

Co- and post-seismic displacements due to the 2016 Kumamoto earthquake observed by GEONET

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The 2016 Kumamoto earthquake (M 7.3) occurred at 01:25 JST on 16 April 2016, and two large foreshocks (M6.5, M6.4) occurred at 21:26 JST on 14 April and 00:03 JST on 15 April, respectively, damaging a wide area around Kumamoto prefecture. The geospatial Information Authority of Japan (GSI) operates the nationwide GNSS network GEONET, which consists of about 1,300 GNSS stations with the average spacing of 20 km. We report the preliminary estimates of co- and post-seismic displacements due to the Kumamoto earthquake using GEONET data.

The GEONET data are processed with three kinds of routine analyses: F3 (24-hour session), R3 (24-hour session), and Q3 (6-hour session). Since two foreshocks on April 14 occurred consecutively within three hours, the coseismic displacements could not be detected from the routine analyses separately. Therefore, an emergency analysis (S3) for static solutions with arbitrary session length, and GEONET real-time analysis (REGARD), which offers 1 Hz kinematic solutions, were also used to detect the coseismic deformations.

Clear coseismic displacements due to the Kumamoto earthquake were observed: NE displacement of 20 cm and subsidence of 3 cm was found at site 1071 near the Hinagu fault during the two foreshocks. NE displacement of 75 cm and subsidence of 20 cm, and SW displacement of 97 cm and uplift of 28 cm were detected just after the mainshock at sites 0465 and 0701, which are located near the Futagawa fault, respectively (Figure). Postseismic deformation up to 3 cm also has been observed, showing a roughly similar deformation pattern to those associated with the mainshock.

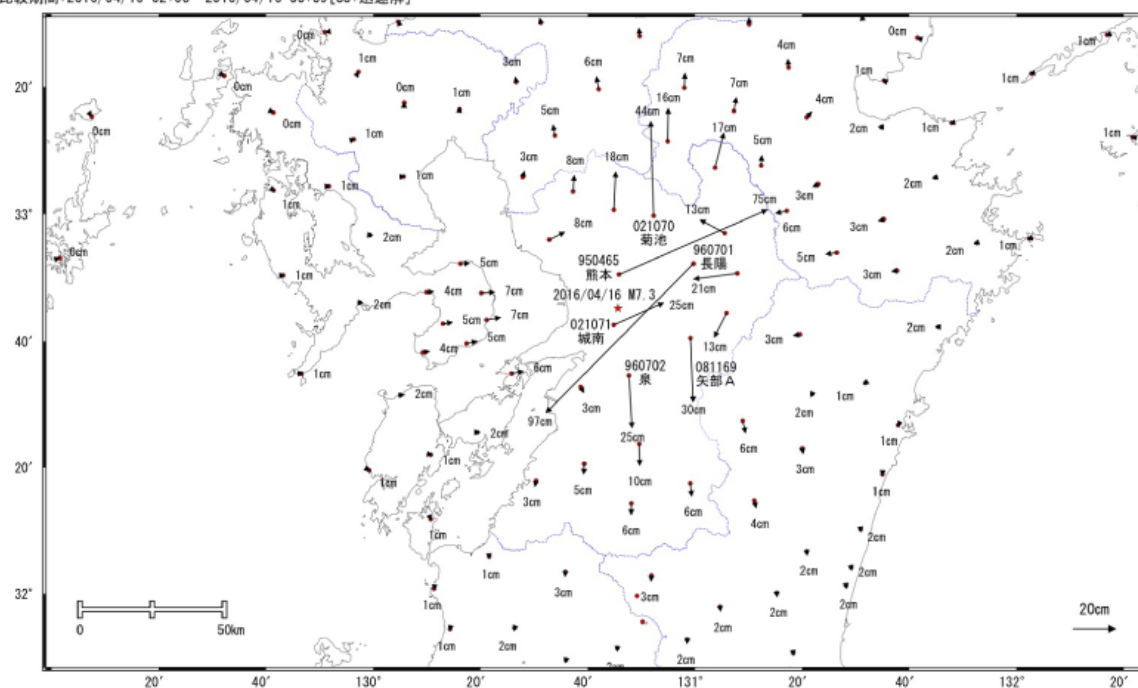
The results implicate that the two foreshocks occurred at the Hinagu fault, and the mainshock occurred at Futagawa fault. Especially, the observed displacements indicate that the mainshock ruptured from the epicenter to east with a lower dip angle compared to the foreshocks. We plan to investigate the fault slips for the sequence of the earthquakes and continue to monitor the postseismic deformation.

