

Strong Ground Motions

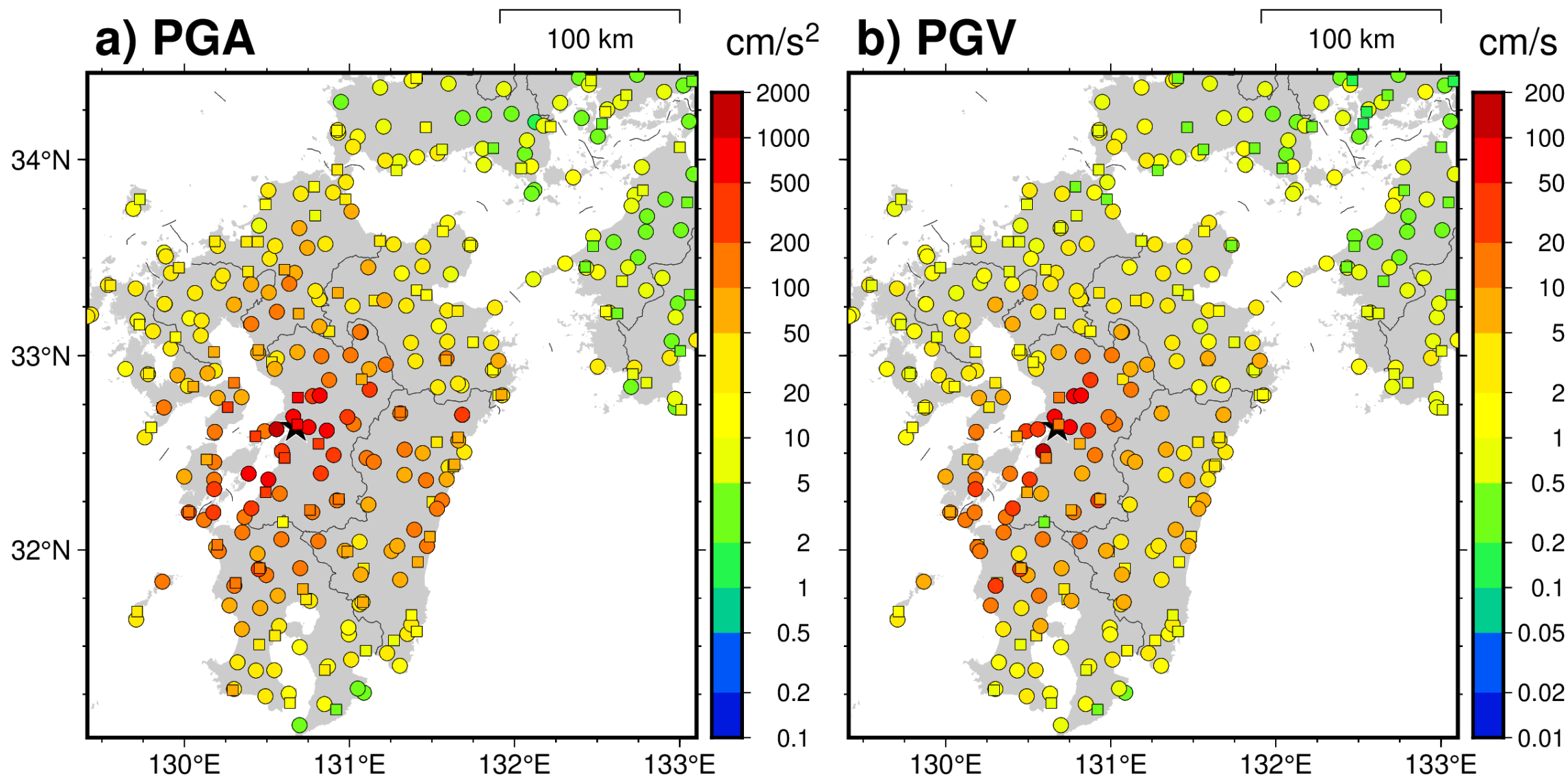
2026 Kumamoto Earthquake on July 28, 2026
(Mj7.1, Mw6.7)

IISEE, Building Research Institute

This report contains preliminary analysis results.

*The moment magnitude (Mw) was adopted from the estimate provided by NIED F-net.

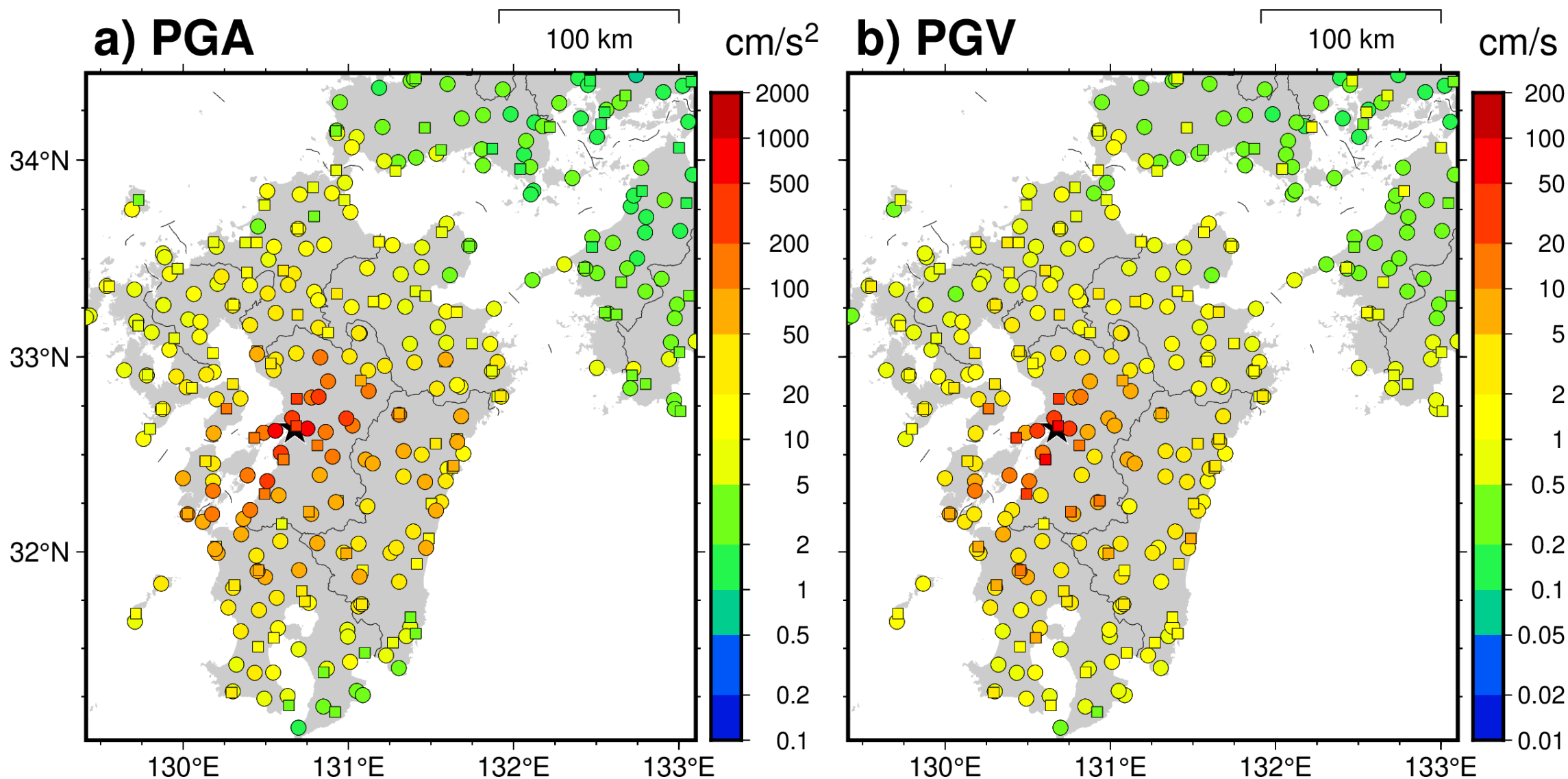
Observed PGAs/PGVs (Horizontal comp.)



