

# Estimation of ground displacements around Aso-Caldera caused by the 2016 Kumamoto Earthquake, with the differential LiDAR DEM analysis

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After the main shock of 2016 Kumamoto Earthquake (M7.3), seismic wide-area crustal deformation was observed around Aso-Caldera region in Kumamoto Prefecture, Japan. In order to estimate ground displacements and deformation in wide-area, we conducted differential LiDAR DEM analysis to measure displacements of less than 1m order. The data sets we used for the analysis are 1 m mesh DTM (Digital Terrain Model) data measured in 2009 (pre-event) and 2016 (4-30 days after the event). We applied the particle image velocimetry method to calculate 3-D vectors of co-seismic deformation (Mukoyama, 2011). As a result, upheaval and northward displacements were observed in N-NW area in the caldera, and upheaval and southwestward displacements were observed in W-SW area. And westward displacements and subsidence were observed in the central-cone volcanoes area. The locations of these ground displacements show a broad boundary zone of directional change extend across the caldera. Additionally, some clear strike-slip ruptures and discontinuous change of ground displacements appeared around the western rim of caldera. On the other hand, large lateral mass movements were observed in the local basin of flat sediment area.

From these results, we confirmed the distribution of the ground displacements suggests the existence of the NE edge of the earthquake fault at the west margin of intra-caldera area. These results are corresponding with the results of other field survey, the GNSS observations, D-InSAR survey and seismic-source-fault-model analysis. Additionally, some results would contribute to make up for the data gap of D-InSAR analysis, and let us know missed surface ruptures by field survey.

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Keywords: the 2016 Kumamoto Earthquake, Differential DEM Analysis, LiDAR, Image matching analysis

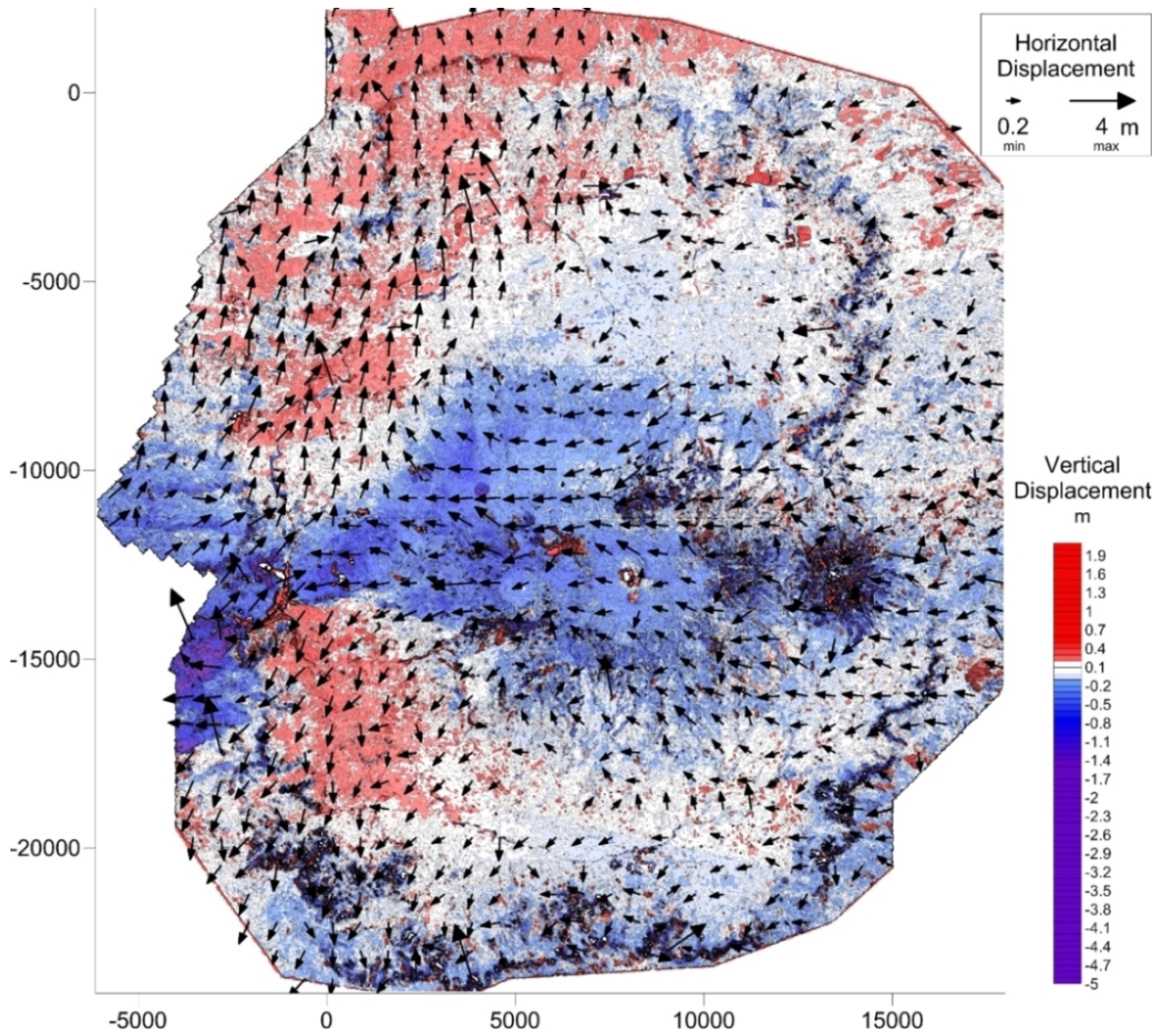


Fig.1 Ground displacements around Aso-Caldera by 2016 Kumamoto Earthquake, Japan  
Coordinate System JDG2000/Japan Plane Rectangular CS II