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Evaluation of the statistical evidence for Characteristic Earthquakes in the frequency-magnitude distributions of Sumatra and other subduction zone regions

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The Sumatran Boxing Day earthquake and subsequent large events provide an opportunity to re-evaluate the statistical evidence for characteristic earthquake events in frequency-magnitude distributions. Our aims are to (i) improve intuition regarding the properties of samples drawn from power laws, (ii) illustrate using random samples how appropriate Poisson confidence intervals can both aid the eye and provide an appropriate statistical evaluation of data drawn from power-law distributions, and (iii) apply these confidence intervals to test for evidence of characteristic earthquakes in subduction-zone frequency-magnitude distributions. We find no need for a characteristic model to describe frequency magnitude distributions in any of the investigated subduction zones, including Sumatra, due to an emergent skew in residuals of power law count data at high magnitudes combined with a sample bias for examining large earthquakes as candidate characteristic events.