Overview of the 2016 Kumamoto Earthquake Sequence

Kazuhiro Ichijo
Seismology and Volcanology Department, Japan Meteorological Agency
kazuhiro.ichijo@met.kishou.go.jp

At 21:26 on April 14 2016 (JST), an earthquake with a magnitude (M) of 6.5 in the Kumamoto area of Kumamoto Prefecture caused strong shaking with a seismic intensity of 7 (maximum scale of the JMA Seismic Intensity Scale) in the local town of Mashiki. Just 28 hours later (at 01:25. on April 16), a quake with an even bigger main-shock magnitude of 7.3 struck the same area, with seismic intensities of 7 recorded in Mashiki and the local village of Nishihara. This was the first time the Japan Meteorological Agency (JMA) had recorded two quakes with a seismic intensity of 7 within two days.

In relation to the M6.5 earthquake of April 14, recorded seismic intensities were 7 for Mashiki, 6-lower for Kumamoto, Tamana, Uki, Nishihara and Kashima, and between 5-upper and 1 from Kyushu to Chubu. The main shock was recorded with a seismic intensity of 7 in Mashiki and Nishihara, 6-upper values were recorded in Kumamoto, Minamiaso, Kikuchi, Uto, Otsu, Kashima, Uki and Koshi, and values from 6-lower to 1 were observed between Kyushu and parts of Tohoku. The tremors caused 271 direct and indirect fatalities, 2,808 injuries and 205,943 instances of residential damage, including 8,668 total collapses, in Kumamoto and the prefectures of Yamaguchi, Fukuoka, Saga, Nagasaki, Oita and Miyazaki and elsewhere (as of September 14 2018; Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications).

After the M6.5 earthquake of April 14 2016, particularly high levels of seismic activity were observed in and around the Kumamoto area. After the main shock, numerous quakes were also recorded in the Aso area of Kumamoto Prefecture and central Oita Prefecture with an area of seismic activity covering around 150 km in length. JMA collectively named this seismic activity “the 2016 Kumamoto Earthquake” (referred to here simply as “the Kumamoto Earthquake”). There were over 7,000 quakes of M2.0 and larger within two years of the first tremor. Aftershock activity from the Kumamoto Earthquake continues, although a trend of decay is observed.

The focal mechanism of the first earthquake (M6.5, April 14) exhibited strike-slip faulting with a NNW-SSE tension axis, and that of the M6.4 earthquake on April 15 showed faulting with a north-south tension axis. The focal mechanism of the main shock exhibited strike-slip faulting with a north-south tension axis. The Headquarters for Earthquake Research Promotion judged that the April 14 M6.5 earthquake and the April 15 M6.4 earthquake occurred along the Hinagu fault zone (Takano-Shirahata section), while the main shock occurred along the Futagawa fault zone (Futagawa section).

