

[A part of lecture note for IISEE training]

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

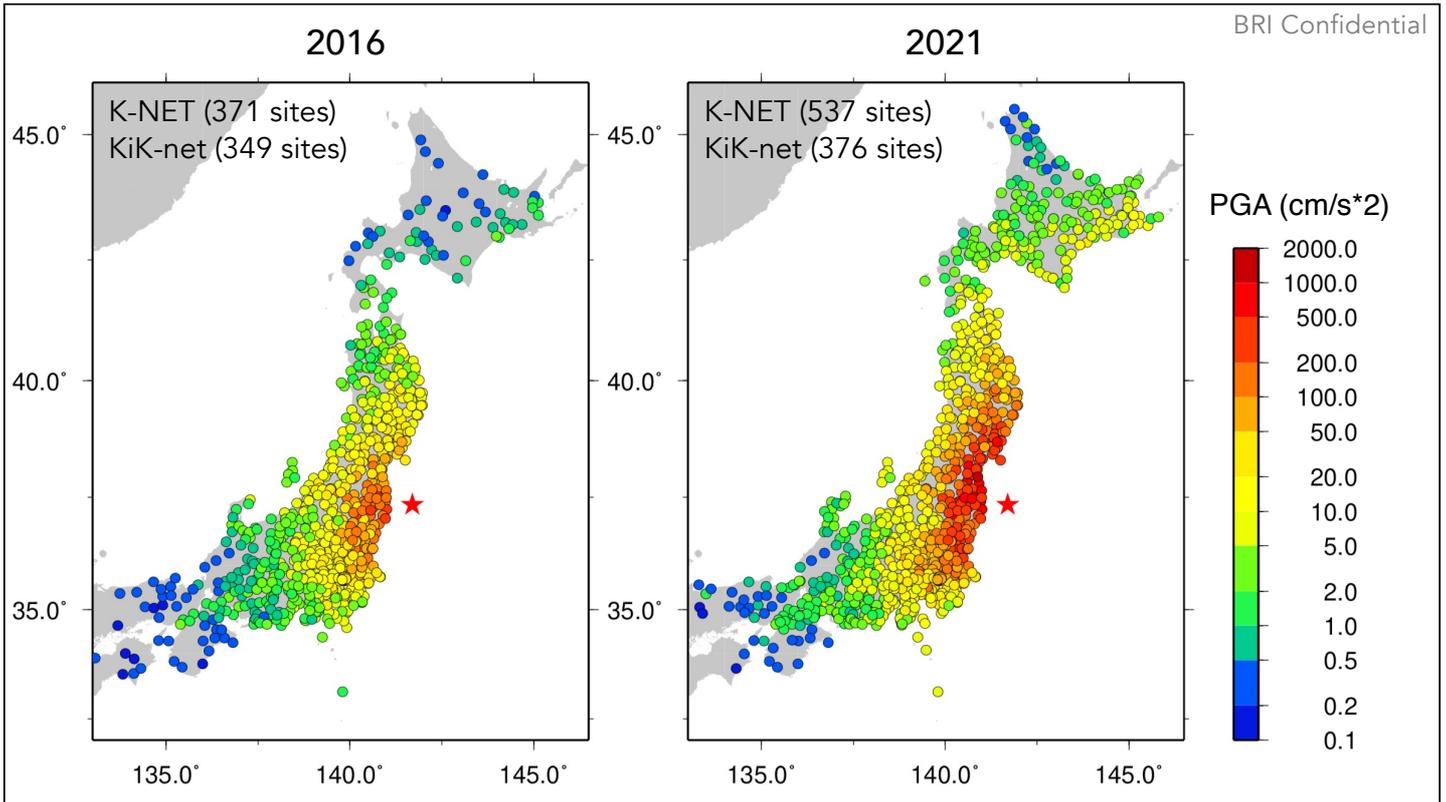
(2021/02/19)

