

[A part of lecture note for IISEE training]

Overview of the Mw7.1 earthquake on February 13, 2021

(2021/02/19)

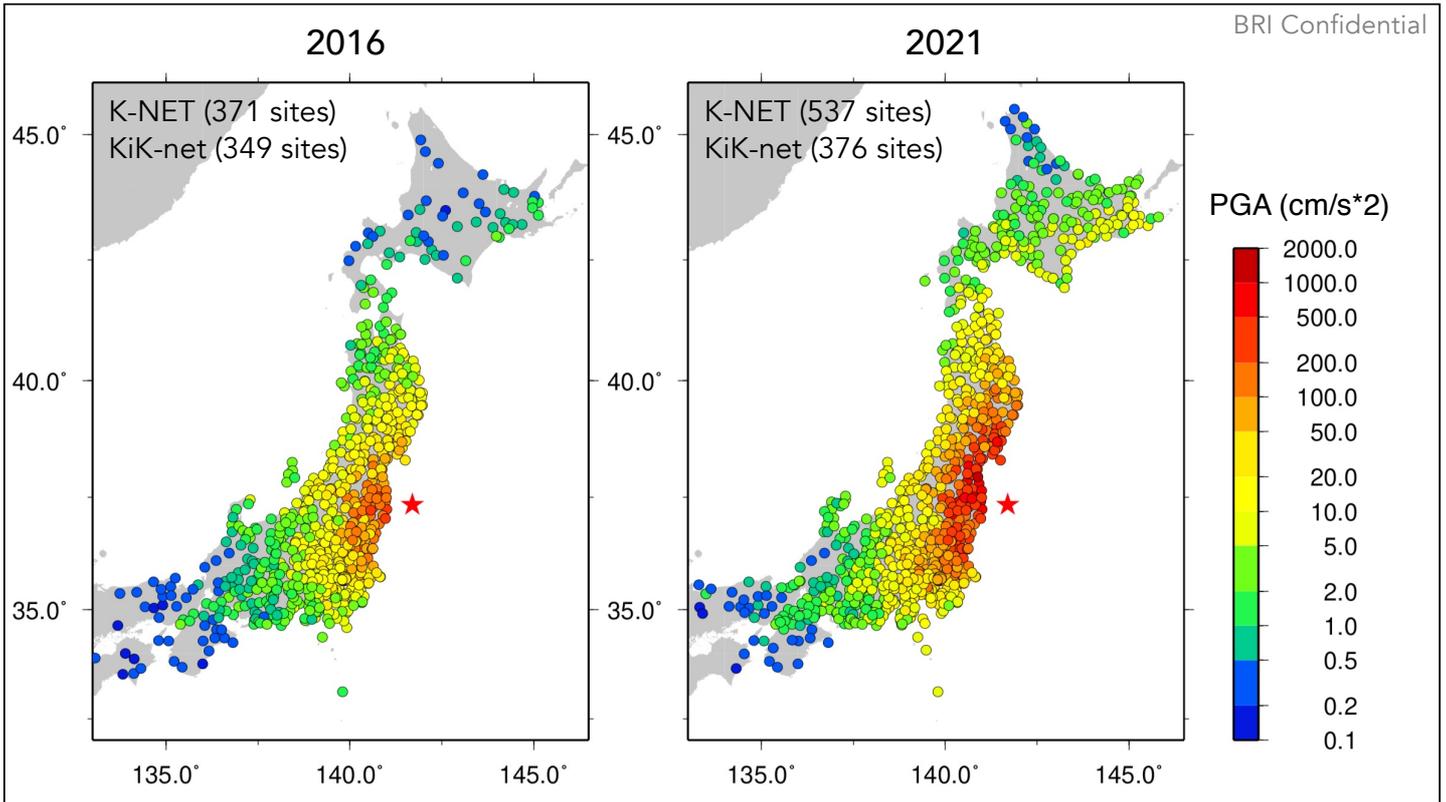
# Strong Ground Motions

## –Comparisons with the 2016 Off Fukushima Earthquake (Mj7.4, h=25 km)–

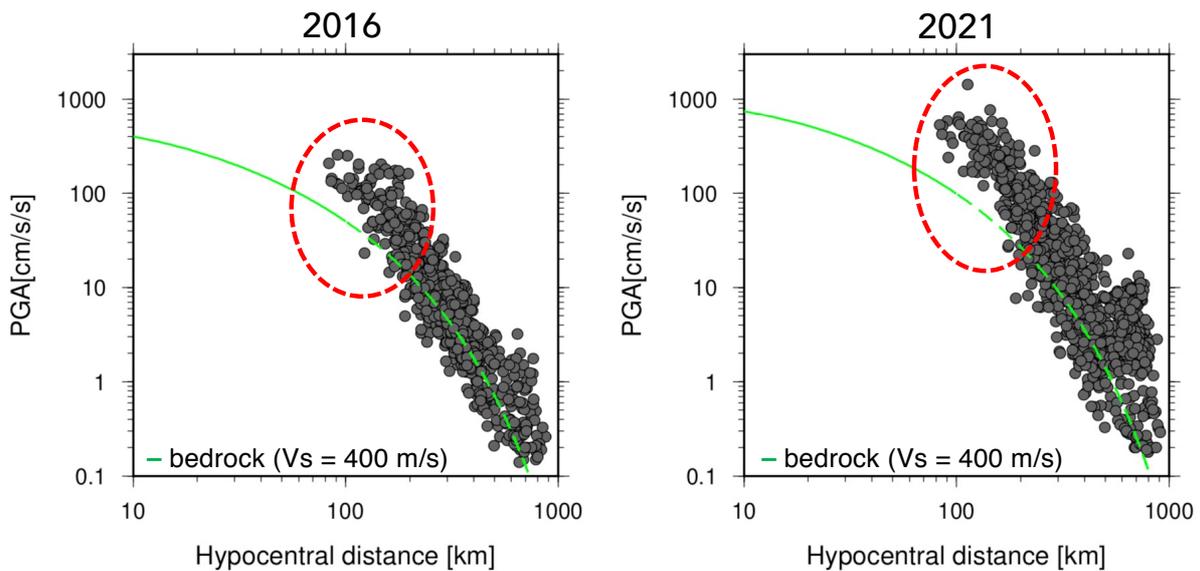
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Created on: Feb 19, 2021  
Modified on: Mar 24, 2021

