

Precise hypocenter distribution in the focal area of the 2016 Mw7.8 Kaikoura Earthquake, New Zealand

*Yuta Kawamura¹, Satoshi Matsumoto¹, Tomomi Okada², Miu Matsuno², Yoshihisa Iio³, Tadashi Sato², Stephen C Bannister⁴, John Ristau⁴, Martha K Savage⁵, John Twonend⁵, Jarg Pettinga⁶, Francesca Ghisetti⁷, Richard H Sibson⁸

1. Kyushu University, Shimabara, Japan, 2. Tohoku University, Sendai, Japan, 3. Kyoto University, Uji, Japan, 4. GNS Science, Lower Hutt, New Zealand, 5. Victoria University of Wellington, Wellington, New Zealand, 6. University of Canterbury, Christchurch, New Zealand, 7. TerraGeologica, Ruby Bay, New Zealand, 8. University of Otago, Dunedin, New Zealand

The Mw7.8 Kaikoura Earthquake struck the northeastern south island, New Zealand, on November 14, 2016. A lot of researchers have tried to explain the cause of this earthquake and revealed the structure in this area. Among variety of prior researches, Clark et al. (2017) argued that this earthquake, which produced surface deformation including uplift and complex surface rupture, was caused by 21 strike-slip, reverse and oblique slip faults. Cesca et al., (2017) proposed an earthquake fault model that consists of three faults in northern, central and southern part, based on the hypocenter distribution of aftershock activity. These studies suggested in common that this earthquake was provoked by multiple faults with complex rupture process.

We had installed 75 temporary seismic stations before the earthquake in the South Island, New Zealand in addition to GEONET stations. The seismic network has successfully recorded the mainshock and the following aftershocks. Here, we relocated the hypocenters of the events associated with the Kaikoura earthquake by using data obtained from the seismic network. The hypocenters was determined by the double difference hypocenter determination algorithm (i.e. HYPODD, Waldhauser and Ellsworth, 2000). The overall distribution of the hypocenters are distinguished into two clusters, northern and southern clusters. The hypocenter distribution in vertical cross section normal to the major alignment of the aftershocks in N54W reveals that the fault in southern part dips to eastward. On the other hand, although we find out a northern cluster in terms of horizontal projection, no obvious faults are recognized in the vertical cross-section, suggesting complex fault structure in the northern cluster.

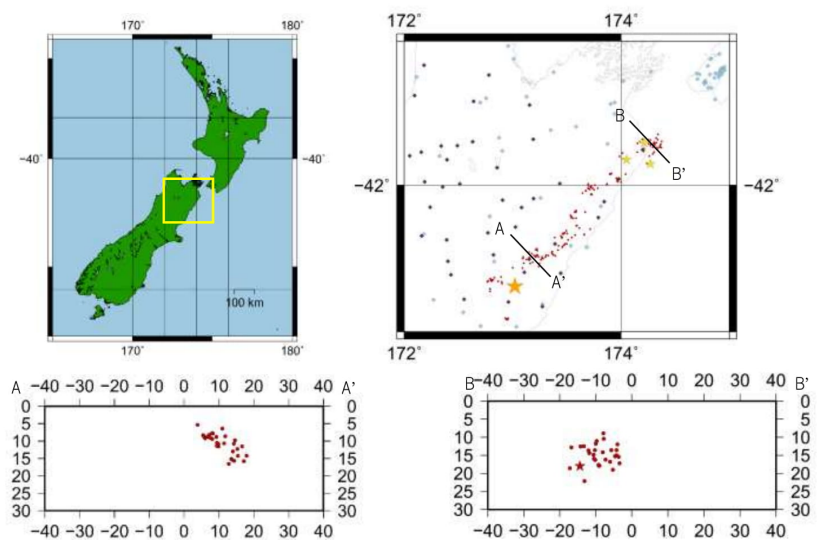


Fig. 1 Relocated hypocenter distribution in the South Island, New Zealand. Upper left) Index map of the target region. Yellow rectangle shows area displayed right map. Upper right) Map showing seismic stations and epicenters. Diamond and dot indicate location of station and event, respectively. Stars indicate epicenters for event with $M > 6$. Lower) Vertical cross sections along A-A' and B-B' in the upper right map. Other symbols are same as the upper right map.