The 2020 European Seismic Hazard Model: Overview and Results - Supplementary Materials

In this supplementary materials section, we provide a comprehensive exploration of the differences of the earthquake rate forecasts of ESHM20 and ESHM13. Additionally, we present a series of trellis plots to facilitate a comparative analysis of the ground motion characteristics models.

Changes in the seismogenic sources cause many of the local differences across the entire region. Regional discrepancies in the earthquake rates are likely caused by the new earthquake catalogue, new completeness time-magnitude intervals, new magnitude frequency distributions (Pareto Tapered Distribution and exponential GR distribution), updated slip-rates and maximum magnitude of the faults, new adaptive-smoothing technique, new subduction sources, new logic tree and its implementation. To investigate these changes the *ensemble* earthquake rate forecast of the ESHM20 minus that of ESHM13 are compared at each grid site for two magnitudes, Mw > 5.5 in Figure S1 and Mw>6.5 in Figure S2, respectively.

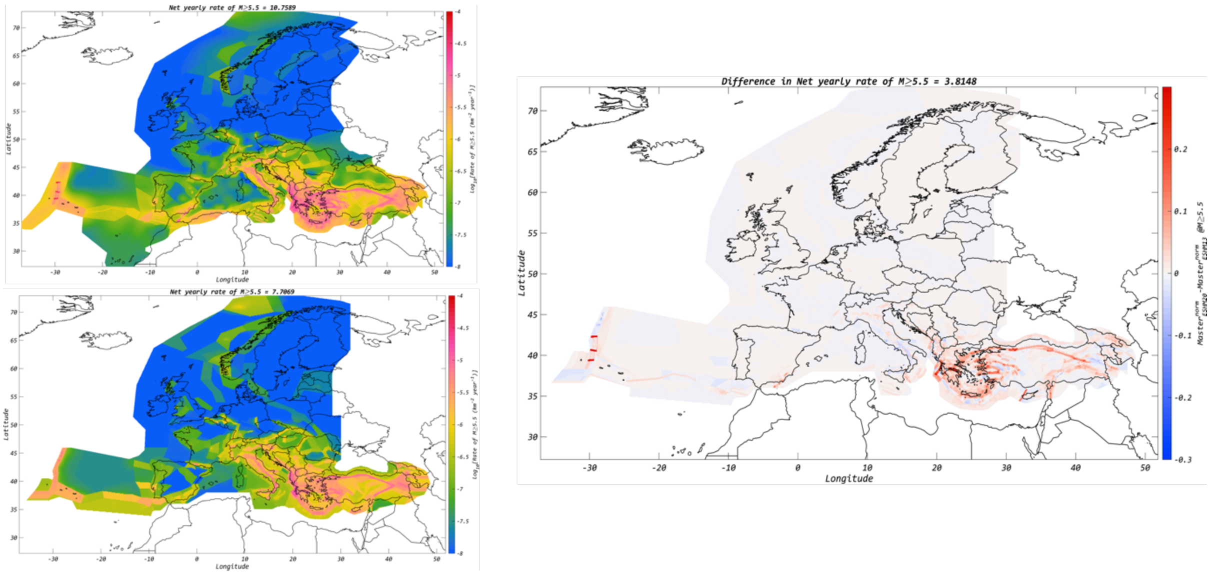

Figure S1: Annual earthquake rate forecasts for both ESHM20 and ESHM13 ensemble models specifically for Mw ≥ 5.5 (left panel). Difference rate maps, represented as ESHM20 - ESHM13 (right panel)