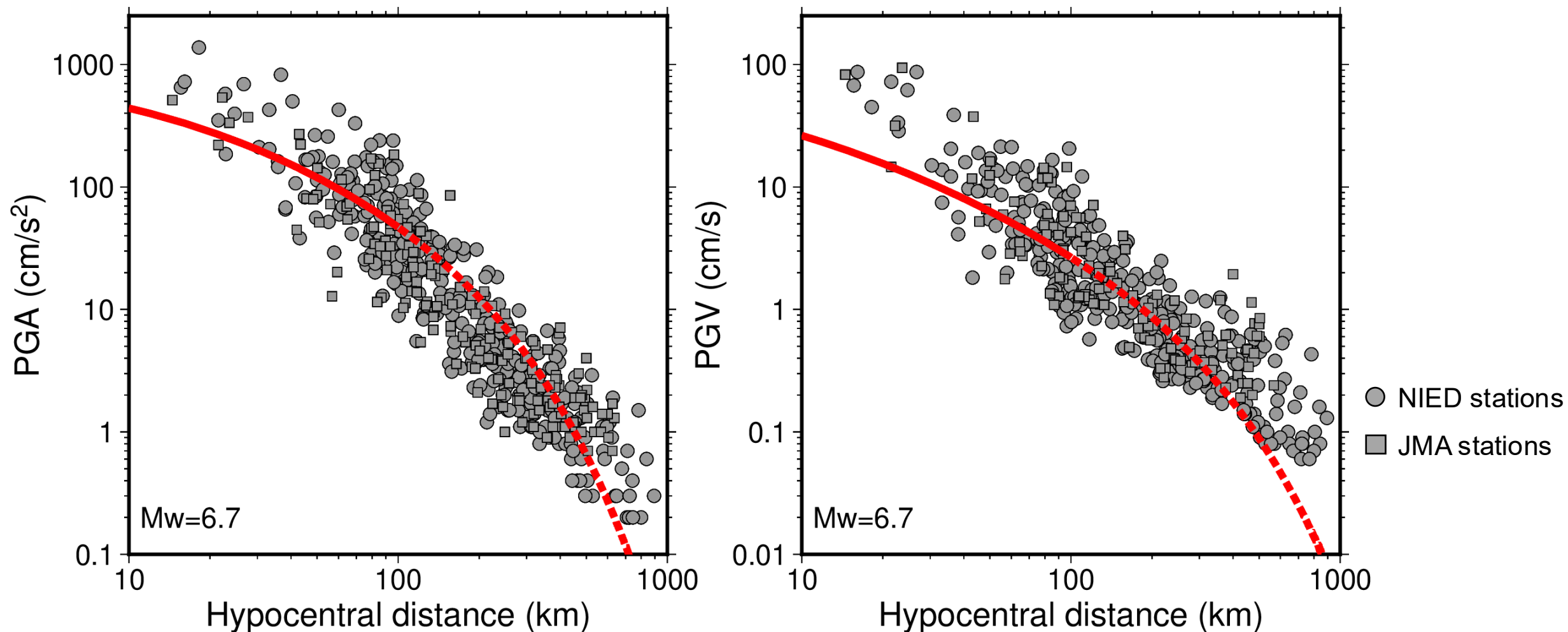
○: NIED stations, □: JMA seismic intensity stations

※ PGA and PGV are the maximum values of vector summation in the horizontal components.

Observed PGAs/PGVs (Vertical comp.)



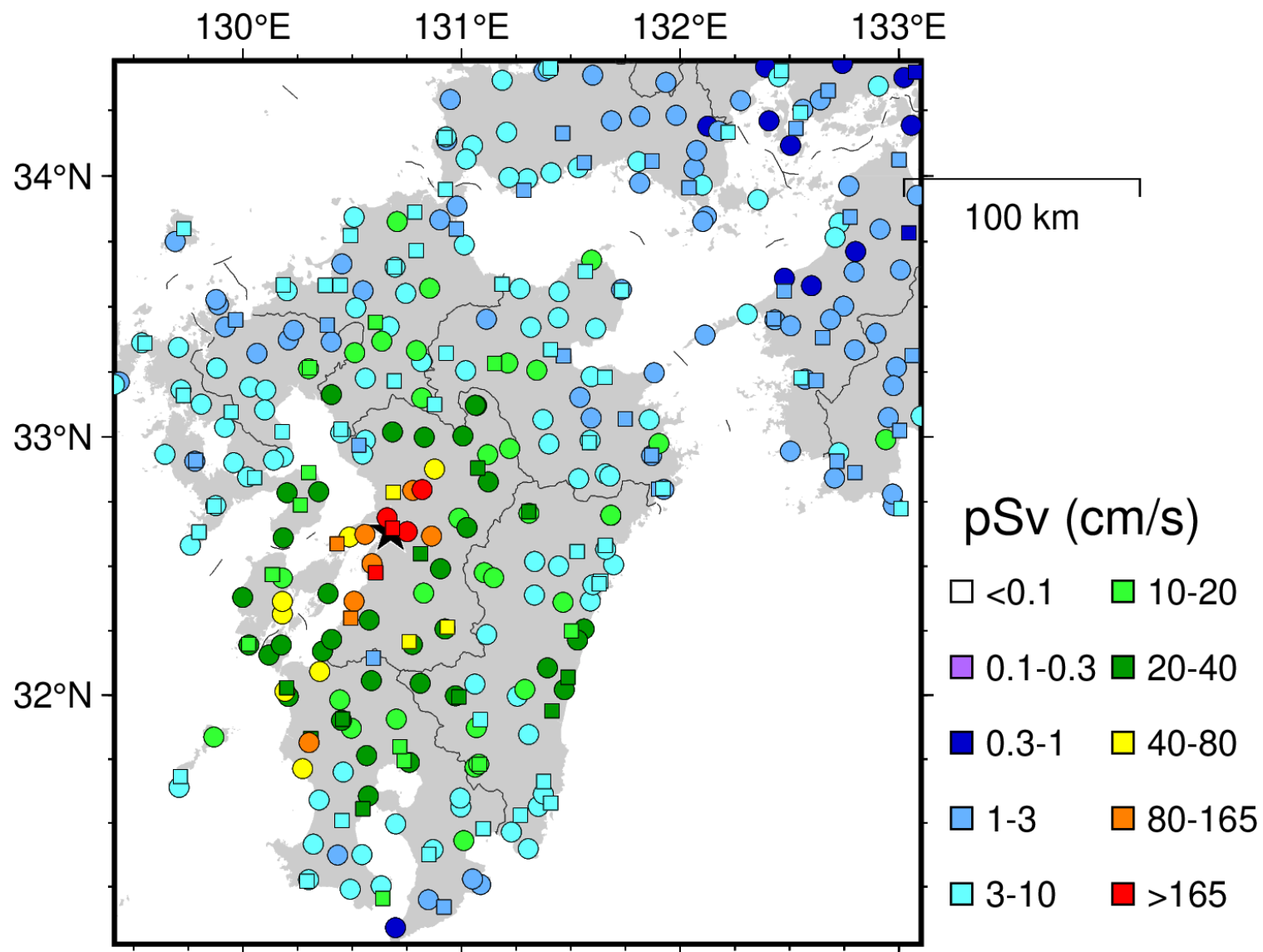
Observed PGAs/PGVs vs GMPE (Si & Midorikawa, 1999)



- ※ Horizontal axis is NOT the “shortest distance to the fault”.
- ※ PGA/PGV values are the larger of the maximum values of NS and EW components.
- ※ Crustal earthquake (depth=14 km) is assumed for the estimation.
- ※ Estimated values beyond 100 km (dashed line) are shown as reference values.