## Peak Ground Accelerations

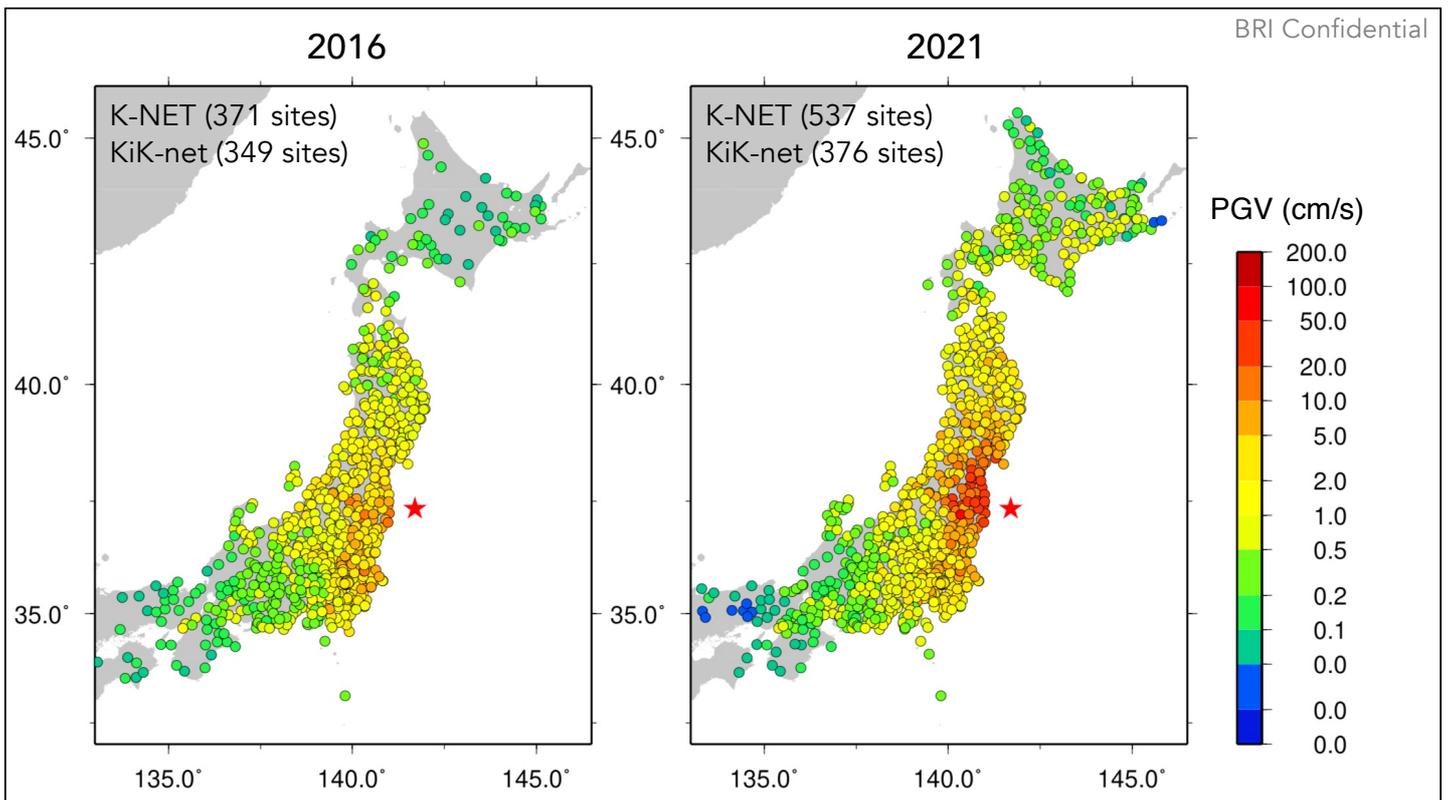


### Observed PGAs vs GMPE (Si and Midorikawa, 1999)

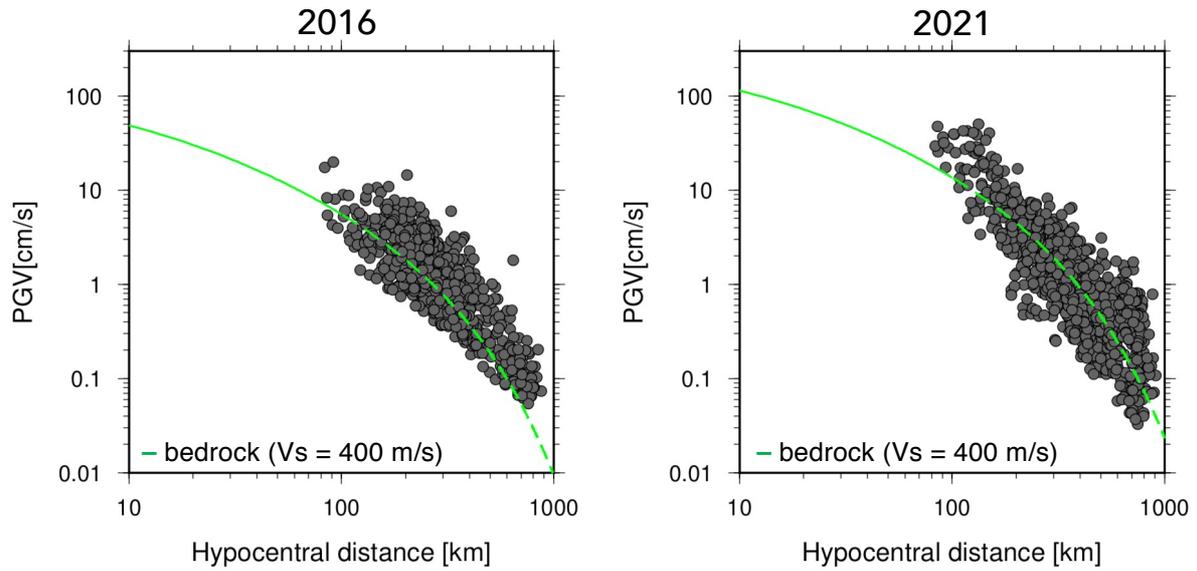


- ※ Hypocentral distance is shown in the horizontal axis (not the shortest distance to the fault).
- ※ Crustal earthquake is assumed for the 2016 EQ and intraplate earthquake is assumed for the 2021 earthquake.
- ※ Si and Midorikawa's equation was designed for ground motions up to 100 km from the fault.  
Estimated values beyond 100 km (dashed line) are shown as reference values.