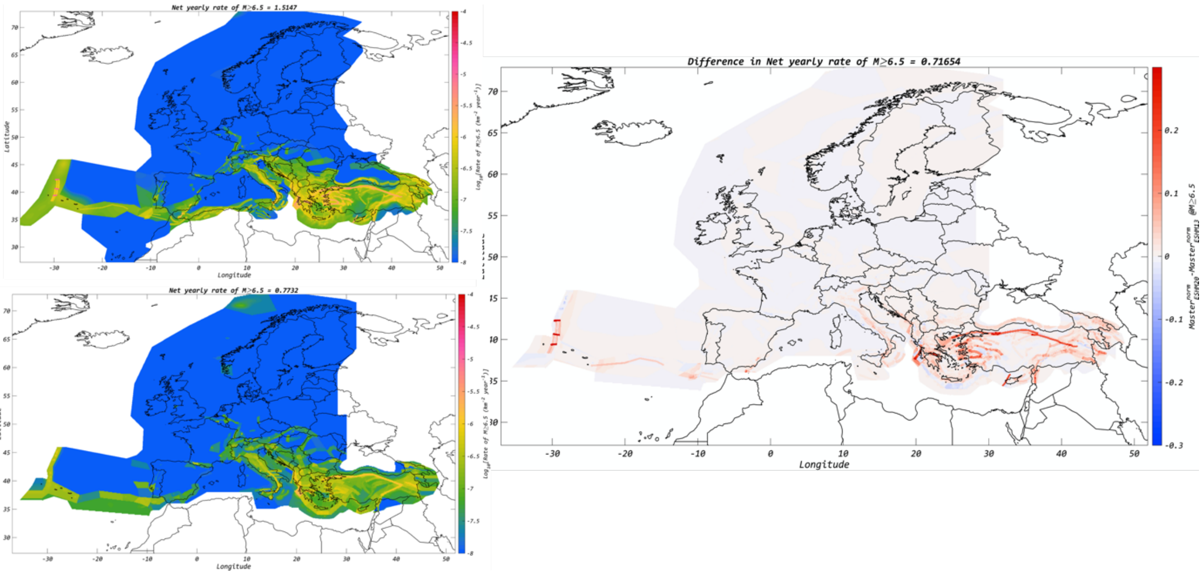

Figure S2: Annual earthquake rate forecasts for both ESHM20 and ESHM13 ensemble models specifically for Mw ≥ 6.5 (left panel). Difference rate maps, represented as ESHM20 - ESHM13 (right panel)

In addition to the earthquake rate forecast maps, we have also included four figures that facilitate a detailed comparison of the ground motion models between ESHM20 and ESHM13. These figures illustrate acceleration response spectra for various earthquake scenarios, for comparison purposes. Specifically, Figure S3 focuses on active shallow crust scenarios, Figure S4 shows the subduction interface scenarios, Figure S5 addresses the comparison for subduction in-slab, and finally, in Figure S6 the comparison for craton regions is shown. These trellis plots provide a comprehensive view of how ground motion models differ between ESHM20 and ESHM13, aiding in the understanding of seismic hazard variations across these two regional models. It is important to note that ESHM20 has been established as the successor to ESHM13 and is now the recommended reference for seismic hazard assessment in Euro-Mediterranean region. Given the substantial improvements and updates incorporated into ESHM20, we strongly advocate for its adoption as the preferred choice for seismic hazard analysis in the region.

