Damage Survey from the 2024 Noto Peninsula Earthquake

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Survey schedule

January 28th – 29th, 2024
Uchinada → Nanao
Wajima → Anamizu → Wajima Monzen

3 seismic tests: ISK009 (1 station), Uchinada (1 station), and ISK003 (microtremor array)

Research members
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Purpose
Understanding geotechnical failure and ground motions

This report partially covers damage due to ground failure with a focus on liquefaction and some damage to buildings. (This is not an extensive report of all damages in the area)
Uchinada

- Liquefaction-induced damage:
  - Lateral spreading (about 2.7 Ha)
  - Ground upheave
  - Ground settlement
  - Sand ejecta

Lateral Spreading NW - SE

Photo Direction

Photo Number

Google Earth
Uchinada

1. Sinking of Traffic Light and upheave of side walk

Before

Street View, Google Maps

After
Uchinada

2. Lateral displacement (NW to SE) and vertical relative settlement
Uchinada

3. Tensile cracks, settlement and lateral spreading
Uchinada

4. Sand ejecta, utility pole rotation and structures’ settlement

Before

After

Street View,
Google Maps
Uchinada

5. Sand ejecta, utility pole sinking and ground upheave

Before

Street View, Google Maps

After
Uchinada

6. Sand ejecta, relative settlement and ground upheave
Uchinada

7. Sand ejecta, horizontal displacement and ground upheave
Uchinada

8. Sand ejecta, rotation, and ground upheave

Before

After

Street View, Google Maps
Uchinada

9. Vertical settlement

Before

Street View, Google Maps

After
Nanao

- Liquefaction-induced damages (1-3, 8):
  - Manholes upheave
  - Sand ejecta
  - Ground settlement

- Damage to structures:
  - Collapsed traditional wood house (4)
  - Collapsed temple entrance gate (5)
  - Collapsed first floor (6)
  - Fallen facade of steel structure (7)
1. Liquefaction-induced Damage surrounding the “Food Festival Market”

- Manholes and pipeline uplift
- Relative settlement
- Ground subsidence
Nanao

1. Liquefaction-induced Damage surrounding the “Food Festival Market”

- Ground subsidence and sand ejecta
- Ground subsidence
- Ground subsidence
2. Liquefaction-induced Damage at the Quay and the aquatic stage

- Tilted quay, sand ejecta and ground subsidence
- Sand ejecta and ground subsidence
- Ground subsidence
- Subsidence and curved quay
Nanao

3. Ground subsidence around bridge

Ramp built to access bridge

Ground subsidence

Cracks in bridge stairs

Cracks and ground subsidence at parking lot near bridge
Nanao

4. Collapsed traditional wood house

Timber structure and earthen plaster

https://www.tutikabe.net/en/
Nanao

5. Collapsed entrance gate

Before

Street View, Google Maps

After
Nanao

6. Collapsed of first floor of wood house

Vertical and horizontal asymmetry
Nanao

6. Collapsed of first floor of wood house

First “Weak floor”
Nanao

7. Fallen facade of steel structure
Nanao

RC buildings with no visible damage
Nanao

8. Liquefaction evidence near damaged and collapsed houses

Pole settlement and sand ejecta

Sand ejecta
Wajima City Center

- Many buildings were damaged or collapsed in Kawai-cho, Wajima City (path in yellow).
  - Ground deformation with compression and cracks in road in N-S and E-W direction.
  - Liquefaction evidence only in parks, parking lots, and uplift of buried pipe and manholes.
  - No evidence of liquefaction-induced failure on structures.
- A fire extended in a large area of Morning market - about 200 buildings destroyed and approx. 1.7 Ha

High compressive stresses
Wajima

1. First floor collapsed

Before

Street View, Google Maps

After
Wajima

2. First floor tilted or collapsed
Wajima

3. First floor collapsed

Before

Street View, Google Maps

After
Wajima

4. First floor collapsed
Wajima

5. First floor collapsed

Before

After

Street View, Google Maps
6. Liquefaction evidence: sand ejecta, ground cracks and manholes uplift
Wajima

6. Liquefaction evidence: manholes uplift and settlement
Wajima

7. Collapsed seven-story building (toppled)
Wajima

8. Fire after earthquake
Wajima

9. Houses collapsed due to seismic landslide
Anamizu

- Two K-NET stations: ISK005 Anamizu (Soft site) and ISK015 Omachi (Medium stiff site)
- ISK005:
  - Bank and ground deformations are observed around the station, but it cannot be determined whether this is due to liquefaction.
  - Water pipeline broke in the street.
- Other houses and structures damage in the town.
Anamizu

1. House tilted and settled near ISK005
Anamizu

2. Building tilted

Before

Street View, Google Maps

After
Wajima Monzen

- Many collapsed and damaged wood houses.
- Dry port
- Coast uplift
Wajima Monzen

1. Collapsed first floor

Before

After
Wajima Monzen

2. Tilted houses
Wajima Monzen

3. Dry port and
Coast uplift
Wajima Monzen

3. Coast uplift

Before

After
Summary of reconnaissance survey

- Liquefaction-induced damage particularly observed in Uchinada, mainly lateral spreading in a large area. The extent is currently unknown.

- Areas with significant building damage were observed particularly in Wajima city center, Wajima Monzen, and Uchinada. But also damaged observed in Anamizu and Nanao.
  - Cracks, settlement and uplift were visible on the road surface.
  - Sand ejecta, sinking poles and manholes uplift evidence liquefaction.
  - However, the causal relationship between building damage and liquefaction is currently unknown.

- K-Net and JMA stations visited were in good conditions but significant damage was observed in their surrounding.