



Where giant earthquakes may come

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Giant earthquakes ($M_W \geq 8.5$) usually occur on the boundary between subducting and overriding plates of converging margins, but it is not yet clear which (if any) subduction zones are more prone to produce such a kind of catastrophic events. Here we analyze the frequency-magnitude distribution of the interplate seismicity occurred in the time period 1976-2007 at subduction zones. We find that the b -value of interplate earthquakes is significantly different among the subduction zones. Then, we calculate the propensity (defined as the average annual rate) of giant interplate events for about half of the subduction zones (those exhibiting a sufficient number of interplate earthquakes to carry out the analysis). We find that out-of-sample giant earthquakes (before 1976 and after 2007) have occurred preferentially in high propensity areas.

These results show that subduction zones may have different capabilities to produce giant earthquakes. Besides the importance for seismic hazard assessment and risk mitigation, our results seem to indicate that a higher seismicity rate does not necessarily imply a higher likelihood to generate giant earthquakes. Conversely, our results suggest that also subduction zones with small seismicity rates can have a large propensity to host future giant earthquakes. Finally, it seems that the way in which the stress is released at a subduction interface does not change significantly after the occurrence of interplate events.