

**DISCUSSION OF “ESTIMATING THE HISTORICAL AND FUTURE
PROBABILITIES OF LARGE TERRORIST EVENTS”
BY AARON CLAUSET AND RYAN WOODARD**

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The similarities between terrorist strikes and earthquakes are quite striking. Clauset and Woodard’s Figure 1 shows that the distribution of severity of terrorist events closely follows the Pareto or power law distribution. This distribution is also often used to describe the total scalar seismic moment, or total energy release, of earthquakes [Utsu (1999)]. It would be interesting to see if the spatial-temporal distribution of terrorist events appears to be well described by the Epidemic-Type Aftershock Sequence (ETAS) models of Ogata (1998), which are commonly used to describe earthquakes and which Mohler et al. (2011) recently used to model the spatial-temporal distribution of violent crimes in the United States.

In seismology, the *tapered* Pareto distribution has been shown to offer a somewhat better fit to some earthquake catalogs [Kagan (1993), Jackson and Kagan (1999), Vere-Jones, Robinson and Yang (2001), Kagan and Schoenberg (2001)]. Similarly, while several authors have argued that wildfire sizes follow the pure or truncated Pareto distribution [Strauss, Bednar and Mees (1989), Cumming (2001), Malamud, Millington and Perry (2005)], there is some suggestion that the tapered Pareto may fit better [Schoenberg, Peng and Woods (2003), Schoenberg and Patel (2012)]. This tapered Pareto distribution is somewhat similar to the stretched exponential considered by Clauset and Woodard, but the tapered Pareto has a pure exponential tail rather than a stretched exponential tail and therefore is typically less heavy tailed. Thus, consideration of the tapered Pareto in the context of terrorism might possibly lead to the conclusion that very large events, such as September 11, 2001, are indeed outliers.

Some might object to modeling terrorist strikes, or other events with human agency, using methods such as those employed by Clauset and Woodard. Indeed, in addition to the usual statistical problems of misspecification, overfitting and estimation error, there is the additional issue that predictions made based on such models can be self-fulfilling, or self-unfulfilling, or have any of various intermediate feedback mechanisms based on humans’ awareness of these predictions. However, Clauset and Woodard do not claim to make precise predictions of future terrorist activity based on their model, and for the purposes of describing previous terrorist strikes and forecasting broad trends of future activity, their analysis seems sensible, fair and honest.

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