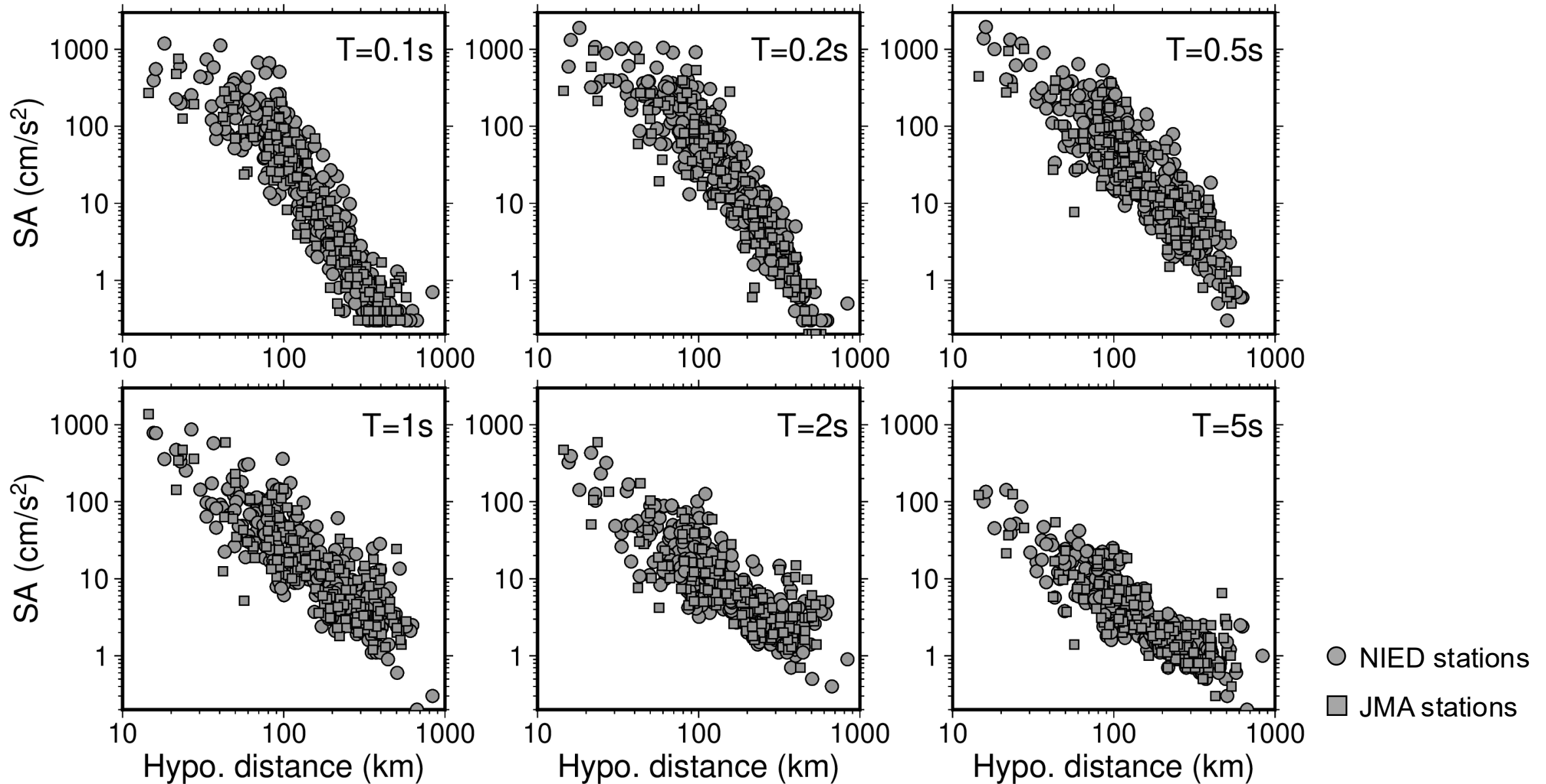
Pseudo-velocity response

(pSv: maximum value for periods of 1–2 s, 5% damping)



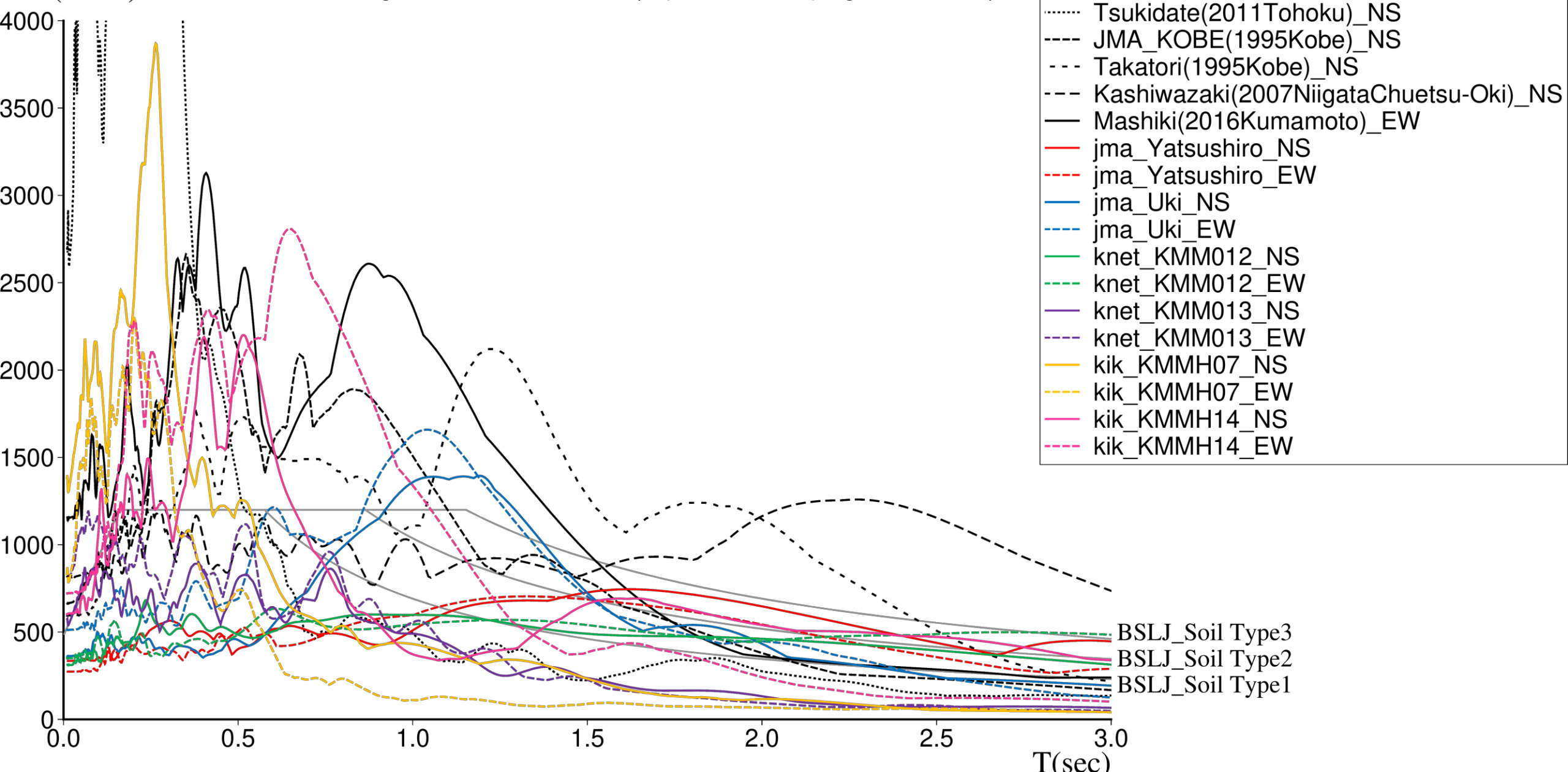
Attenuation characteristics of response spectra (Sa)

