



## **Some thoughts about extreme events in earthquakes, rockfalls and volcanic eruptions**

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There are several different views on extreme events. In statistical theory, an extreme event is the biggest event in a certain time interval. From a more applied point of view, extreme events may simply be those events above an arbitrarily defined threshold. However, in some phenomena there may be big events whose characteristics differ from those of smaller events, which may provide some kind of natural definition of extreme events. The difference may concern the frequency-magnitude relation, e.g., big events may occur less frequently than an extrapolation from smaller events suggests, but it may also affect temporal correlations, e.g., the biggest events may occur more regularly in time than smaller events, providing some kind of long-term predictability. For earthquakes, this question has been widely discussed for a long time, and it seems that the biggest earthquakes occur more regularly than smaller events. Numerical models suggest that these extreme events may be events which affect nearly an entire fault or even a fault system. For other natural hazards, this discussion is just at the beginning: The frequency-magnitude relations of rockfalls and volcanic eruptions apparently follow power-law distributions which break down at big event sizes, but very few is known about the origin and about the consequences for predicatbility.