

## Early rupture process of the 2019 Off Yamagata earthquake

\*Ryo Fujimoto<sup>1</sup>, Hirofumi Kowari<sup>1</sup>, Masanao Komatsu<sup>1</sup>, Hiroshi Takenaka<sup>1</sup>

1. Department of Earth Sciences, Graduate School of Natural Science and Technology, Okayama University

The earthquake ( $M_{\text{JMA}} 6.7$ ) occurred in Off Yamagata prefecture on June 18th, 2019 (JST). In this study, we investigate the early rupture process during 3.6 seconds after the origin time by source imaging technique (Takenaka *et al*, 2009, EPS). We use P-wave portion before the S-wave arrival on vertical components of velocity waveform data which obtained by integrating the original strong-motion records observed at 15 stations from the seismic networks of NIED, JMA, Yamagata and Niigata prefectures. We assume two fault planes through the hypocenter (38.608°N, 139.479°E and 14.0 km depth) reported by the JMA unified catalogue: first one is the plane of strike N26°E and dip 27° from the JMA CMT mechanism solutions; second one is the plane of strike N16°E and dip 31° from the JMA focal mechanism solution using P-wave first motion polarity.

From the result of the source imaging for 3.6 seconds from the origin time (Fig. 1), for either fault planes, the area of large radiation strength was found in north side of the hypocenter. This area corresponds to the large slip region in the result of source inversion conducted by NIED. Two peaks of rupture strength in this area are located 4 km and 10 km northward along the strike from the hypocenter. The snapshots shown in the Fig. 2 image the highest peak of the radiation strength located about 4 km toward north from the hypocenter after 1.2 to 1.8 seconds from the origin time. The rupture in this area extends to north along the strike. Second peak in the area is located 10 km northward from the hypocenter after 3.0 seconds from the origin time.

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Keywords: Early rupture process, Source imaging technique, 2019 Off Yamagata earthquake

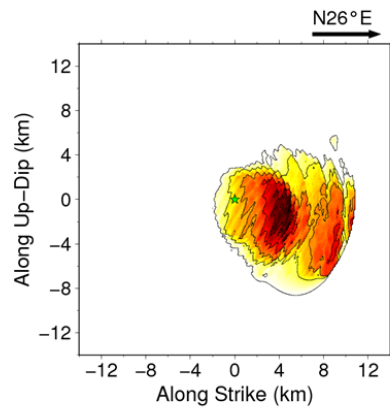


Fig. 1. Radiation strength images on the fault plane given by the JMA CMT solution. Green star indicates the hypocenter.

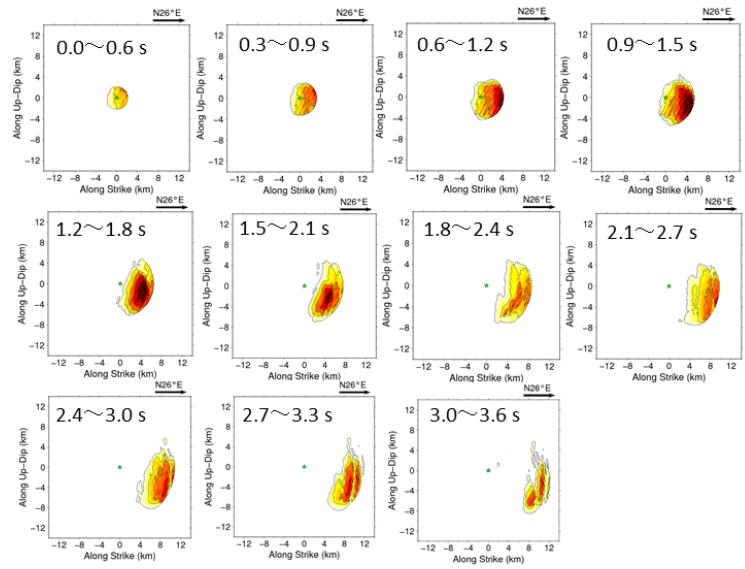


Fig. 2. Snapshot of the radiation strength every 0.3 s. Green star indicates the hypocenter.