5% damping

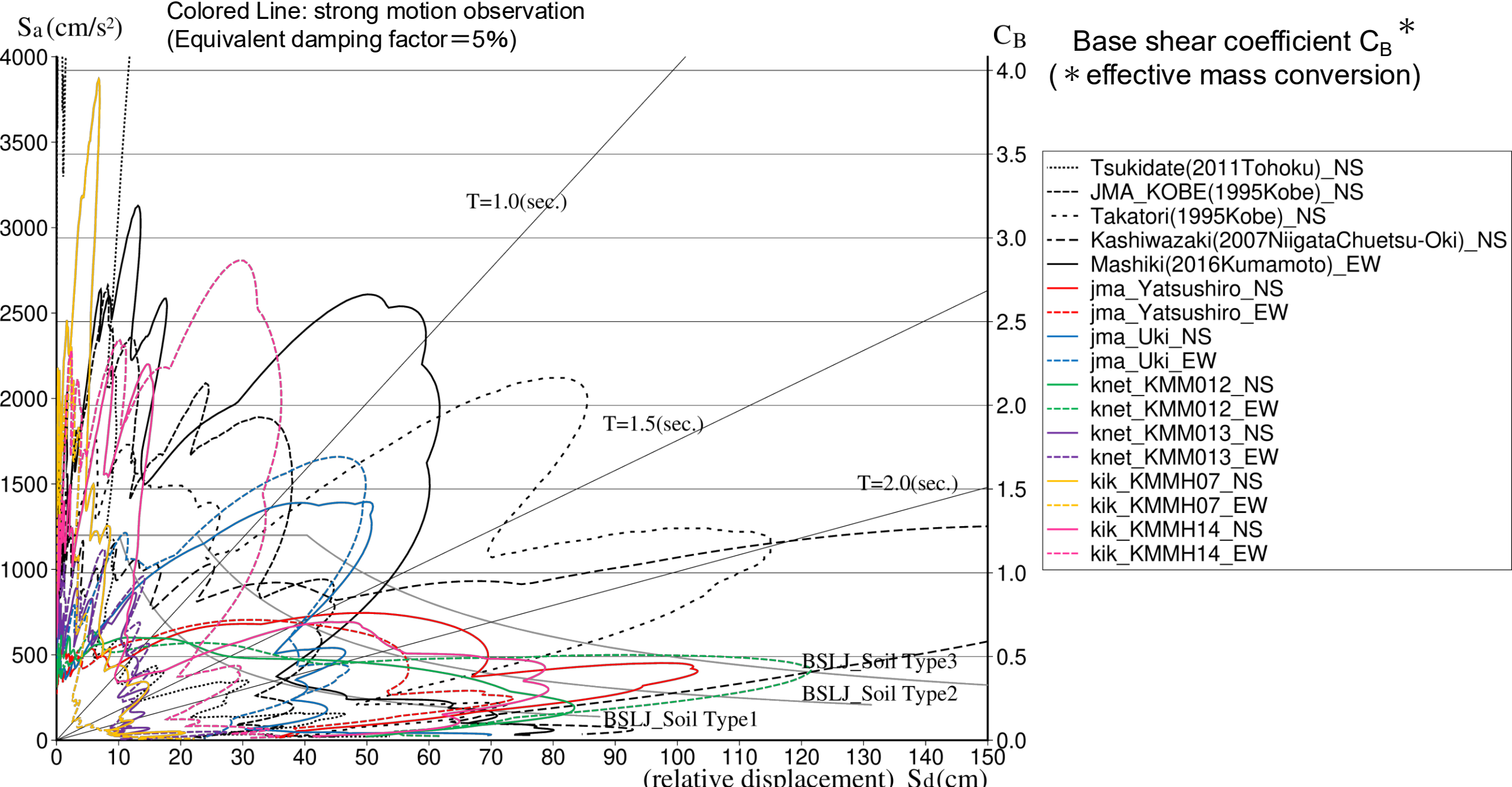


Response acceleration spectrum S_a and response periods

S_a (cm/s²) Colored Line: strong motion observation (Equivalent damping factor=5%)



$S_a - S_d$ curve and response periods



Summary

- Strong ground motions were observed over a wide area of the Kyushu region.
- Significant ground motions were observed from central Kumamoto Prefecture to the southwestern coastal areas.
- At least five stations recorded pseudo-velocity response spectra (5% damping) exceeding 165 cm/s in the 1–2 s period range.
- From the Sa-Sd curve assuming a 5% equivalent damping ratio, the Sa-Sd shapes of the East-West (EW) components of KMM012 were protruded with a period of 3 seconds, and JMA_Uki were protruded with a period of 1 second.
- From the response accelerations (Sa) and the Sa-Sd curve, assuming a 5% damping ratio, the Sa and Sa-Sd shapes of this earthquake were comparable to, or less pronounced than, those of past major earthquakes in Japan.

Acknowledgments

We 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>)

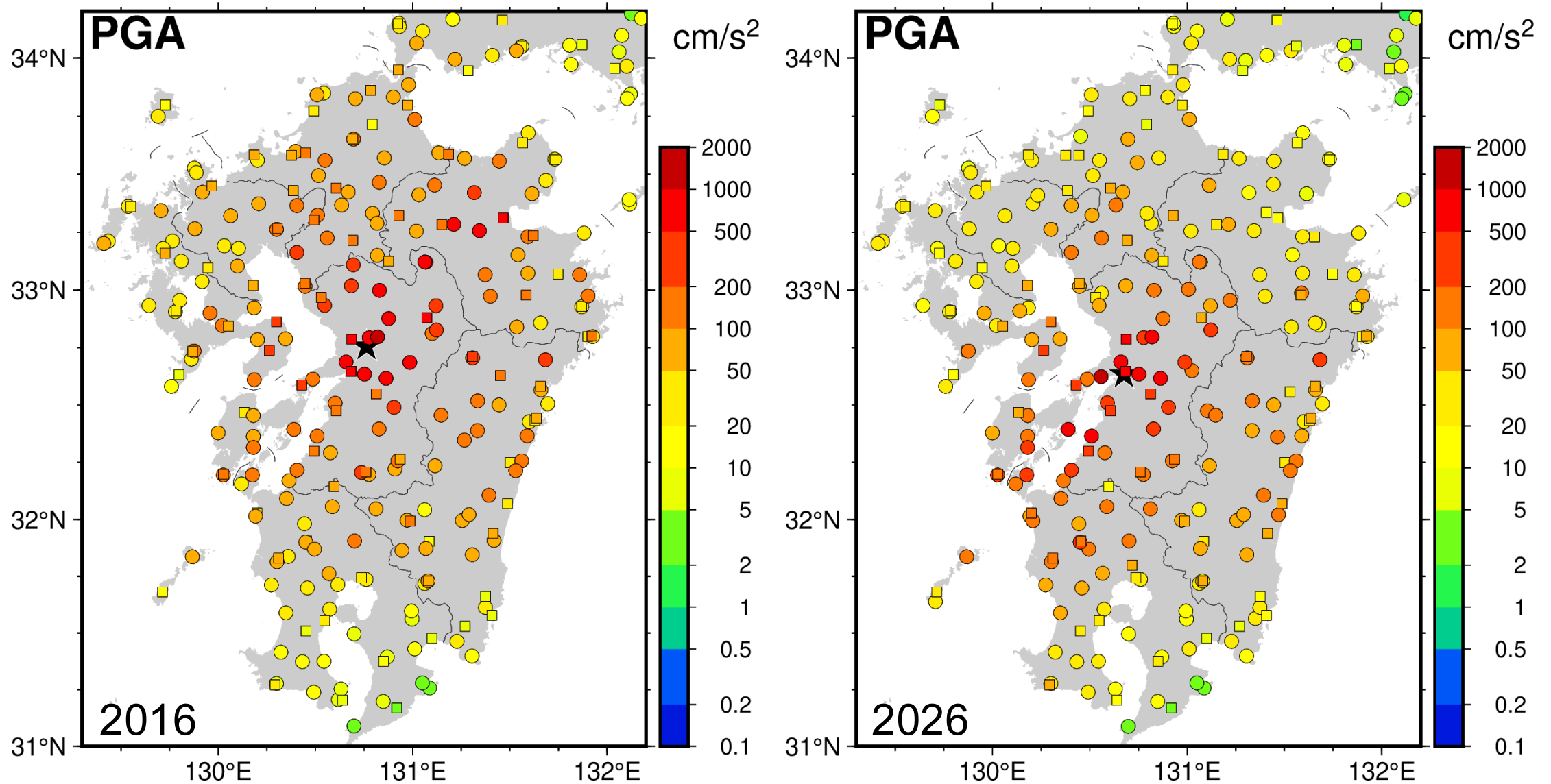
We used strong-motion data from NIED (K-NET and KiK-net), JMA, and RTRI for past strong motion in Japan.

Sa-T and Sa-Sd were calculated using the View Wave by Kashima, BRI.

Figures were prepared using Generic Mapping Tools (GMT: Wessel and Smith, 1998 and 2019).

