

Characteristics of recent two moderate earthquakes in South Korea

*朴 舜千¹、Min Kihun¹、Cho Seongheum¹、Park Eun Hee¹、Choi Mikyung¹、You Seolhan¹、Lee Duk Kee¹、Oh Ha-Young¹、Sohn Dong-Hyo¹、Sun Jongsun¹

*Sun-Cheon Park¹、Kihun Min¹、Seongheum Cho¹、Eun Hee Park¹、Mikyung Choi¹、Seolhan You¹、Duk Kee Lee¹、Ha-Young Oh¹、Dong-Hyo Sohn¹、Jongsun Sun¹

1. 韓国気象庁

1. Korea Meteorological Administration

According to the instrumental earthquake catalog, Korean peninsula has been thought to have low seismicity with small earthquakes or little of moderate events. Small number of aftershocks seemed to follow moderate earthquakes. For example, an inland earthquake with ML 4.8 in 2007 was reported to have aftershocks within 3 days with the largest aftershock of ML 2.0. However recent two inland earthquakes with Mw 5.4~5.5 showed different seismic activities. One of the two events is Gyeongju earthquake in 2016 (ML 5.8, Mw 5.5) and the other is Pohang event last year (ML 5.4, Mw 5.4). The 2016 Gyeongju event was followed by more than 3500 aftershocks for more than 6 months. The largest aftershock was the ML 4.5 event occurred one week later. Even a large foreshock occurred about 50 minutes before the mainshock, which is very unusual seismic activity in the Korean peninsula. Furthermore seismic activity became higher in the wide area of the Korean peninsula after the 2016 event. The 2017 Pohang event had some small foreshocks and large number of aftershocks. A ML 4.3 earthquake about 140 minutes later and a ML 4.6 one about 3 months later were the two largest aftershocks.

Meanwhile, the 2016 Gyeongju and 2017 Pohang events showed different features each other. While the source spectra of the 2016 event had strong high frequency energy, that of the 2017 event significantly had lower frequency energy. This difference in source energy was revealed in earthquake damage as well. The 2016 earthquake produced damages mainly in low story buildings with wall crack, roof damage or brick wall damage. Meanwhile, much of the damage due to the 2017 earthquake was observed in high story buildings. Even sand and mud volcanoes were observed in several places within about 15 km distance. The difference in earthquake damage by the two events may be due to both of source energy and site effect. Soft sediment layer is well developed in the surrounding areas of the 2017 event. These two moderate earthquakes have shown significant features in terms of aftershock activity, seismic source characteristics and damage, so that we may understand the environment of earthquake generation in the Korean peninsula.

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