Keywords: The 2016 Kumamoto earthquake, GEONET, crustal deformation, Kinematic GNSS analysis

平成28年4月16日の熊本県熊本地方の地震(M7.3)(暫定値)前後の観測データ(1)
地殻変動(水平)

【暫定】

基準期間: 2016/04/15 03:00~2016/04/15 23:59 [Q3: 迅速解]
比較期間: 2016/04/16 02:00~2016/04/16 05:59 [S3: 迅速解]



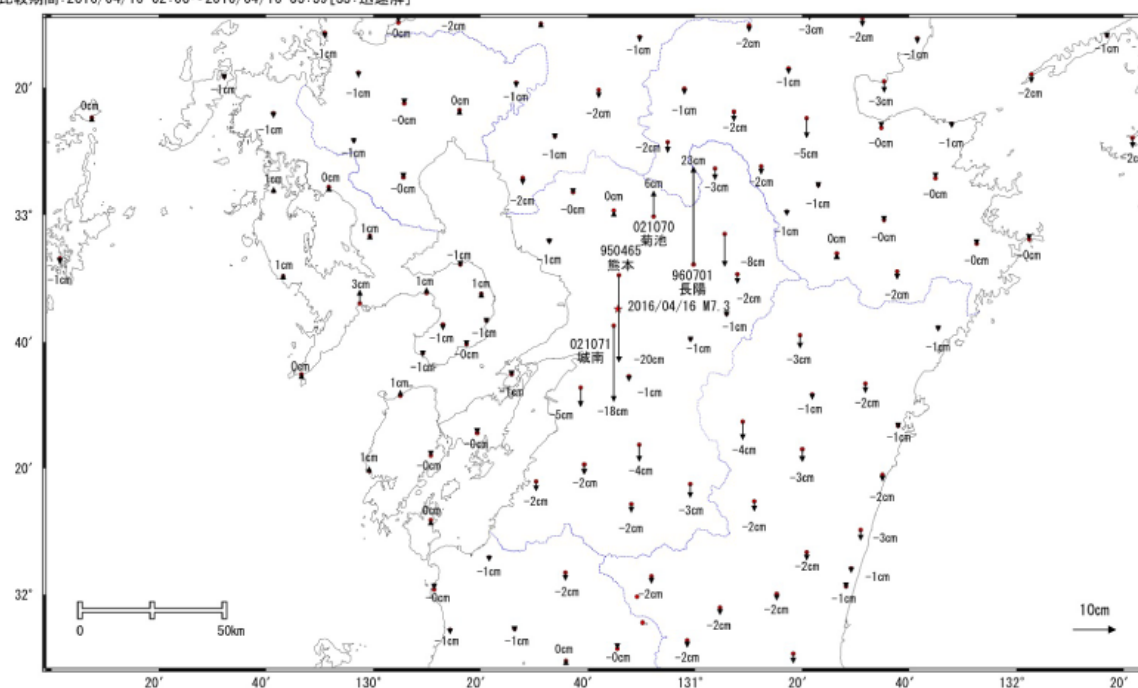
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平成28年4月16日の熊本県熊本地方の地震(M7.3)(暫定値)前後の観測データ(2)
地殻変動(上下)

【暫定】

基準期間: 2016/04/15 03:00~2016/04/15 23:59 [Q3: 迅速解]
比較期間: 2016/04/16 02:00~2016/04/16 05:59 [S3: 迅速解]



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