Rupture properties of the 2016 Kumamoto Earthquake sequence based on seismicity data analyses

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The Kumamoto Earthquake sequence occurred on April 14, 2016 for the foreshock (Mw 6.2) and on April 16, 2016 for main shock (Mw 7.0) in the Kumamoto area of Kyushu. The earthquake sequence was derived from fault ruptures of the Futagawa and Hinagu Fault zones. The rupture directivity was just northeast. Furthermore, the earthquake sequence dominantly affected the northeast region, and M ~6 earthquakes are triggered around the Oita area (Uchida et al., 2016). On the other hand, the southwestern parts of the Hinagu Fault zone were not ruptured. The purpose of the study is to examine what is a factor for controlling seismic properties of the earthquake sequence.
We used earthquake data that occurred from October 24, 1997 to July 31, 2015 in the JMA catalog to grasp the seismic activity around the source faults: Futagawa and Hinagu Fault zones. We applied the fault model which was proposed by HERP [2013] to the analysis. According to some previous research results, the dip angles of the Futagawa and Hinagu Fault zones are set up to be 60º in northwest and 90º, respectively. Then, we define the analytical area of the Futagawa Fault zone as the region of 10 km in the northwest direction from the surface trace. For the Hinagu Fault zone, the area is defined as 5 km on either side on the surface trace.
We recognized a remarkable seismic gap in the Hinagu Fault zone based on seismicity data before the Kumamoto Earthquake sequence. The fault rupture of the Kumamoto Earthquake sequence was probably arrested at the seismic gap, however the southern part of the Hinagu fault zone is within positive stress change. The aftershocks of the foreshock do not propagate in the seismic gap, however, those of the main shock distribute over a seismic gap; propagating to the southern part of the Hinagu Fault zone.
Here, we focused on two Mw ~5 earthquakes happened in 2000 and 2005 on Hinagu Fault zone. The analysis results show the 2005 earthquake maybe is related to the 2000 earthquake: a delayed earthquake. Therefore, the analysis of the seismic sequence probably provides useful information to evaluate seismic condition of the Hinagu Fault zone after the Kumamoto Earthquake sequence. The seismic scale of the Kumamoto Earthquake sequence is far bigger than the 2000 earthquake, and the aftershock activity propagated up to the southern part of the Hinagu Fault zone. Therefore, the Hinagu Fault zone has a potential to cause some delayed earthquakes.

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