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

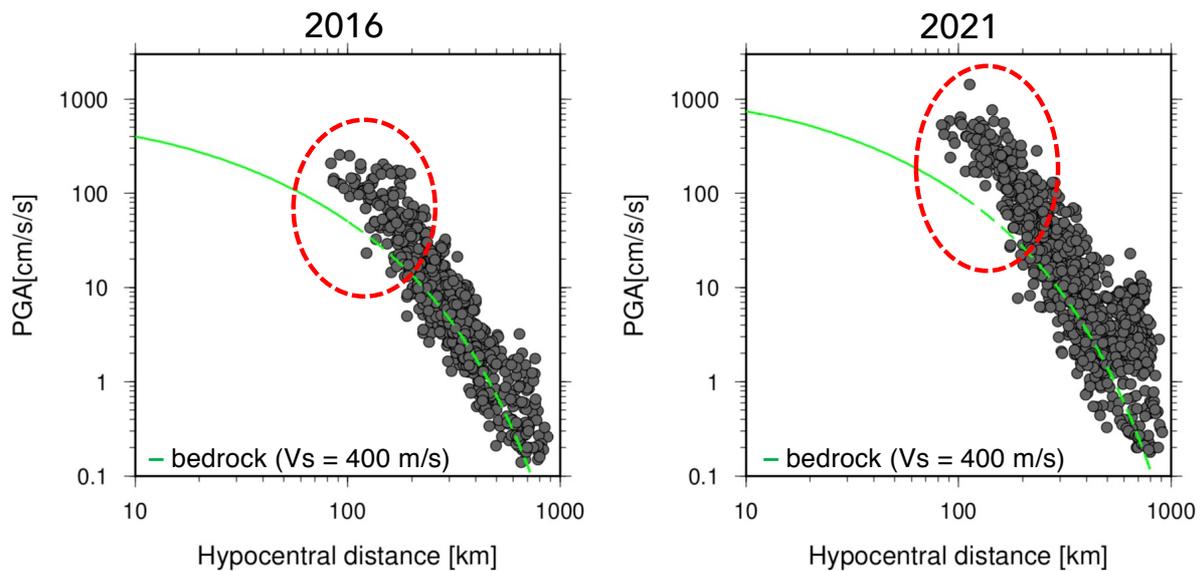
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Created on: Feb 19, 2021
Modified on: Mar 24, 2021

