An Outline of The 2018 Hokkaido Eastern Iburi Earthquake (M6.7)

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An earthquake with JMA-scale magnitude (Mjma) of 6.7 (moment magnitude of 6.6) occurred in Hokkaido region at 3:07 a.m. (JST) on September 6, 2018 with a focal depth of 37 kilometers. JMA issued an earthquake early warning 7.3 seconds after the detection of its tremor. A seismic intensity meter in Atsuma City recorded an intensity of 7, which is the highest level of JMA's seismic intensity scale. Seismic intensity 7 ground shaking means: people would be impossible to move without crawling, reinforced-concrete buildings with low earthquake resistance would be more likely to collapse, ground fissures and large landslides would be generated, etc. In fact, region-wide landslides and liquefaction of the ground were observed close to the epicenter, and 41 people were killed by this earthquake (as of statistics as of September 27, 2018, Japan's Fire and Disaster Management Agency).

Just after the earthquake, a massive blackout was occurred in wide areas of Hokkaido, and JMA could not obtain some data of seismic intensity meters and seismometers. At first, the maximum seismic intensity observation was 6 upper. And along with the gradual recovery of power supply, the data of seismic intensity 7 in Atsuma City was transmitted to JMA within the day. On the other hand, JMA's Estimated Seismic Intensity Distribution Map, which is issued around 15 to 30 minutes after an earthquake and is made based on seismic intensity observations and site amplification data, indicated the existence of seismic intensity 7 areas.

Seismic activity after the M6.7 earthquake has been active over the north-south linear area extending around 30 kilometers, and hypocenters of these earthquakes have been distributed around on the plane tiling to the east with a high angle. CMT solution indicated a reverse fault with pressure axis of northeast-southwest direction was slipped, and the high seismicity plane was roughly accommodative to one plane of the CMT solution. Active earthquake clusters are found around a depth of 15 kilometers and 25-40 kilometers, and a gap can be seen between the two clusters. Focal depth was 37 kilometers and is relatively deep for crustal earthquakes in Japan. However, sometimes such deep crustal earthquakes occur around this region.

Close to the hypocenter of this earthquake, there is a long fault zone, i.e., Ishikari-lowland fault zone. Although this fault zone is considered to be a reverse fault with east-west pressure axis, which is similar to the focal mechanism of this earthquake, the relation between this fault zone and this earthquake is not clear.

Detailed analysis of seismic wave data revealed that around 5-6 seconds after an initial small rupture, a major rupture seemed to occur around 10 kilometer south-southwest from the initial rupture. According to the source process analysis using local strong motion waveform data, the major rupture zone would extend at a depth of 25-30 kilometers and was shallower than the hypocenter of the initial rupture. Aftershocks have been rarely found in this major rupture zone.

The outline of this earthquake will be introduced in this presentation.

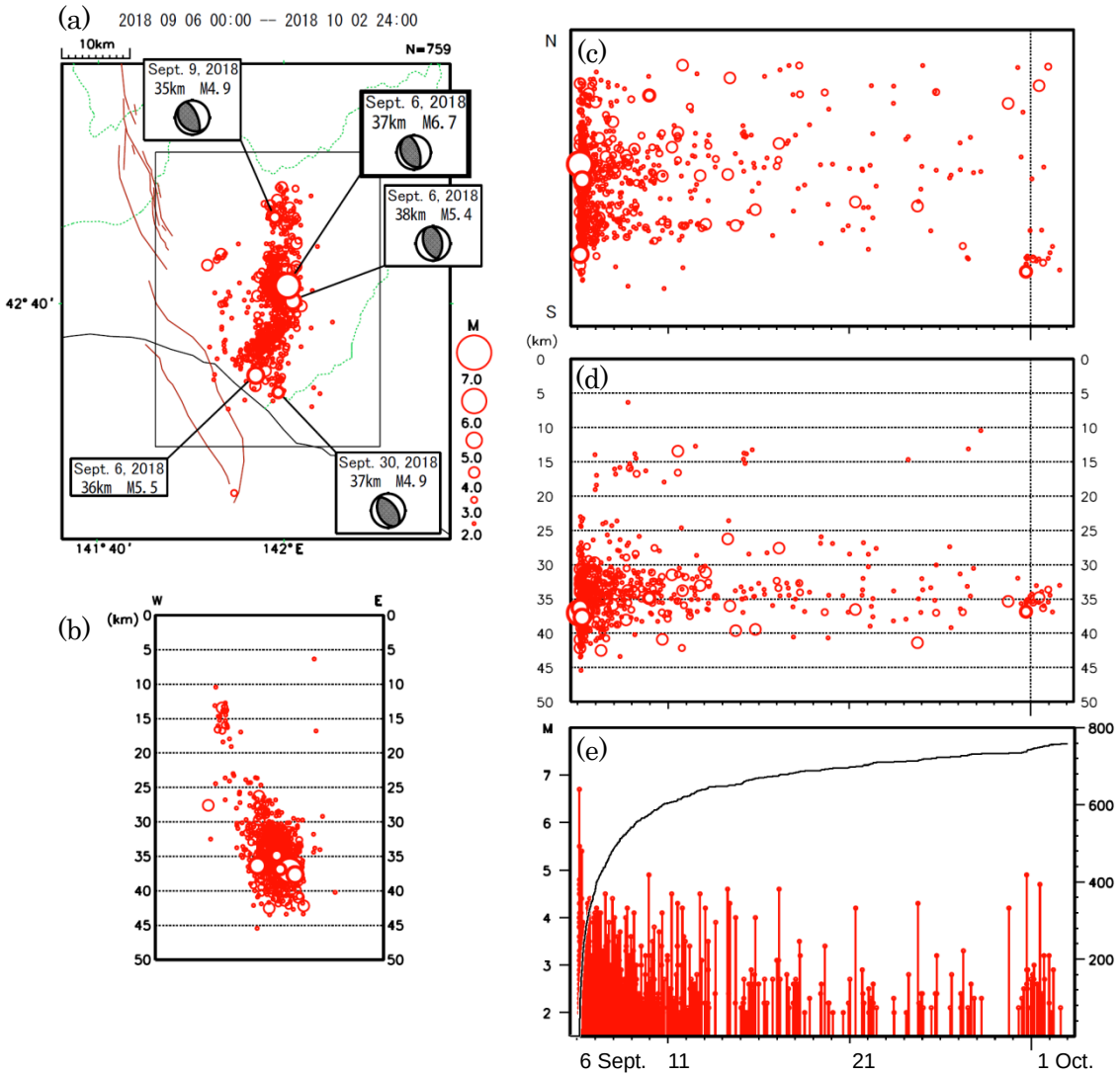

Figure 1 Seismicity of the 2018 Hokkaido Eastern Iburi Earthquake (M6.7).
(a) Epicenter distribution from 6 September 2018 to 2 October. CMT solutions for some large events are also shown. (b) Cross section of the hypocenters (E-W profile). (c) Time-Space distribution (N-S profile). (d) Depth-Time distribution. (e) Magnitude-Time distribution and cumulative numbers of them.