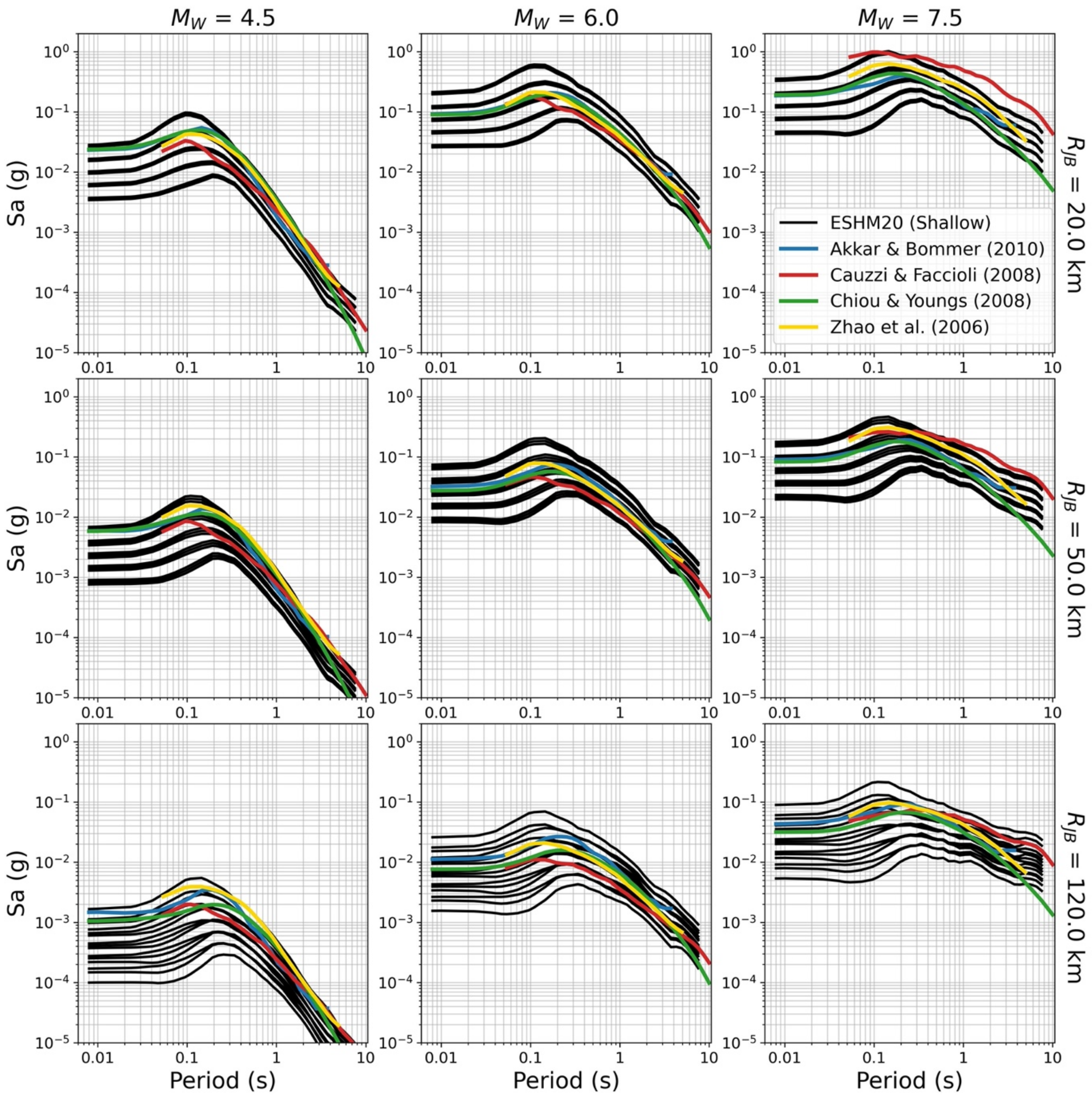

Figure S3: Trellis plots comparing the response spectra of the nine-branch default shallow logic tree against the ESHM13 shallow crust GMPE selection Delavaud et al. (2012) for a strike-slip earthquake and sites located at 20, 50 and 120 respectively, assuming a measured site condition of VS30 800 m/s

