

EGU26-12065, updated on 27 Oct 2026

<https://doi.org/10.5194/egusphere-egu26-12065>

EGU General Assembly 2026

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High-Rate GNSS and Multi-Sensor Benchmark Dataset from Earthquake Simulation Experiments driven by EPOS NFO Community (TRANSFORM²)

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Within the TRANSFORM² project, seismic events have been simulated on a triaxial earthquake shake table (ANCO R-303) during a series of ten experiments conducted at the Seismological Observatory in Timișoara, Romania, in October 2025. These experiments included 223 variants of motion, consisting of either fully synthetic or natural records of earthquakes occurring in Poland (2019 mining induced seismicity), Italy (2016 Norcia seismic event), Romania (Vrancea 1986 earthquake) and Greece (2020 Samos and 2021 Damasi earthquakes). The tabletop was instrumented with GNSS receivers, including both low-cost and geodetic-grade – some of which were connected to external atomic clocks, accelerometers of both low-cost and professional types, and inclinometers, providing high-resolution, multi-sensor observations. Multiple configurations of the equipment setup, instrument settings, and data processing options.

We introduce a fully documented and organized dataset that will be shared publicly on Zenodo. This presentation discusses an experimental setup, sensor calibration, and integration workflow to combine multi-sensor measurements into one coherent dataset. Several illustrative analyses are included: the comparisons of low-cost versus high-grade GNSS and accelerometer data; preliminary processing results assessment, and visualizations of induced motions across various motion variants.

The provided dataset will enable the geoscience community to validate algorithms for high-frequency GNSS data, accelerometric data, and fusion algorithms, but also related to seismological modeling, ranging from controlled robotic experiments to real-world seismological data.

Acknowledgments: TRANSFORM² is funded by the European Union under project number 101188365 within the HORIZON-INFRA-2024-DEV-01-01 call.