Peak Ground Accelerations

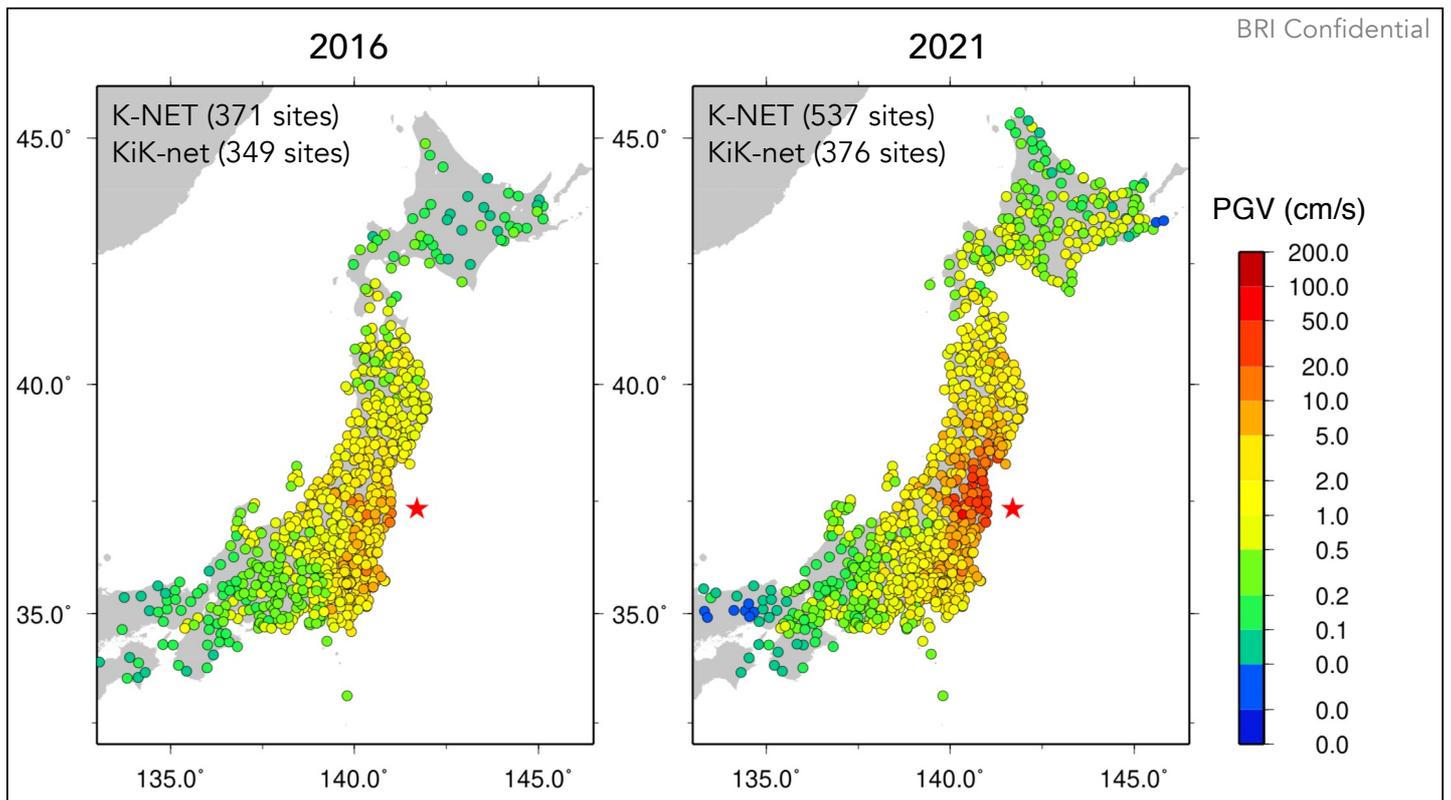


Observed PGAs vs GMPE (Si and Midorikawa, 1999)