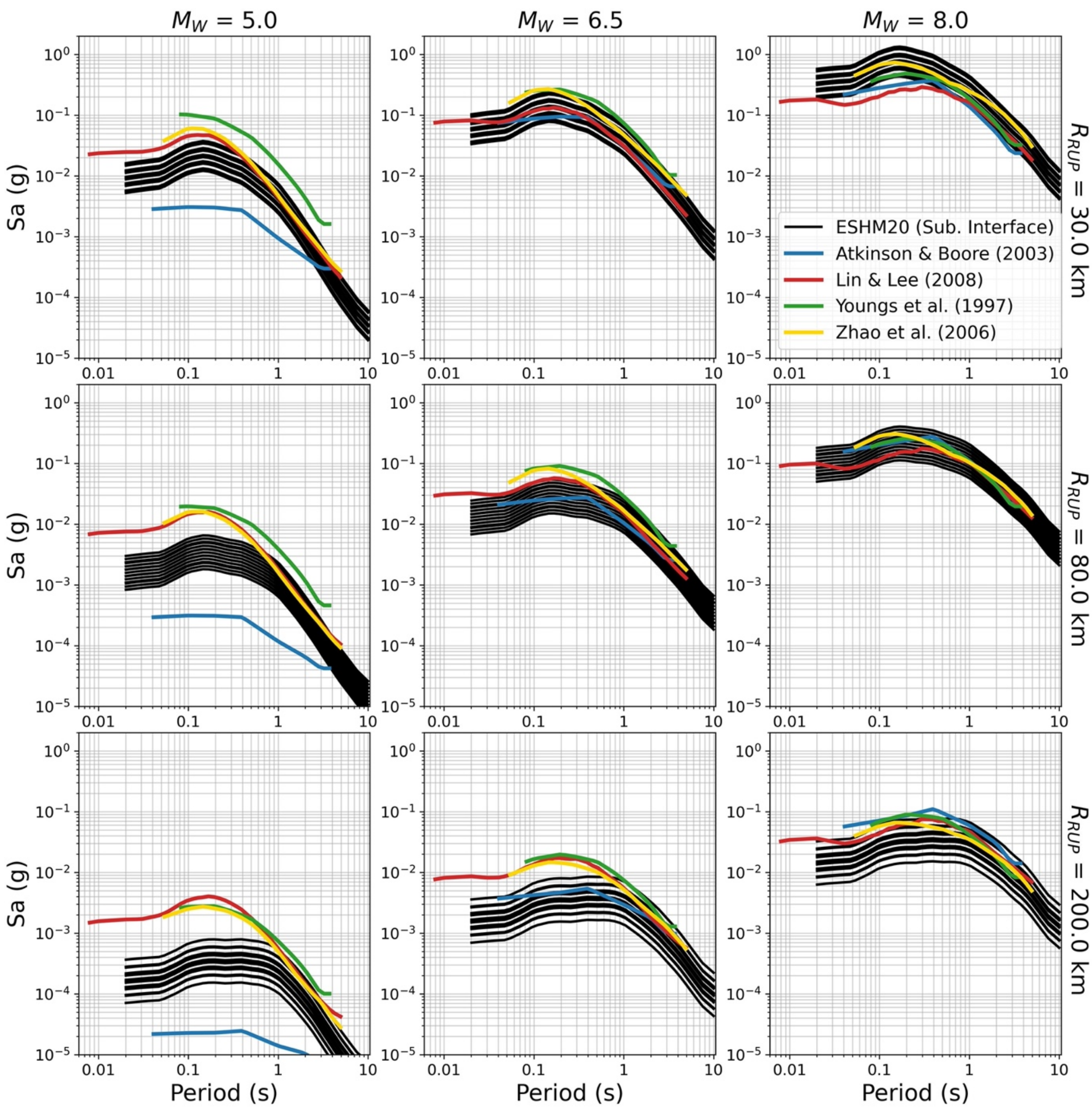

Figure S4: Trellis plots comparing the response spectra of the subduction interface logic tree against the ESHM13 GMPE used to model the subduction interface, for sites located at Rrup=30, 80 and 200km assuming a measured site condition of VS30 800 m/s