Comparison with the 2016 Kumamoto Earthquake
(mainshock: Mj7.3, Mw 7.0)

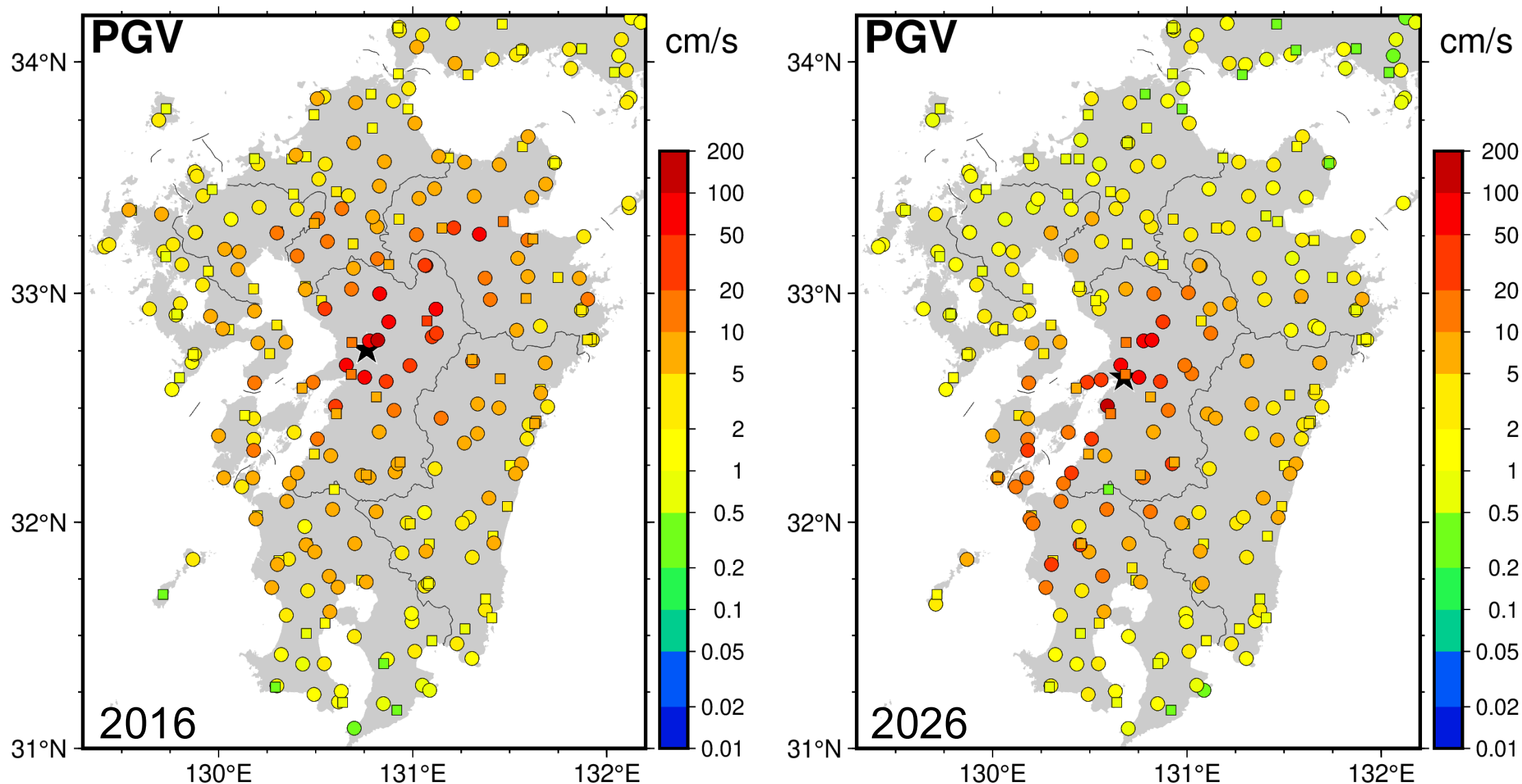
PGA (maximum values of vector summation in the horizontal components)



○: NIED stations, □: JMA seismic intensity stations

※ PGAs are the maximum values of vector summation in the horizontal components.

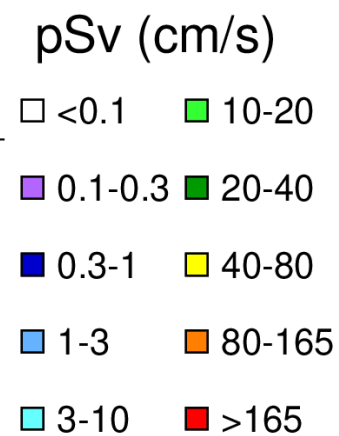
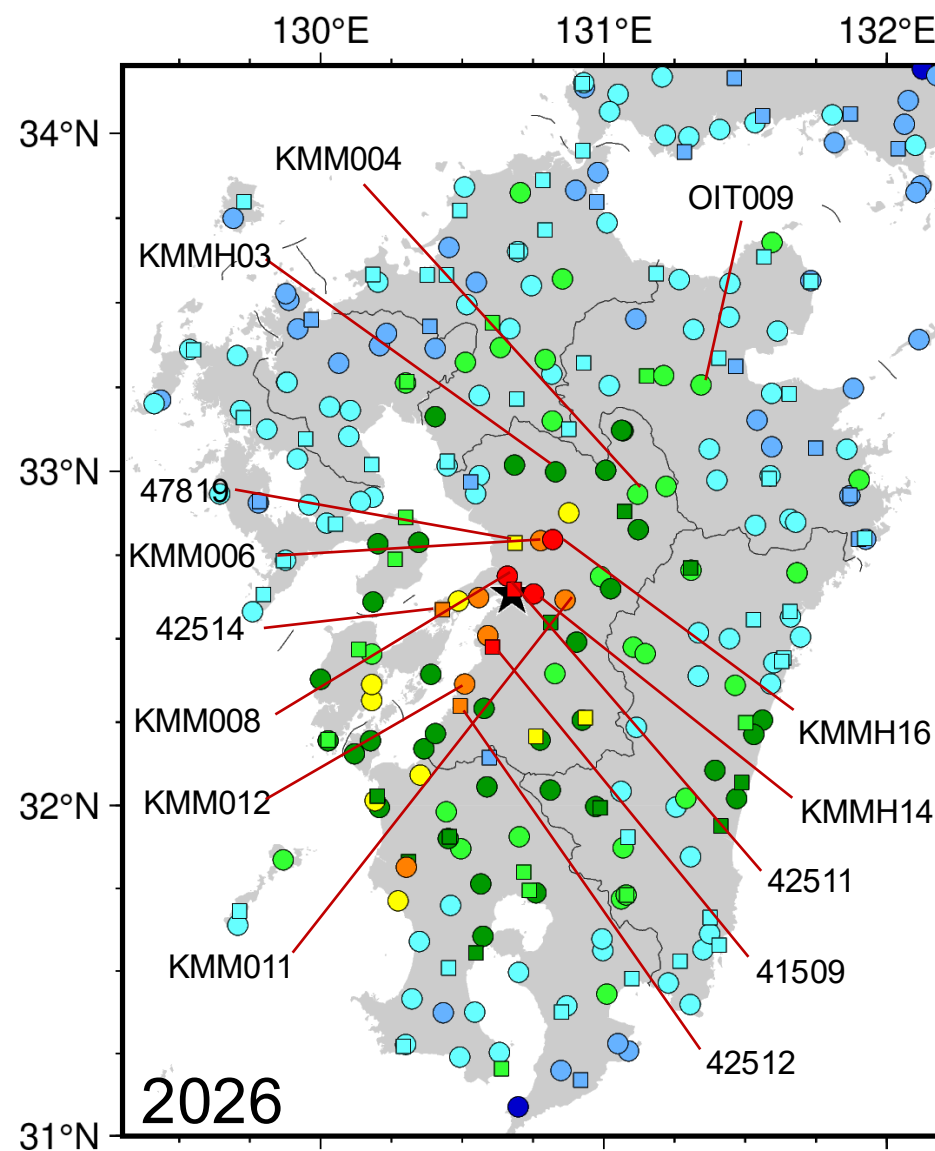
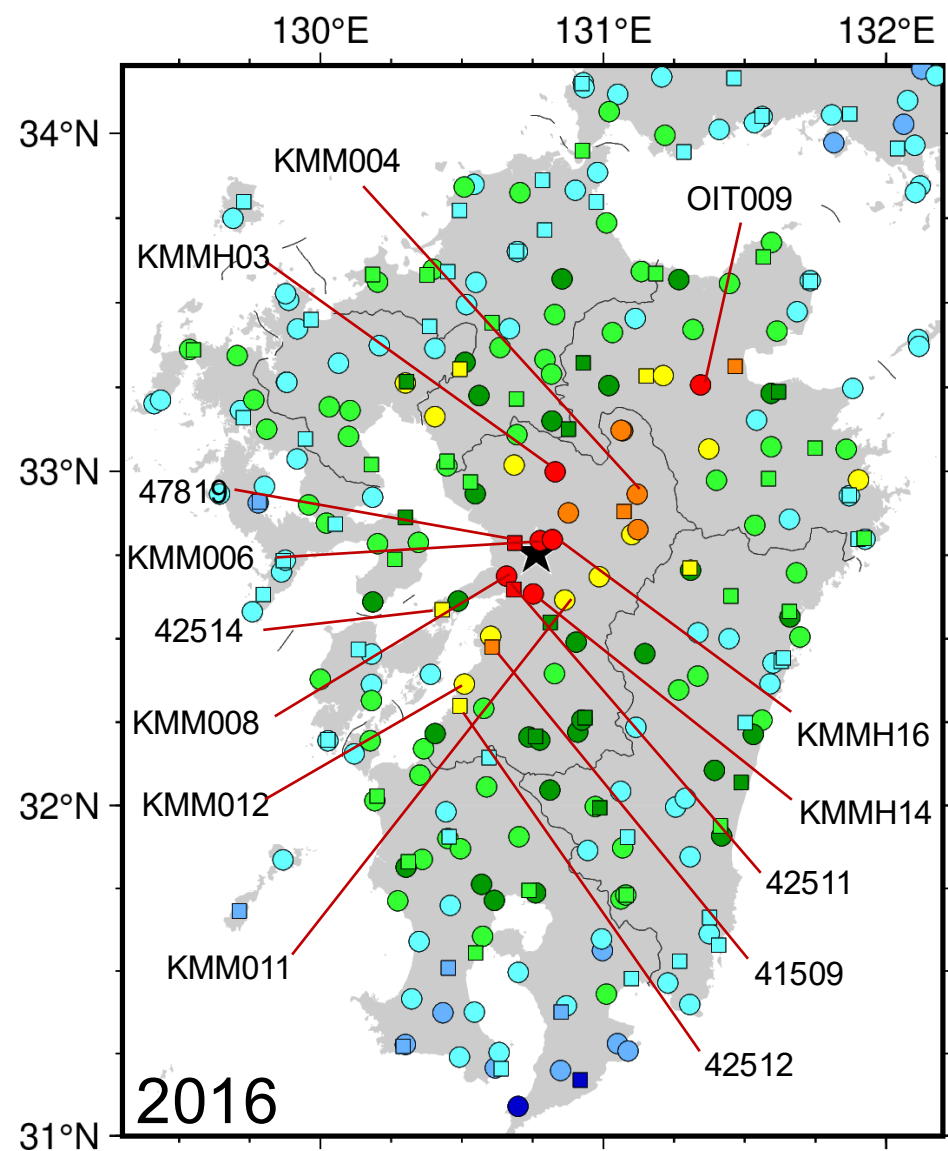
PGV (maximum values of vector summation in the horizontal components)