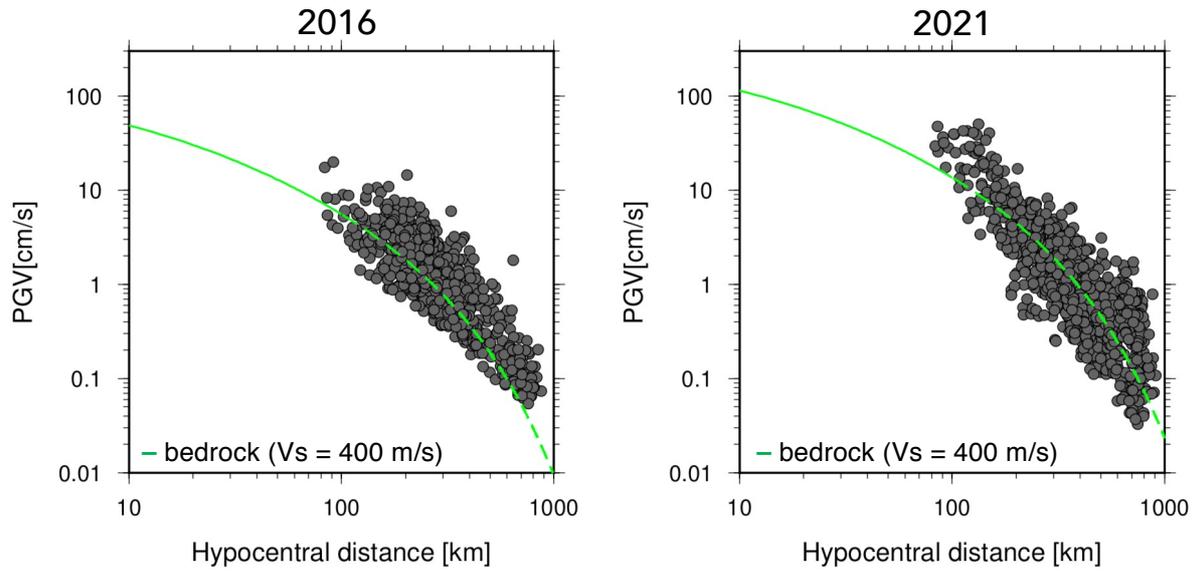


- ※ Hypocentral distance is shown in the horizontal axis (not the shortest distance to the fault).
- ※ Crustal earthquake is assumed for the 2016 EQ and intraplate earthquake is assumed for the 2021 earthquake.
- ※ Si and Midorikawa's equation was designed for ground motions up to 100 km from the fault.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

Peak Ground Velocities



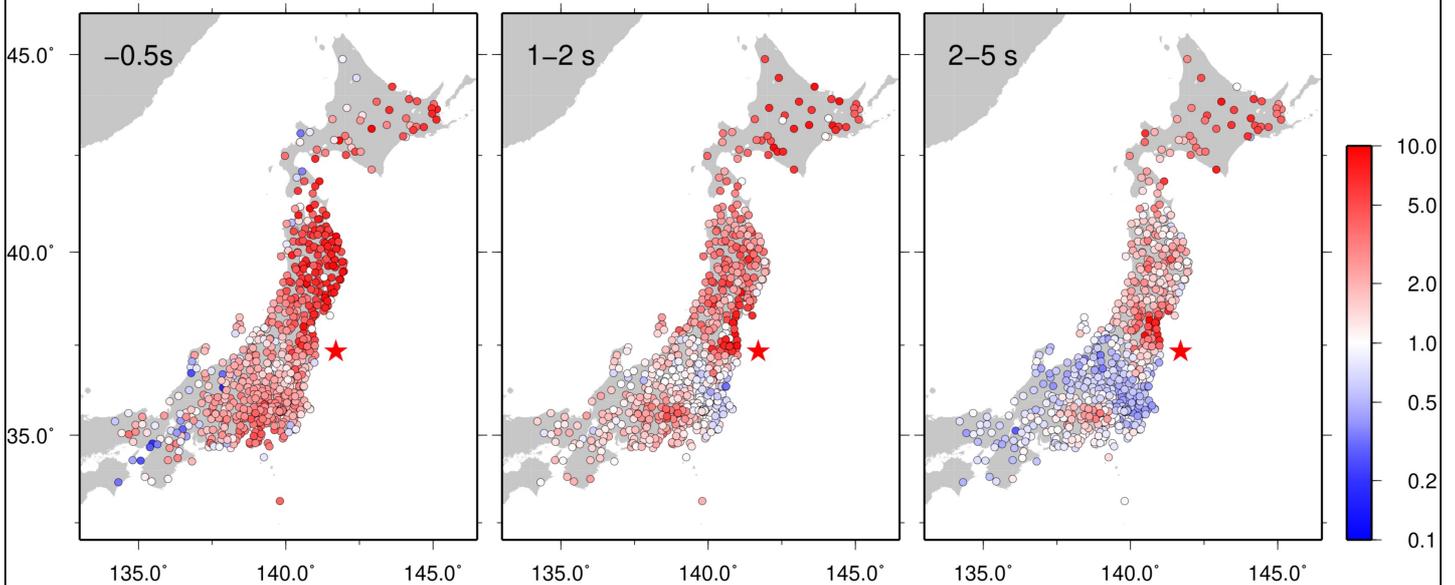
Observed PGVs vs GMPE (Si and Midorikawa, 1999)