# Peak Ground Velocities



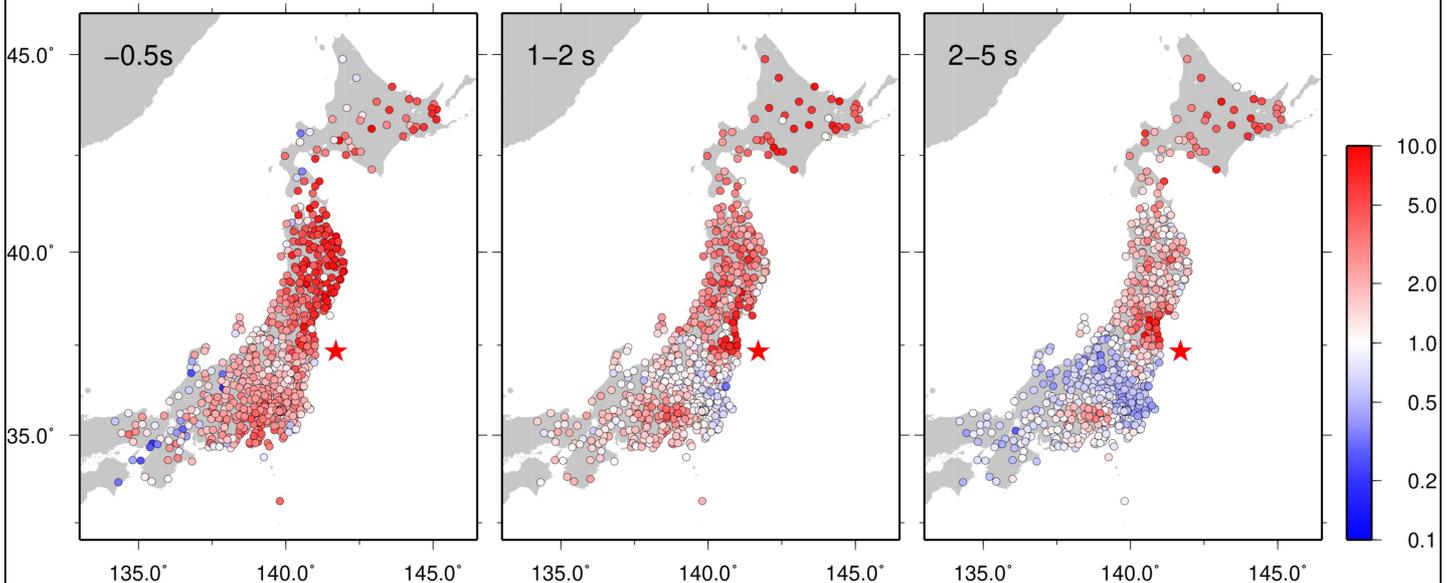
# Observed PGVs vs GMPE (Si and Midorikawa, 1999)



