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Slow-Slip Earthquakes observations in Costa Rica and their Potential Impact on Seismic Hazard Assessments

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Costa Rica is located at a subduction margin in a complex tectonic setting where four tectonic plates (Caribbean, Coco, Nazca, and Panama) interact, and large earthquakes are generated. Slow-Slip earthquakes (SSEs) are defined as a seismic activity that involves the gradual and aseismic release of tectonic stress. Therefore, SSEs play a very complex role in the seismic cycle, representing a crucial element to be considered in seismic hazard assessment. These events are a common feature in subduction regimes and have been reported in most of the well geodetically instrumented subduction zones worldwide. In northern Costa Rica, shallow and deep SSEs have been identified at the Nicoya peninsula, and recently, shallow SSEs were also documented in the southern part of the country at the Osa peninsula. Here, we present a synthesis and compilation of SSEs observations in Costa Rica based on an in-depth review of previous studies, aiming to delve into potential implications and explore possible viable ways to incorporate it in seismic hazard assessments. We accomplished this by identifying differences among patches inside the subduction segments where occur or not SSEs, evaluating the coupling factors, and considering the observations of recurrence intervals to infer slip deficit values. Based on the previous analysis, we summarized the main findings regarding possible implications of the SSEs occurrence in Costa Rica for seismic hazard purposes. A significant result from the comparison with the 2022 Costa Rica seismic hazard model is that the non-quantification of SSEs in PSHA may be conducting to overestimations, particularly in subduction margins near the coast, as in the case of Costa Rica.