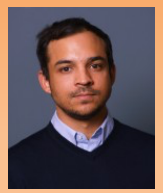
[1] King Abdullah University of Science and Technology (KAUST), Saudi Arabia,[2] GFZ German Research Centre for Geosciences, Germany, [3] Swiss Seismological Service, ETH Zürich, Zürich, Switzerland

EGU2020-2626

The source scaling of swarm-genic slow slip events

Luigi Passarelli[1] Eleonora Rivalta[2] Paul A. Selvadurai[3] Sigurjón Jónsson[1]

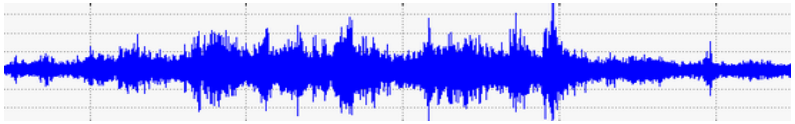





Slow slip events (SSEs) are fault ruptures so slow to excite seismic waves and detected via deformation data, but:

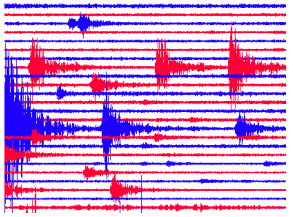
SSEs can trigger seismic events as:

Non-volcanic tremor and VLF



and/or

Swarms of ordinary (fast) earthquakes

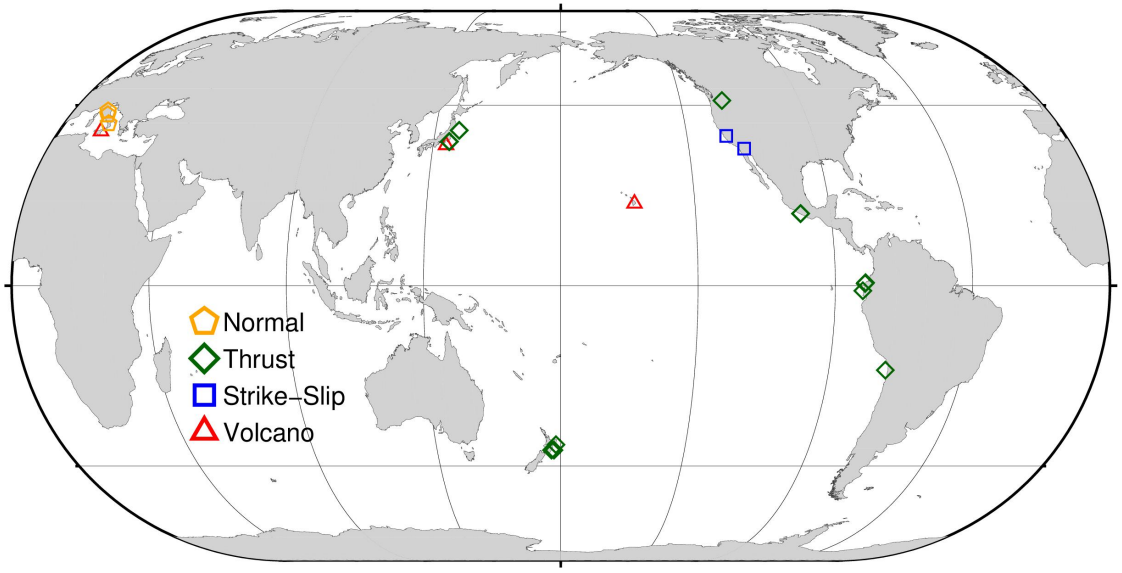


We study SSEs accompanied by swarms of earthquakes (SG-SSEs)**

- **The strong interplay between the aseismic and seismic moment release**
- **The physical processes controlling the aseismic/seismic energy release**

** We focus on SG-SSEs because there are data on seismic moments and other source properties of ordinary earthquakes, not the case for seismic tremor

Database earthquake swarm-genic slow slip events (SG-SSE)