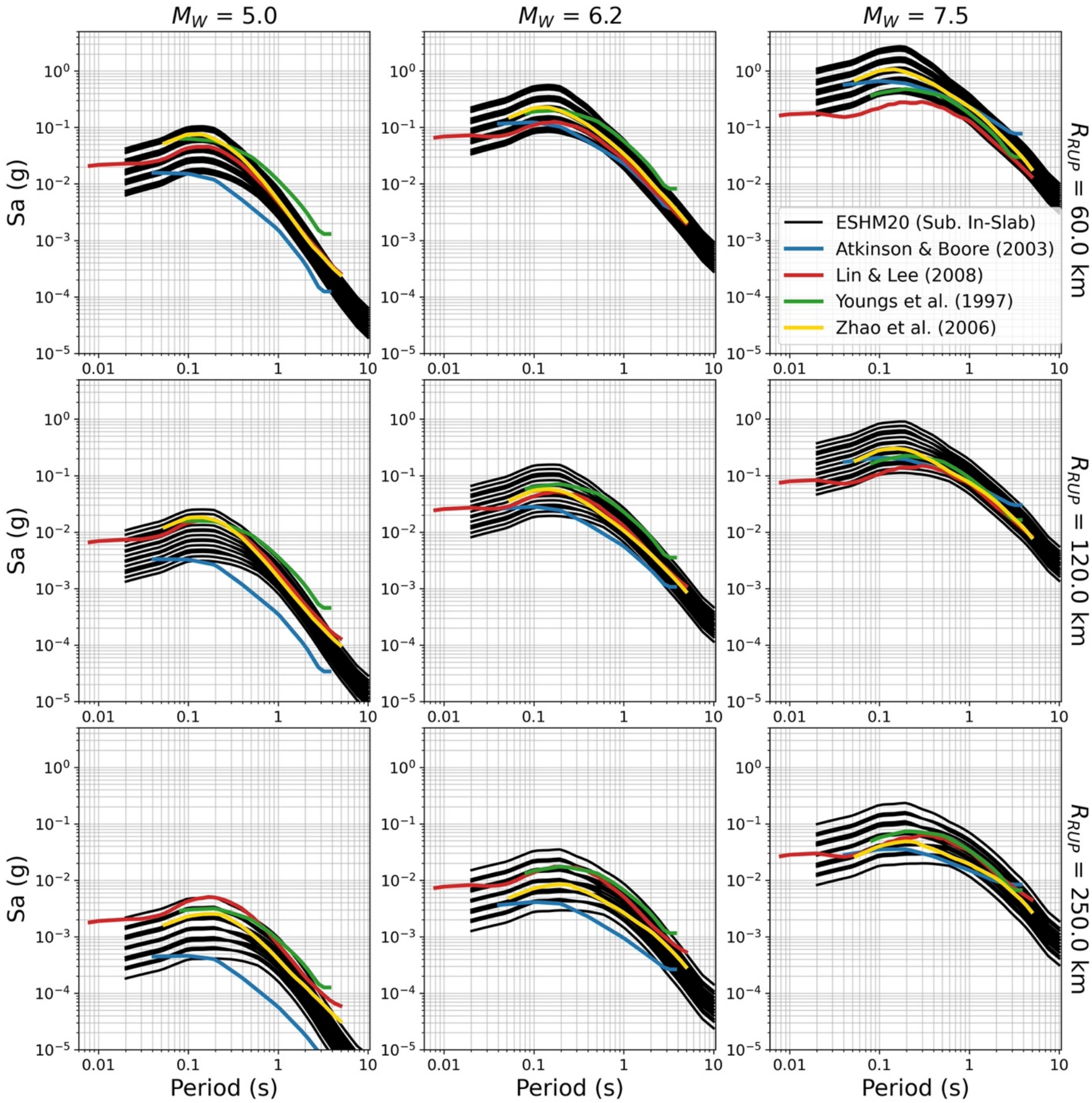

Figure S5: Trellis plots comparing the response spectra of the subduction interface logic tree against the ESHM13 GMPE used to model the subduction interface, for sites located at Rrup=60, 120 and 250km assuming a measured site condition of VS30 800 m/s

