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Seismic activity in stable continental regions

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Stable continental regions (SCRs) have low seismicity and large magnitude earthquakes are infrequent and diffuse compared to plate boundary settings. Because of this, seismicity parameters required for seismic hazard analysis (SHA) are difficult to constrain. A method to overcome this challenge involves using an analogue approach to generate seismic hazard inputs in SCRs. Seismic hazard analysis of these regions develops recurrence parameters by drawing upon data from a larger global database than what is typically done for plate boundary regions. This is completed by choosing regions that are considered seismotectonically analogous and then amalgamating data from the regions to generate larger and perceivably more robust seismicity data sets. Historically, this is done by considering all SCRs as analogous and including all of their data into the analysis.

This study refines and updates this approach by assessing whether there is internal variability of seismogenic potential within SCR crust that can be distinguished by comparing properties of the crust to seismicity. We completed this analysis by: (1) compiling a global homogeneous earthquake catalog for earthquakes \geq Mw 2 up to July 2020 which includes historical and instrumental events; (2) subdividing global SCR crust into five geological domains that distinguish crustal criteria within SCRs; (3) calculating and comparing the seismic parameters between the different SCRs and sub-domains to better understand the range in values across different SCRs and determine if there is statistically observable variation between sub-domains. Our results provide an initial step towards redefining what crustal characteristics define analog regions for use in seismic hazard studies.