

Time and spacial analyses of the 2016 Kumamoto Eathquake and its position in seismic activities in the Southwest Japan

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Large earthquake whose magnitude is Mj6.5 occurred at April 14, 2016 22:26 in central Kumamoto Prefecture. After the large shock, 27 hours later, much larger earthquake whose magnitude is Mj7.3 occurred near the hypocenter of the previous large quake. The first large quake is named the foreshock, and the later, the main shock of Kumamoto Earthquake in 2016 (JMA, 2016).

According to the detailed time and spatial analyses of the Kumamoto Earthquake in 2016, following evidences are found.

The main shock and its aftershocks occurred mainly on a NE-SW directional plain dipping to the northwest (the main plane), while the plane which consists of the foreshock and its aftershocks before the main shock (the foreshock plane) develops only in the footwall of the main plane. The foreshock plane dips east-southeastward against the main plane. Another plane which consists of aftershocks of the main shock is found. This plane dips gently northwestward lies about 10km in depth connecting to the main plain.

These facts indicate that the foreshock occurred firstly in the footwall of the main plane, and it exited the main shock on the main plane. and the block which is divided by the gently dipping plain and the main plane seems to move northwestward. Such faults and block movements would reflect the geologic structure of the upper part of the upper crust connecting to the surfical geologic structure.

According to the time and spacial analyses of seismic activities of Southwest Japan, the Kumamoto Earthquake occurred just after the activity of the earthquake and its aftershocks in the northwest margin of Okinawa Trough lying southwest of the Kyushu Island. These earthquakes (the Okinawa trough earthquakes) distribute in a narrow zone elongated northeastward and concaved northwestward. Most of earthquakes in this area waned just before the Kumamoto Earthquake. But the only seismic activity of the close concentrated area which is found near the center of the distribution of the Okinawa Trough earthquakes occurred continuously after the Kumamoto Earthquake as it was before. Such continual closed seismic activity should indicate an activity of any liquid flow though the any low frequency earthquake is not found.

According to much more wide view point of seismic activity in Southwest Japan, large earthquakes occur semiannually toward the east, namely the earthquake in the northwest margin of the Okinawa trough at 14th November in 2015, the Kumamoto Earthquake at 14th April in 2016, an earthquake in the southeast of Korean Penninshula at 16th September in 2016, the Tottoriken Chubu Earthquake in 2016 at 21st October in 2016 and the earthquake at the off Tango Penninshura at 27th May in 2017. Many low frequency earthquakes are found in the foreshocks and aftershocks of the Tottoriken Chubu Earthquake in 2016. This fact indicates clearly that the Tottoriken Chubu Earthquake is driven by the movement of the liquid flow of magma or boiled water. Such evidence of the driving liquid flow of the earthquakes indicate that the large earthquakes in the upper crust of Southwest Japan should be by any eastward transmigrating thermal energy in the upper mantle (Tsunoda et al., 2013).

Reference:

JMA, 2016, Disaster earthquake report, 2016, no.1. 230p.

Tsunoda, F., Choi, D.R. and Kawabe, T., 2013. Thermal energy transmigration and fluctuation. NCGT Journal, v.1, p.65-80.

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