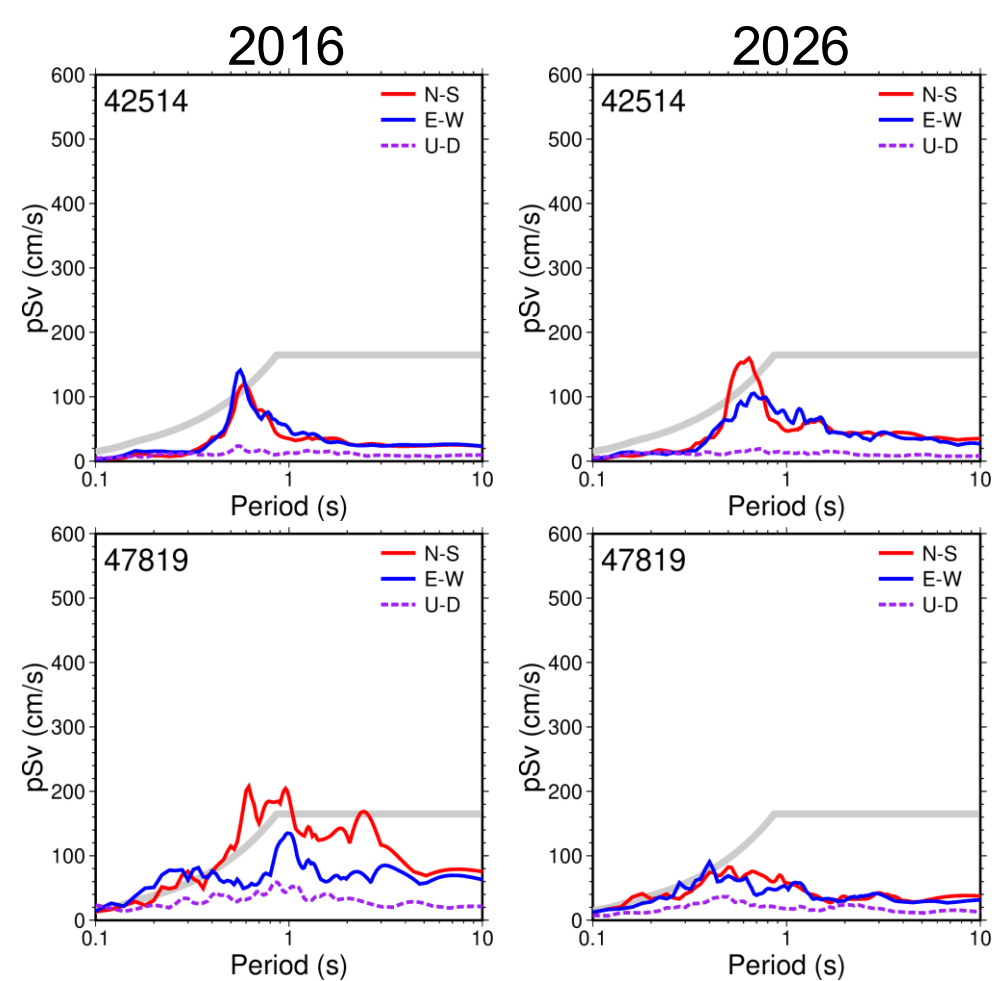
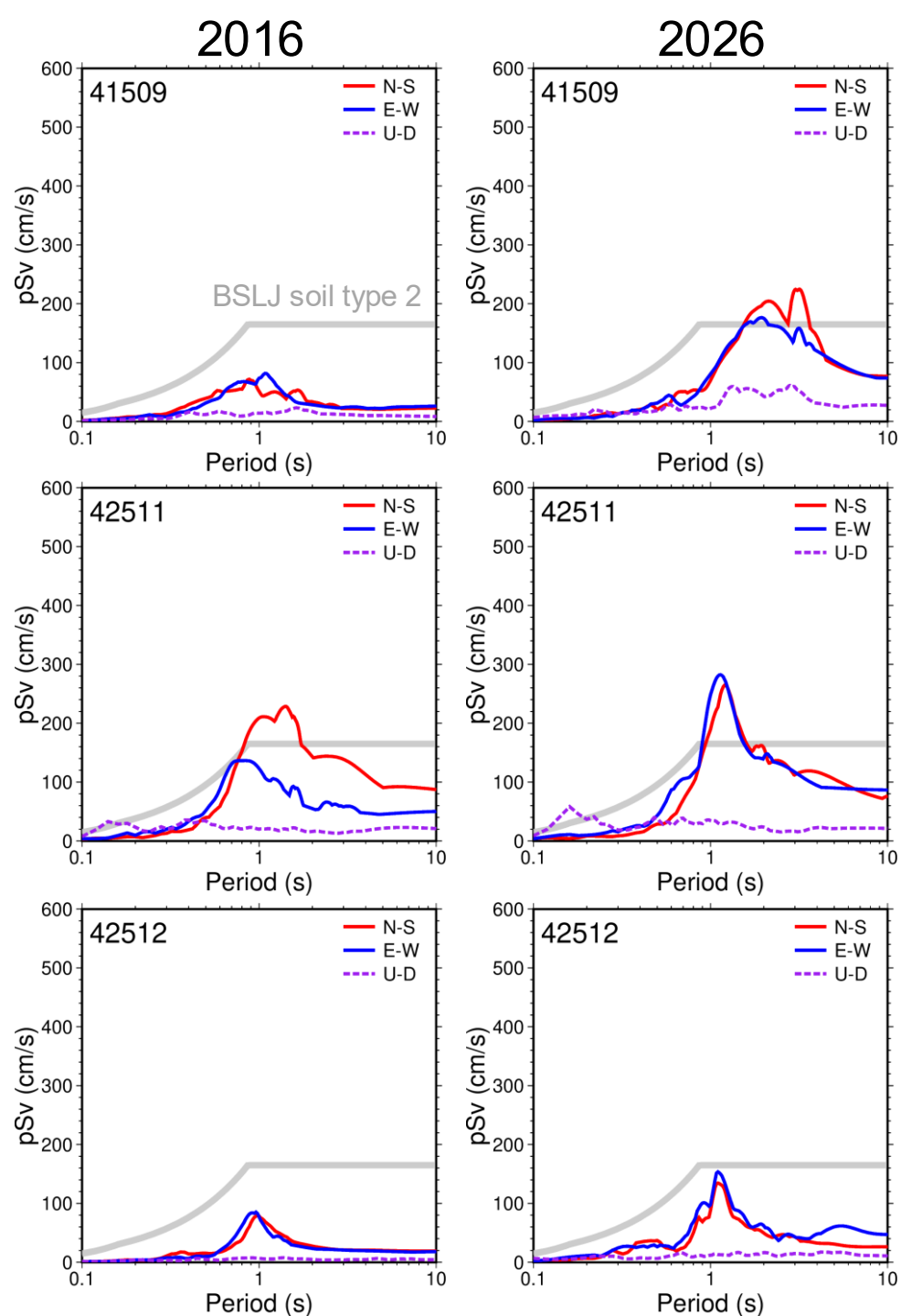
○: NIED stations, □: JMA seismic intensity stations

