Co-seismic displacements of the 2016 Kumamoto Earthquake derived from GNSS Campaign measurements

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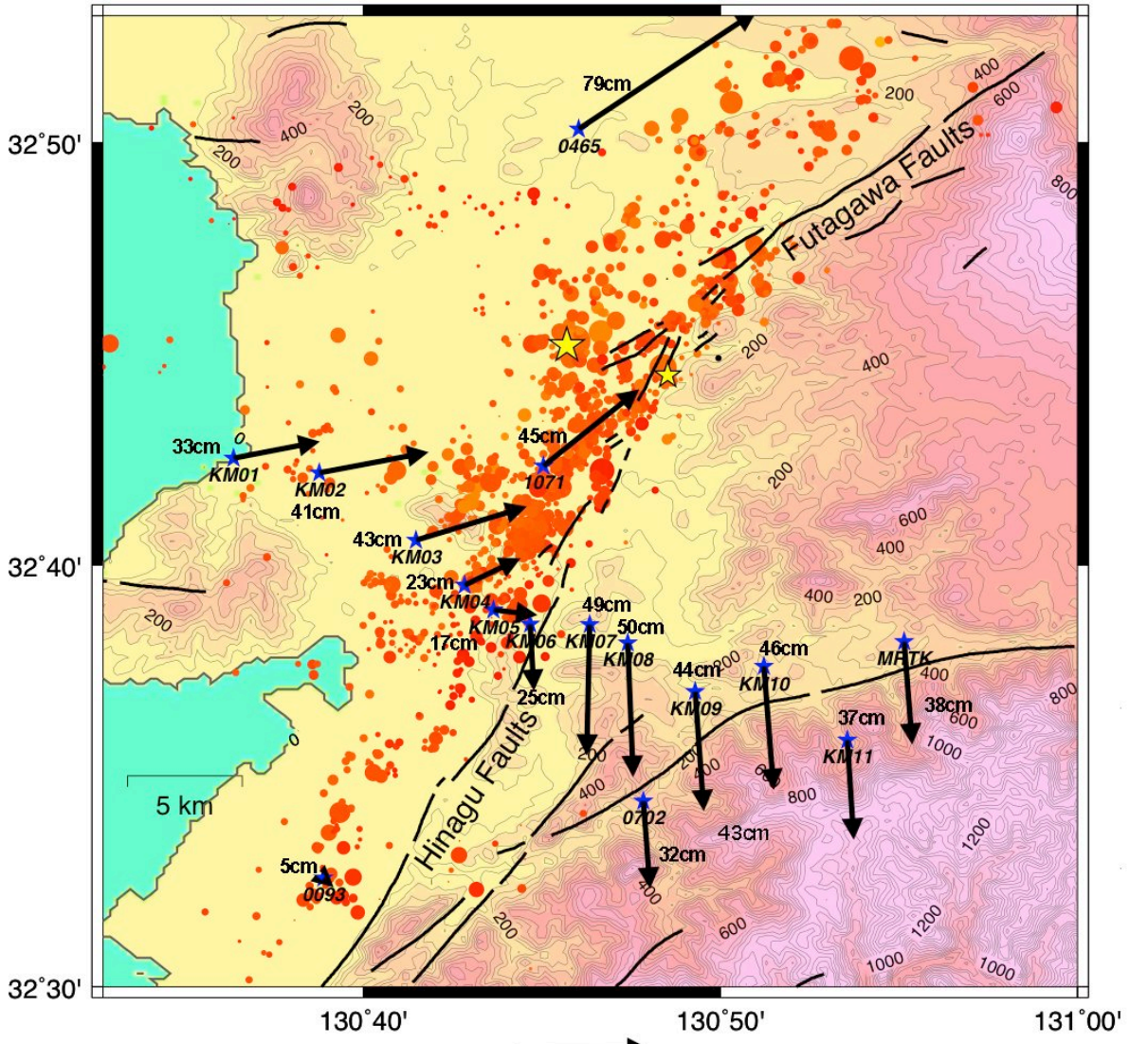
Since October 1999, small-earthquake activity has been detected in the Futagawa and Hinagu fault zones. In particular, in June 2000 an earthquake of magnitude 4.8 occured in the northern end of Hinagu fault, and JMA intensity 5- was recorded in the surrounding area.
In order to reveale the presence or absence of a creep movement in the deeper area of Hinagu fault, and to obtain the knowledge of the loading process of the fault, we set the west-northwest to east-southeast survery line of about 30km which is perpendicular to the Futagawa fault. We set the reference point of the 11 places on the survey line. We started the Campaign observation from 2000. The reference point, the antenna was fixed using a wooden tripod, and acquires data of 2-3 days per point. The most recent measurement was February 2010, but after the 2016 Kumamoto earthquake occurred, we carried out the re-measurement hurriedly.
The Precise Point Positioning mode of GIPSY- OASIS version 6.4 and the JPL final almanac file was used in the process.
At the continuous observation point (MRTK and GEONET), the co-seismic crustal displacement of Kumamoto earthquake that occurred on April 14 to 16, 2016, the difference vector between the average value of each of the five days of the coordinates of the April 1-5 and April 23-27, 2016. For the campaign observation, the observation vector includes the secure movement for 6 years since 2010 and besides the co-seismic movement. Therefore the average value between the early April, 2010 and in early April, 2016, crustal movement vector obtained by the GEONET observation points around is assumed to be secure crustal movements in the region.
Co-seismic crustal movement vectors were show in the figure. (1) The largest vector of 50 cm was found in our observation. The small vector was found just along the active fault zone, because the rupture of Hinagu fault was not reached to the earth surface. (2) The displacement was limited tn the northern segment of the Hinagu fault. (3) The earthquake source fault of the underground was shifted to 1~2km west side of the active faults that have been traced at the surface.
Also the central and southern segment of the Hinagu fault, which lies on the south of our survey line, does not release the strain, there is a possibility that large earthquakes future occur.

Keywords: The 2016 Kumamoto Earthquake, The Futagawa and Hinagu Fault Zones, Crustal Displacement, GNSS



Campaign観測点（KM01- KM11)
測定1：2010年2月 7～12日
測定2：2016年4月23～27日
連続観測点(MRTK)およびGEONET
測定1：2016年4月 1～5日
測定2：2016年4月23～27日

固定点：IGS点　解析:GIPSY 6.4　暦：JPL Final

Campaign観測点については，2010年2月から2016年4月上旬の間の定常的な地殻変動を周囲のGEONET観測点から推定し，測定値から差引いている．