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Recurrence of megathrust events: Impact on hazard and risk in South America

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Megathrust earthquakes along the South American subduction zone where the Nazca plate slips below the South American plate rapidly subducts below the South American plate contribute significantly to the seismic hazard in Chile, Peru, Ecuador and Colombia. Estimating recurrence of the megathrust events is of prime interest not only for securing effective counter measures for engineering purposes, but also for assessing seismic hazard and risk for appropriate disaster risk management solutions in the insurance sector.

We present an evaluation and interpretation of recent research on the recurrence of megathrust earthquakes along the South America subduction zone. The modelling approach is conceptually founded in the asperity model and in this spirit evidence for documented earthquakes is assembled. We utilize time-independent and time-dependent recurrence models to understand the range and likelihood of recurrence times given the incomplete picture of the seismic history and the impact from uncertain event dates based on paleo-seismic / paleo-tsunami studies. In addition, we illustrate the sensitivity of recurrence rates for the largest earthquakes due to assumptions on seismic coupling and the size of potential ruptures.

Downstream from the recurrence rate analysis, the results are used to estimate the impact of the subduction interface model seismicity on a select set of exposure subject to earthquake shaking due to those events. These examples highlight the potential range of seismic hazard and risk and set the basis to further constrain disaster risk management solutions.