※ PGVs are the maximum values of vector summation in the horizontal components.

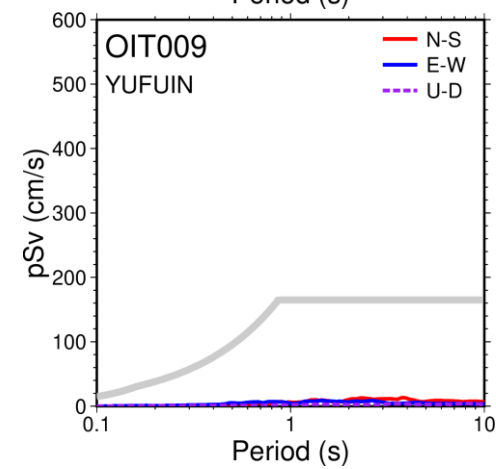
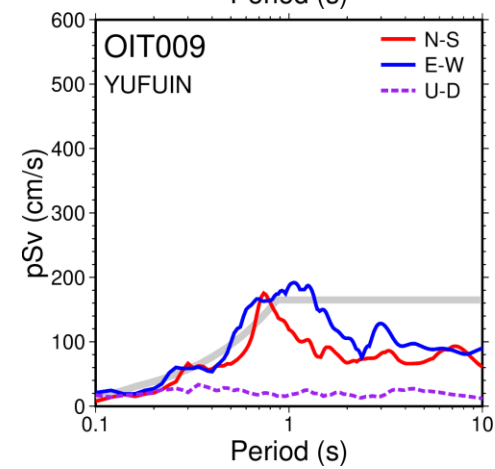
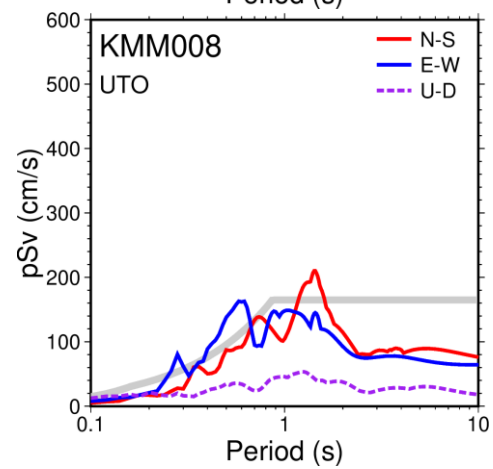
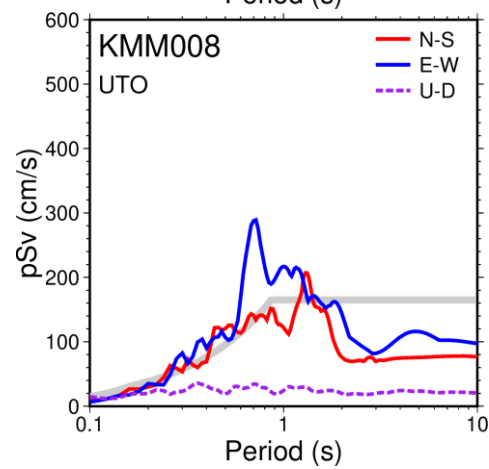
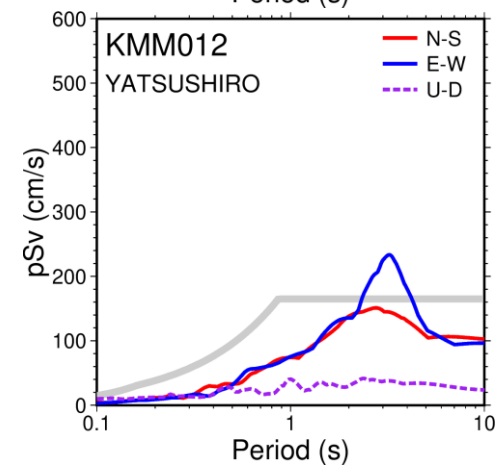
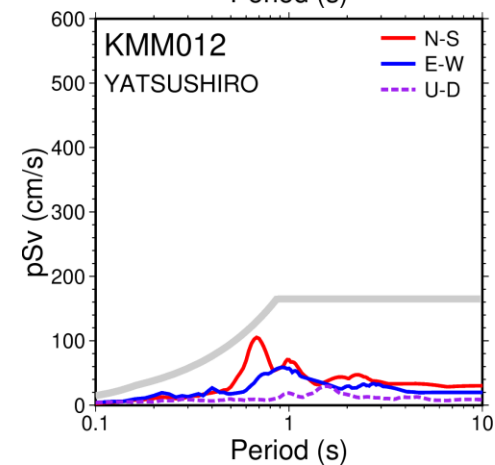
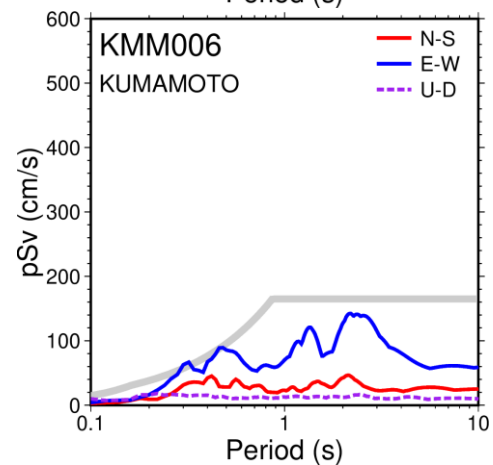
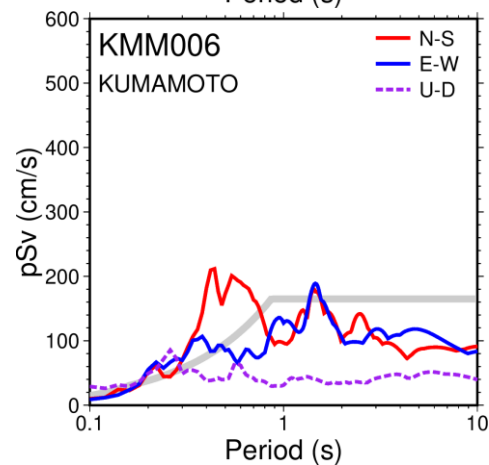
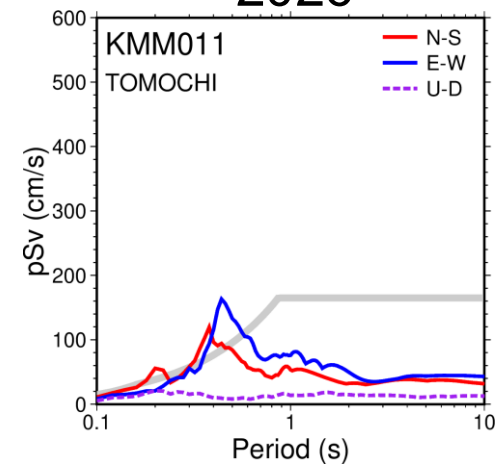
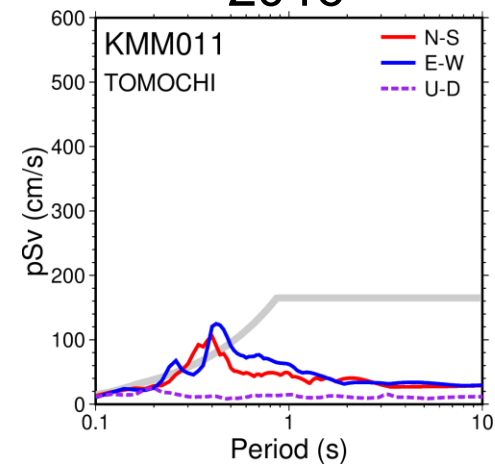
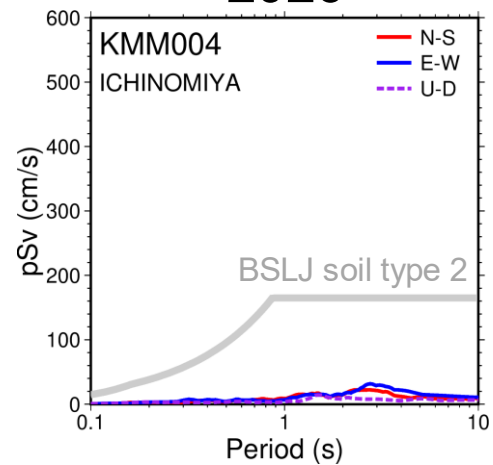
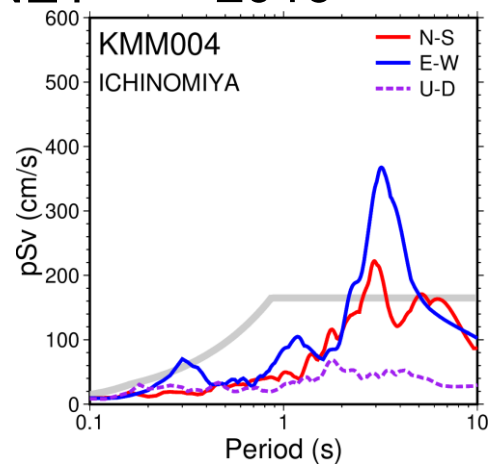
pSv: maximum value for periods of 1–2 s (5% damping)

