Bayesian inference on earthquake size distribution: a case study in Italy

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This paper is focused on the study of earthquake size statistical distribution by using Bayesian inference. The strategy consists in the definition of an a priori distribution based on instrumental seismicity, and modeled as a power law distribution. By using the observed historical data, the power law is then modified in order to obtain the posterior distribution. The aim of this paper is to define the earthquake size distribution using all the seismic database available (i.e., instrumental and historical catalogs) and a robust statistical technique. We apply this methodology to the Italian seismicity, dividing the territory in source zones as done for the seismic hazard assessment, taken here as a reference model. The results suggest that each area has its own peculiar trend: while the power law is able to capture the mean aspect of the earthquake size distribution, the posterior emphasizes different slopes in different areas. Our results are in general agreement with the ones used in the seismic hazard assessment in Italy. However, there are areas in which a flattening in the curve is shown, meaning a significant departure from the power law behavior and implying that there are some local aspects that a power law distribution is not able to capture.