

Strong Ground Motions from the Teshikaga Earthquake

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Introduction

The largest inland crustal earthquakes in Hokkaido have occurred at 5:38 on January 31st in 1959 and at 23:30 on November 4th in 1967 at Teshikaga area, eastern part of Hokkaido. Their M_j is 6.3 and they have strike-slip fault mechanism. These records are important to understand behavior of ground motion caused by inland crustal earthquakes. Now we analyze records of JMA strong motion seismograph of Abashiri, Kushiro, Nemuro and Obihiro about these two earthquakes.

Characteristics of JMA strong motion seismograph records

Fig.1 is observed waveform of 1967 earthquake. We can find out the difference of amplitude at each station at a glance. At Abashiri; north from hypocenter and epicentral distance is about 58km, maximum amplitude is 1cm and at Kushiro; south from hypocenter and epicentral distance is about 58km, maximum amplitude is about 0.5cm. However at Obihiro which is one of the further stations; south west from hypocenter and epicentral distance is about 105km, maximum amplitude is about 5cm. On the contrary, at Nemuro; south east of hypocenter and epicentral distance is about 108km, maximum amplitude is about 0.2 cm that is 1/25 of Obihiro's record. All wave groups which give maximum amplitude is surface waves and their amplitudes and waveforms are greatly different. Similar characteristics are shown in 1959 records, though their amplitudes are half of them in 1967 event.

Characteristics of underground structure

Characteristics noted above are related with difference of underground structure from hypocenter to the stations. Then we compare vertical cross sections from epicenter (a star) to the stations based on underground structure of Hokkaido (S-wave velocity model) by NIED (Fig.2). Structure to Abashiri is comparatively flat, but about structure to Kushiro, upper surface of layer where V_s is 2.2km/s drastically shallows near the station (A-B survey line). About structure to Nemuro, thick sedimentary basin of Konsen moor drastically shallows near the station (C-D survey line). On the contrary, about structure to Obihiro, sedimentary layer shallows once on the way and thicken at Tokachi plain again (E-F survey line).

Conclusion

From discussion noted above, quite complex underground structure in three-dimension of Hokkaido is considered as a main reason of huge difference between each waveform observed in Teshikaga earthquake. In addition, from strong excitation of surface wave, hypocentral depths decided by JMA (39km in 1959 event, 20km in 1967 event) are regarded as deeper depths than appropriate depths. Now, in our plan to confirm them, we are going to do 3-D simulation with accurate fault mechanism and seismic moment.

