

Preliminary Report on Post-Earthquake On-Site Investigation after the 2013 Aceh, Indonesia Earthquake

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Summary of Earthquake

A magnitude 6.1 earthquake occurred in Aceh province, Sumatra, Indonesia. Details of the earthquake are reported by USGS¹⁾ as follows:

Time: 14:37, 2/July/2013 (local time)

Location: 4.698N°, 96.687E°

Depth: 10.0 km

The shake map around the epicenter provided by USGS is shown in Figure 1.

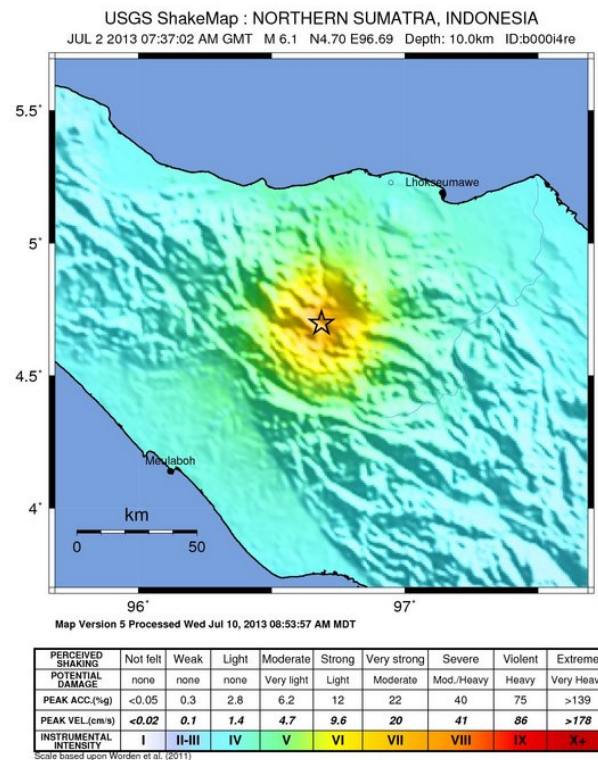


Figure 1 Shake map by USGS

Summary of On-Site Investigation

On-site investigation was conducted around the epicenter of earthquake during 27-28/July/2013 mainly by the following members:

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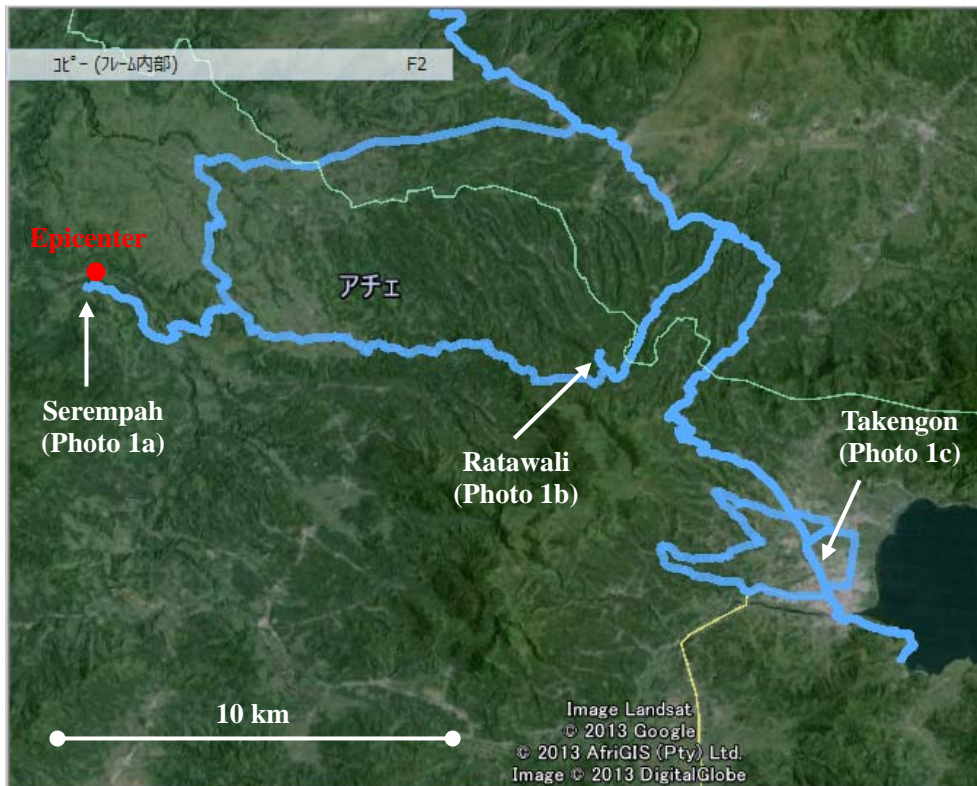
Table 1 and Figure 2 show the timetable and route map of the investigation.