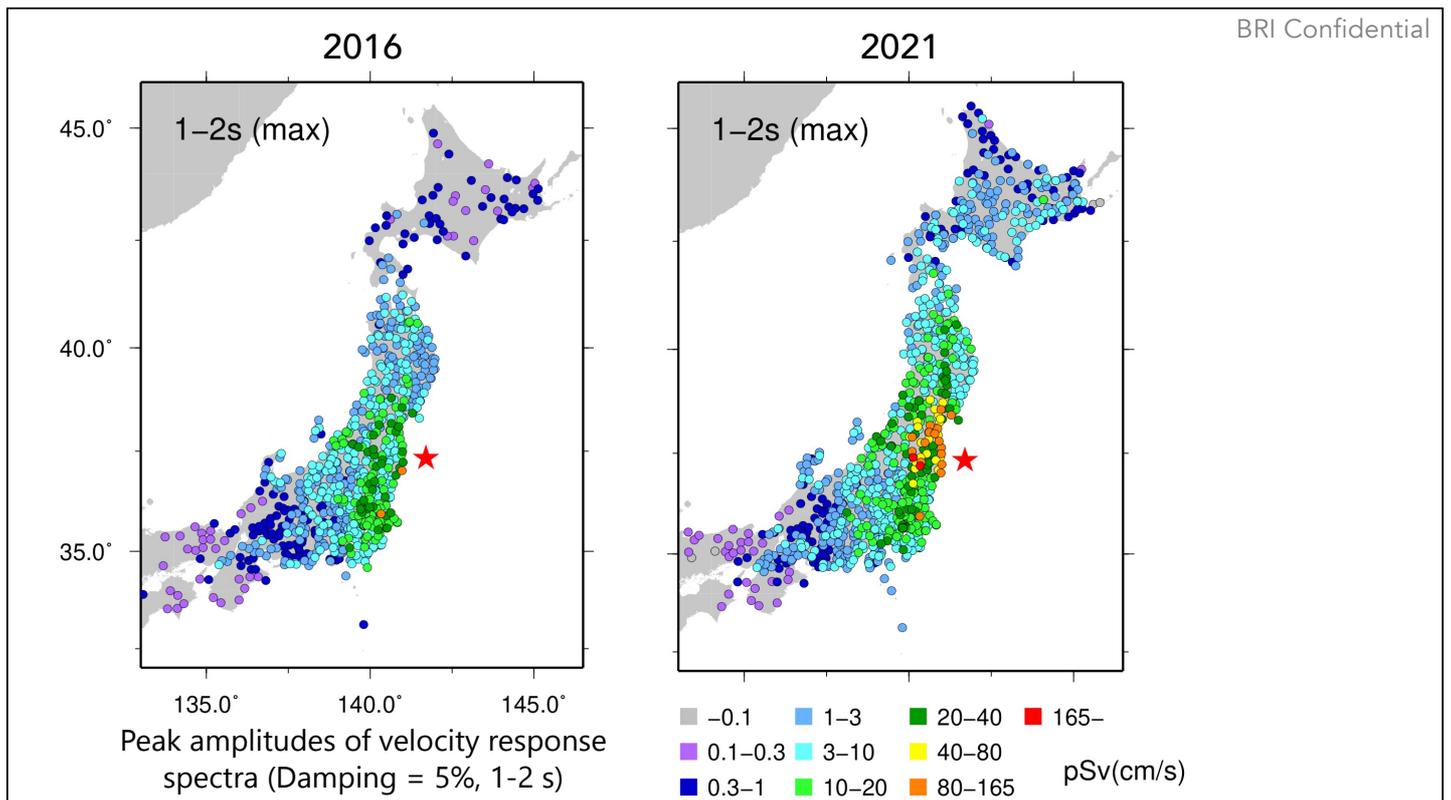
- ※ Hypocentral distance are shown in the horizontal axes (not the shortest distance to the fault).
  - ※ Crustal earthquake is assumed for the 2016 EQ and intraplate earthquake is assumed for the 2021 earthquake.
  - ※ Si and Midorikawa's equation was designed for ground motions up to 100 km from the fault.
- Estimated values beyond 100 km (dashed line) are shown as reference values.

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## PGV ratios (2021/2016) in different period bands



# Response Spectra



## Summary

- Larger ground motion amplitudes are observed in the short-period band ( $T < 0.5$  s) during the 2021 EQ at most sites
- Larger ground motions amplitudes are observed in the long-period band ( $T > 1$  s) during the 2016 EQ at deep sedimentary basin sites in the Kanto region
- Different propagation paths (attenuation characteristics) between 2016 and 2021 EQs mainly resulted in the different ground motion distributions
- Response spectra of the 2021 EQ show larger values between 1–2 s at sites in Fukushima and Miyagi Prefectures

### Acknowledgements:

I used K-NET and KiK-net strong-motion data provided by the National Research Institute for Earth Science and Disaster Resilience; (NIED), Japan

<https://www.doi.org/10.17598/NIED.0004>

Velocity response spectra were calculated using the subroutine program developed by Osaki (1994).

Figures were prepared by using the Generic Mapping Tools (GMT: Wessel and Smith, 1998).