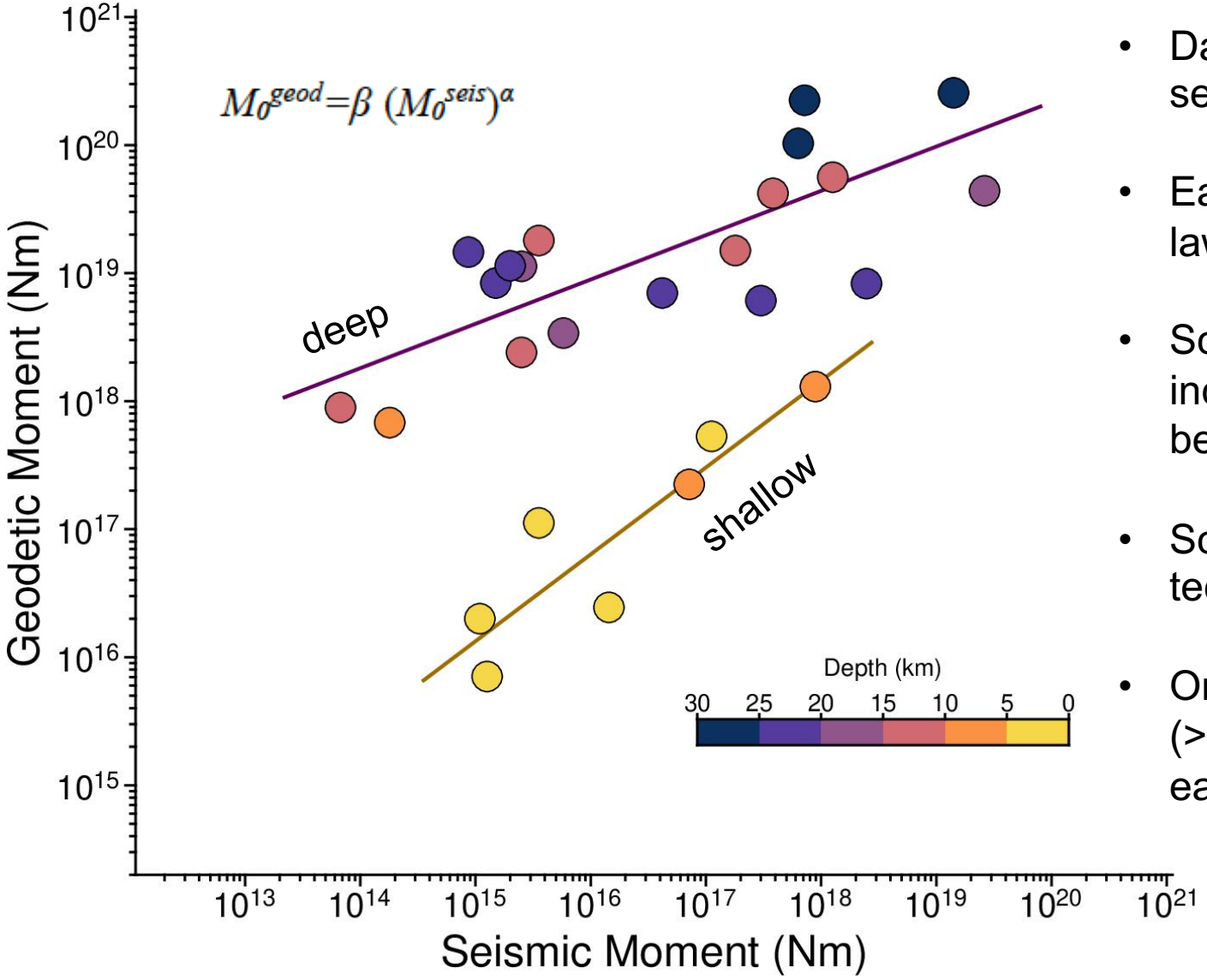
- Seismicity considered if only during ongoing SSEs
- 27 instances SG-SSE
- 3 at volcanoes, 2 strike-slips, 3 normal faults, 19 thrust faults (18 in subduction zone)
- **Collected source parameters, like:**
  - **Aseismic (Geodetic) Moment** from deformation data
  - **Cumulative Seismic Moment** of earthquake swarm from seismological data
  - **Depth**

luigi.passarelli@kaust.edu.sa

King Abdullah University of Science and Technology

جامعة الملك عبدالله للعلوم والتقنية

Scaling aseismic and seismic moments



- Data populates two regions separated by depth of SG-SSE
- Each population shows a power-law scaling
- Scaling implies seismic moment increase as geodetic moment becomes larger
- Scaling independent of the tectonic setting
- On average deeper SG-SSEs (>10km) produce less earthquakes

luigi.passarelli@kaust.edu.sa

King Abdullah University of Science and Technology
جامعة الملك عبدالله للعلوم والتقنية

Take-home message

- Strong interplay between aseismic and seismic slip indicated by moments scaling
- Shallower SSEs are accompanied by relatively larger size swarms than deeper SSEs
- The larger the SG-SSEs the larger the magnitude of the earthquake swarms
- Depth dependent rheological conditions modulated by fluid pore pressure, temperature and density of asperities appear to be the main controls on the scaling.
- …stay tuned more analysis and interpretation on other source parameters is coming in a paper...

luigi.passarelli@kaust.edu.sa

King Abdullah University of Science and Technology

جامعة الملك عبدالله للعلوم والتقنية