



Characterizing Long-Term Background Seismicity Rates: Testing the Integration of Strain Rate Data in Global and European Seismicity Models

Anne Strader (1), Danijel Schorlemmer (1), Fabrice Cotton (1,2)

(1) GeoForschungsZentrum Potsdam, Section 2.6, Potsdam, Germany (strader@gfz-potsdam.de), (2) Universität Potsdam, Potsdam, Germany

Locations and magnitudes of recent large earthquakes have sometimes contradicted seismicity rates expected by earthquake source models that form the basis of PSHA. The discrepancies are a consequence of underestimating either the seismicity rate or expected maximum magnitude, both of which are primarily derived from historical and instrumental earthquake-catalog data. Furthermore, conflicting seismicity rates inferred from GPS velocity and seismicity data have been observed, suggesting that earthquake-catalog data may not completely account for seismic moment release.

The Global Earthquake Activity Rate (GEAR1) seismicity model is currently undergoing prospective evaluation within the Collaboratory for the Study of Earthquake Predictability (CSEP). Testing results during the 1/10/2015-7/9/2017 evaluation period indicate that global $M_w \geq 5.767$ seismicity rates are best constrained by a combination of strain rate and earthquake-catalog data. At the 0.05 significance level, both the smoothed seismicity (KJSS) and strain rate-based (SHIFT_GSRM, SHIFT_GSRM2F) component forecasts can be rejected in favor of GEAR1. However, both strain rate-based models fail to forecast the spatial earthquake distribution during the evaluation period, indicating that further research is warranted on the performance of the GEAR1 and SHIFT_GSRM models in localized regions.

Within the Italy CSEP testing and SHARE hazard model regions, we test the impact of integrating strain rate data in background seismicity models used for seismic hazard analysis. We investigate how the stability of the GEAR1 model optimization over space and time is affected by the availability of geodetic and earthquake-catalog data. Furthermore, we test the impact of earthquake-catalog data availability and integration of smaller earthquakes on smoothed-seismicity forecast performance stability.