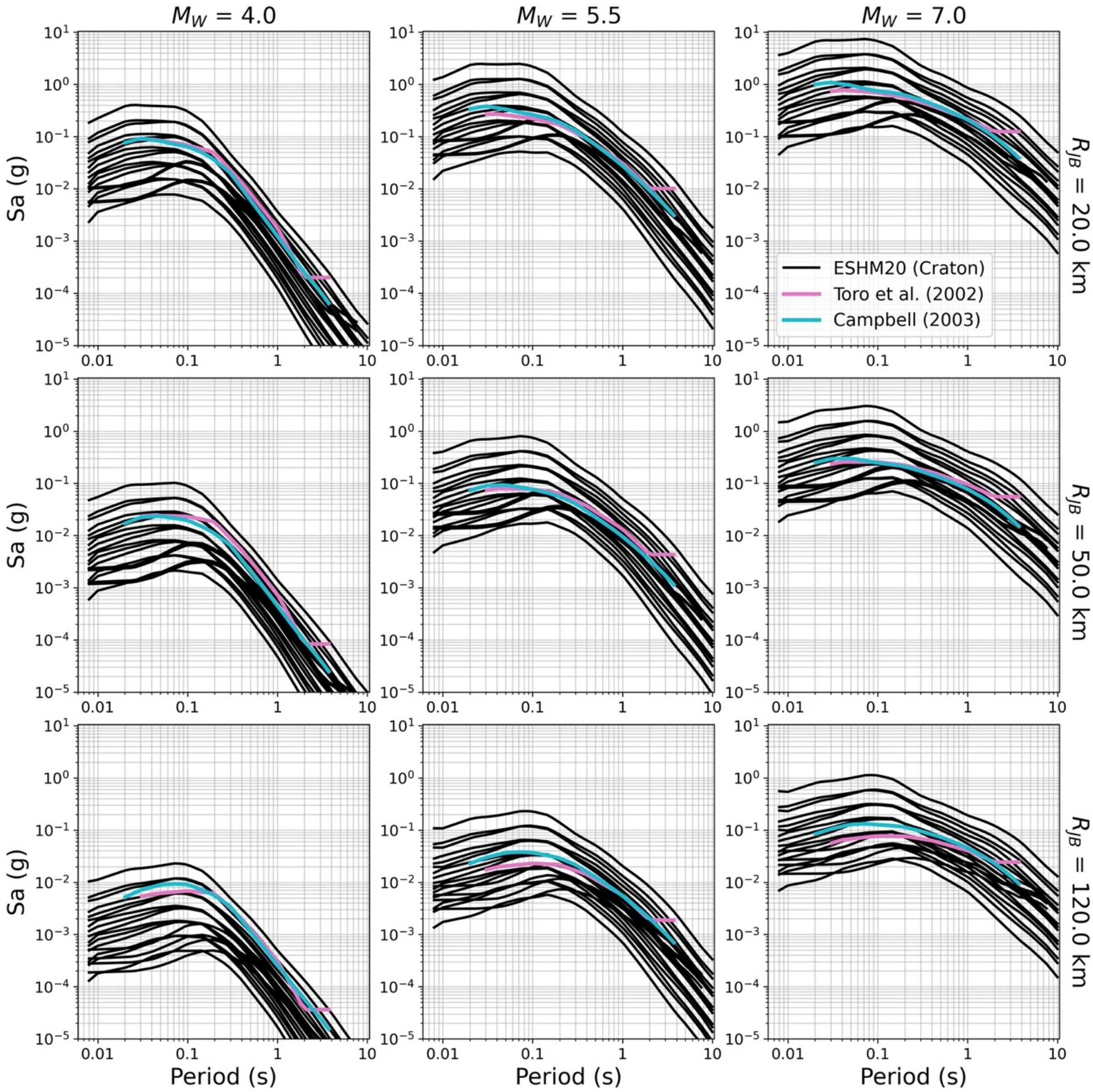

Figure S6: Trellis plots comparing the response spectra of the ESHM20 logic tree against the ESHM13 GMPE selection Delavaud et al. (2012) for craton regions, sites located at 20, 50 and 120Km, respectively, assuming a measured site condition of VS30 800 m/s