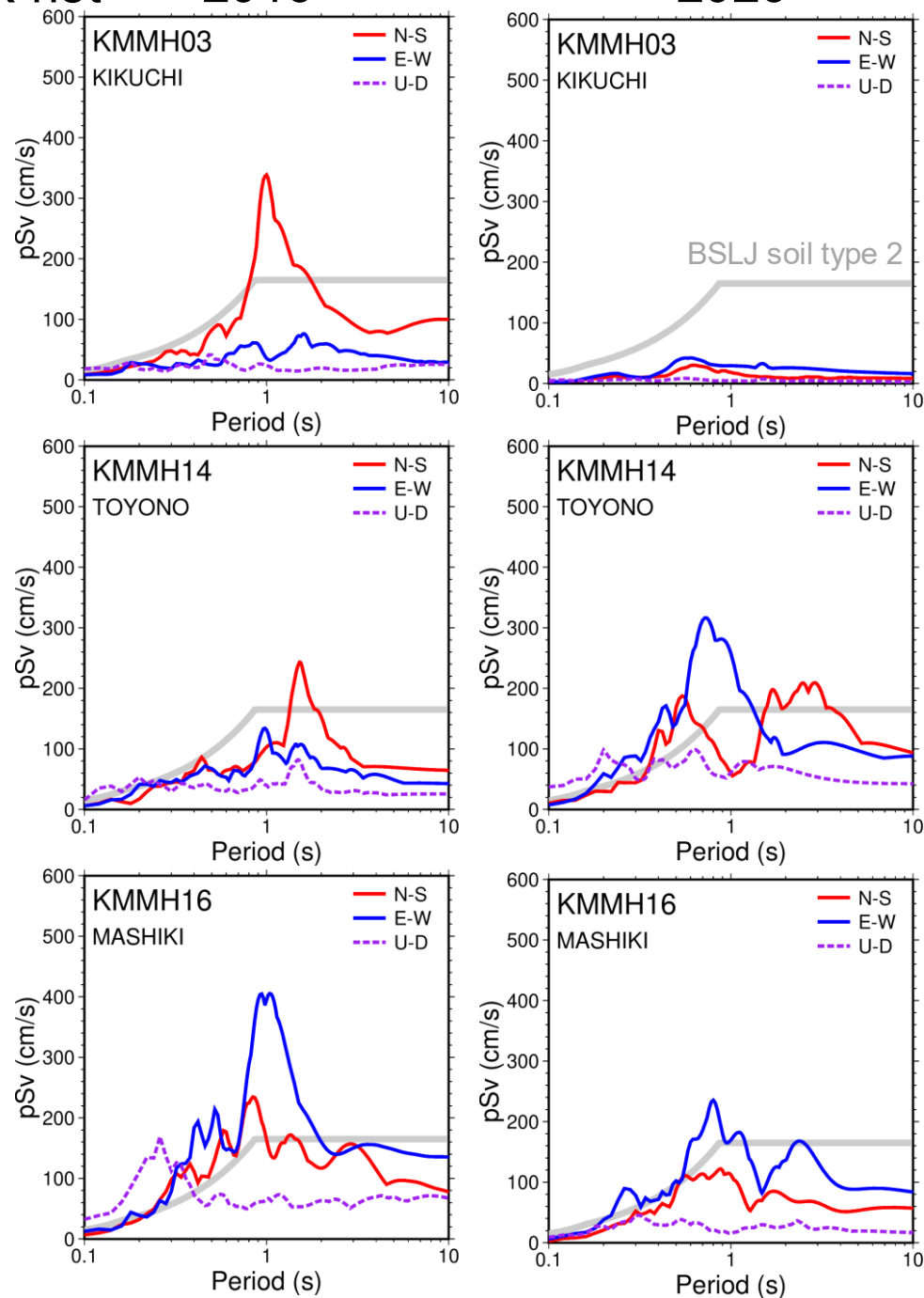


○: NIED stations, □: JMA seismic intensity stations



41509: 八代市平山新町 (Yatsushiro City)
42511: 宇城市松橋町 (Uki City)
42512: 芦北町芦北 (Ashikita Town)
42514: 上天草市大矢野町 (Kamiamakusa City)
47819: 熊本西区春日 (Kumamoto City)





- During the 2016 earthquake, strong ground motions were observed over a wider area than in the 2026 earthquake. In particular, strong ground motions were recorded toward Oita Prefecture.
- During the 2026 earthquake, stronger ground motions were recorded in the southwest part of Kumamoto Prefecture than in the 2016 earthquake.
- The observed differences are possibly attributed to differences in the fault geometry (source location), earthquake magnitude, and rupture process.