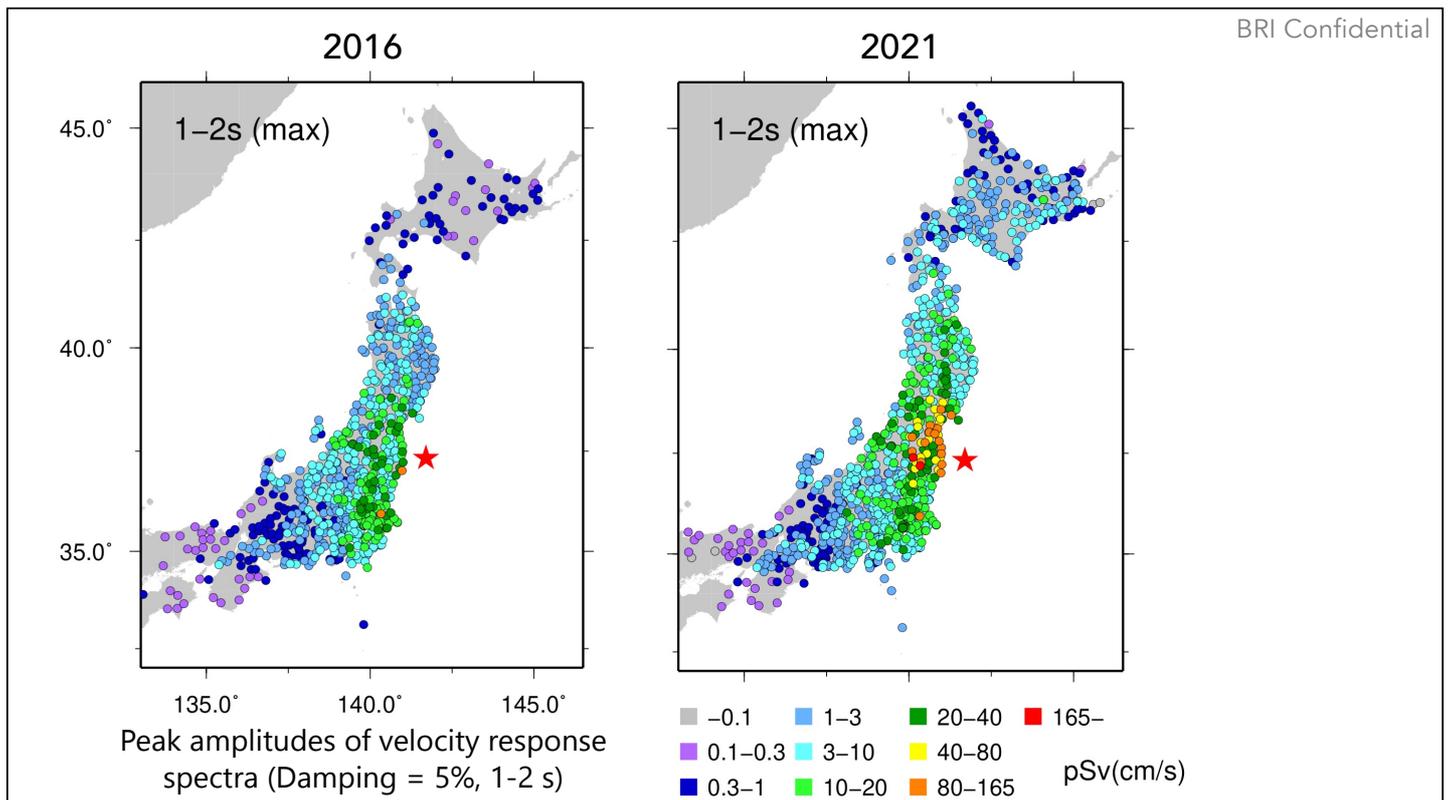
- ※ Hypocentral distance are shown in the horizontal axes (not the shortest distance to the fault).
 - ※ Crustal earthquake is assumed for the 2016 EQ and intraplate earthquake is assumed for the 2021 earthquake.
 - ※ Si and Midorikawa's equation was designed for ground motions up to 100 km from the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