi

Seismic activity around Kamikochi has been active in a narrow range of 25km north-south and 15km east-west, including medium-seismic earthquakes reaching a depth of about 50km for at least the past 100 years. It has been. The three-dimensional shape of the distribution area is exactly the shape of a funnel.

Looking at the seismic activity around Kamikochi up to the present, there is a cycle in which Mj5 to 5.5 class earthquakes are active in a cycle of several years to about 10 years, and among the aftershocks caused by water reduction. In addition, there is an activity cycle around Mj4 with a cycle of about one week, and an activity cycle with a cycle of half a day to one day is also observed.

More characteristically, earthquakes up to a depth of several tens of kilometers occur within hours after an earthquake of Mj5 or higher that occurs in a shallow layer with a depth of several kilometers. During this time, the depth at which earthquakes occur gradually increases. Earthquakes up to a depth of several tens of kilometers do not occur in all cycles, and the continuity between shallow and deep earthquakes may not be clear.

Mechanism of seismic activity around Kamikochi

It is possible to consider the involvement of thermofluids in such a phenomenon that shallow earthquakes and deep earthquakes occur intermittently in a narrow range (Omi, 2001; 2020, Kawabe, 2017). If thermofluids are involved, the general pattern is that a deep earthquake occurs first, and then the active area gradually shifts to shallow areas. However, in the case of an earthquake around Kamikochi, on the contrary, it is always a transition from a shallow earthquake to a deep earthquake, which is the opposite of the direct involvement of thermofluids.

according to the actual condition of the lower bottom surface of the shallow earthquake and the rise of the quaternary granite body in the southern part of the Hida Mountains, the upper crust is more brittle due to the bending deformation of the crust caused by the magma derived from the upper mantle. A model is conceivable in which rupture occurs from the ground, and the rupture progresses further downward, and eventually the rupture propagates to the lower crust and upper mantle in the plastic region under the original stress field.

Keywords: earthquake swarm activity, northern Hida Mountains, up-warping deformation