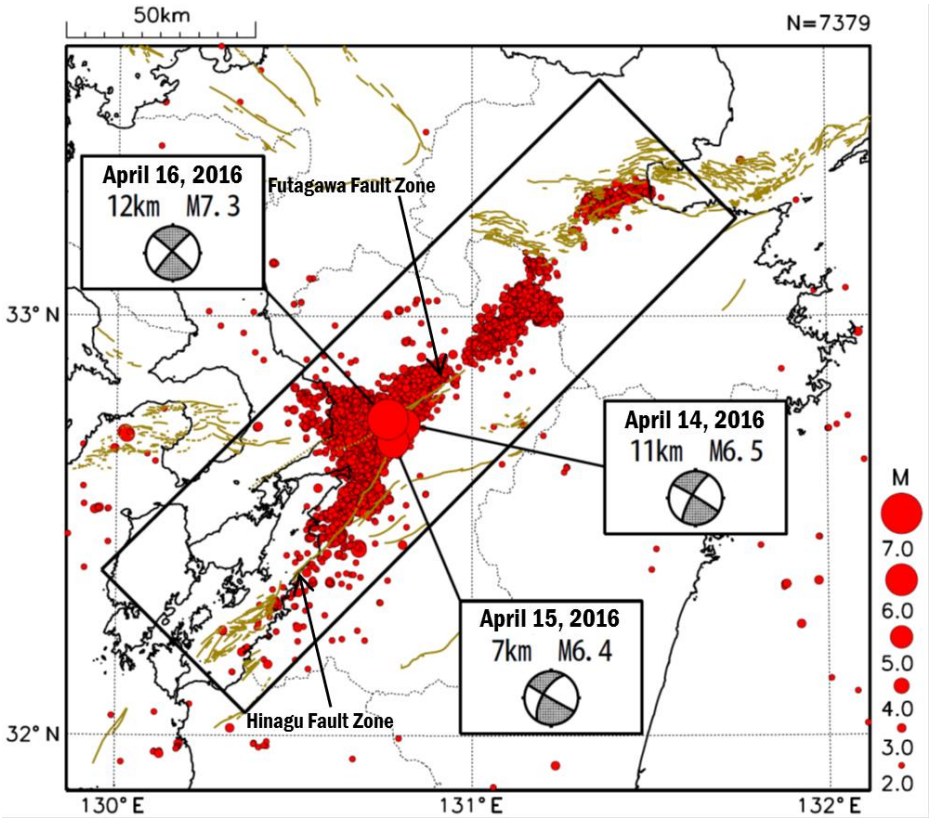

Fig. 1 Epicenter distribution in and around Kumamoto Prefecture by JMA earthquake catalogue. Red nucleation points are epicenters of earthquakes shallower than 20km with magnitude of 2.0 and larger from 21:26 on April 14 2016 to 21:25 April 14 2018, scaled relative to their magnitude. Brown solid lines are the active fault zone evaluated by the Headquarters for Earthquake Research Promotion. The CMT solution of each event (M6.5 of April 14, M6.4 of April 15 and main shock) is plotted using a lower-hemisphere projection.

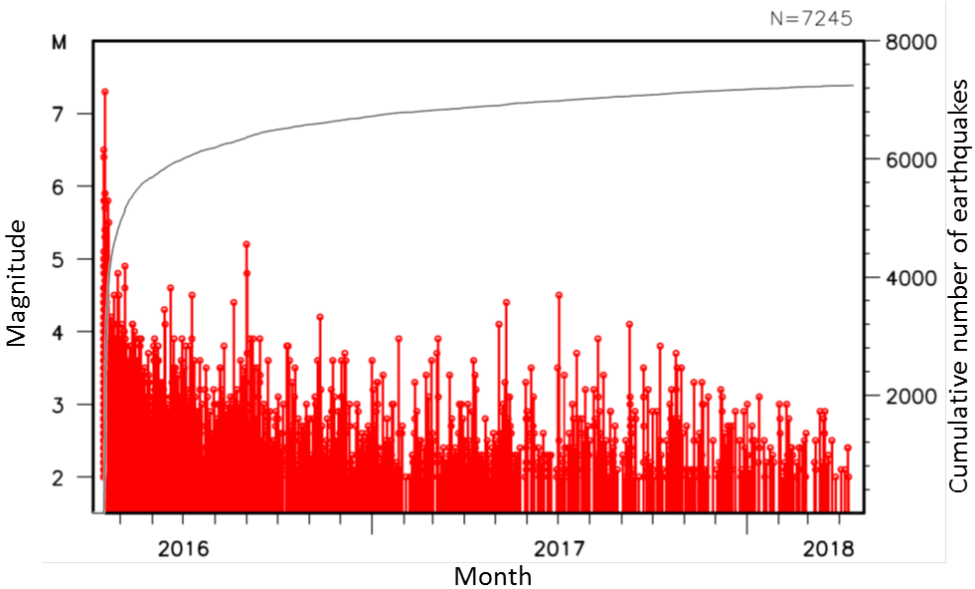

Fig. 2 Plot of magnitude as a function of time for earthquakes (red bars) and the cumulative number of earthquakes (the black curve) in the black rectangle region of fig1.