Table 1 Timetable of investigation

| 26/July/2013 | Notes |
|---|--|
| 11:30 Leaving Banda Aceh | |
| 19:00 Arriving at Takengon | 6:30 driving |
| | |
| 27/July/2013 | |
| 8:00 – 9:20 Investigation in Takengon | Relatively light damage (Photo 1) |
| 9:20 – 10:20 Driving to mountain range | |
| 10:20 – 12:30 Investigation at Ratawali | Heavy damage to confined masonry (Photo 1) |
| 12:30 – 13:30 Driving to the epicenter | Similar damage at several villages |
| 13:30 – 13:45 Investigation at Serempah | Dead end due to large landslide (Photo 1) |
| 13:45 – 15:30 Driving to Takengon | |
| 15:30 – 17:00 Discussion | |
| | |
| 28/July/2013 | |
| 8:10 – 8:50 Driving to Ratawali | |
| 8:50 – 9:30 Investigation at Ratawali | Sampling materials |
| 9:30 – 16:00 Driving to Banda Aceh | 6:30 driving |
| 16:00 – 16:45 Discussion | |



(a) Banda Aceh to Takengon



(b) Takengon and mountain range close to the epicenter

Figure 2 Route map of investigation (Google Earth)



(a) Serempah on the epicenter



(b) Ratawali at about 10 km from the epicenter



(c) Takengon

Photo 1 Investigated area

Typical Building Structures and Damage

Building structural systems can be roughly categorized into four types: 1) confined masonry, 2) timber, 3) timber with masonry spandrel walls, and 4) reinforced concrete, as shown in Photo 2. The first three types except for reinforced concrete were typical structures at the mountain range close to the epicenter. Confined masonry buildings suffered from the most severe damage: complete collapse, out-of-plane failure of walls, etc., as shown in Photo 3. On the other hand, damage to timber structures was generally lighter, however, some of them leaned due to ground settlement or damage to masonry spandrel walls, as shown in Photo 4. Only one sample of reinforced concrete building, which was found at the mountain range, also suffered from severe damage, as shown in Photo 5.



(a) Confined masonry



(b) Timber



(c) Timber with masonry spandrel walls



(d) Reinforced concrete

Photo 2 Typical structures at earthquake-damaged area



(a) Complete collapse



(b) Out-of-plane failure of wall



(c) Gable wall failure



(d) Collapse of confining element

Photo 3 Typical damage to confined masonry



(a) Damage due to ground settlement



(b) Damage due to spandrel wall collapse

Photo 4 Damage to timber



(a) Severely damaged column



(b) Close-up of bottom

Photo 5 Damage to reinforced concrete

Remarks

- Severe earthquake damage to buildings was observed at several small villages on the mountain range, which can be accessed from Takengon city. Some damaged buildings can be also seen in Takengon city.
- Building systems in the attacked area can be categorized into four types: 1) confined masonry, 2) timber, 3) timber with masonry spandrel walls, and 4) reinforced concrete.
- Structural damage was observed mainly to confined masonry buildings.
- Damage to timber construction was generally light.

Reference

- 1) USGS website: <http://www.usgs.gov/>

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