Geophysical Research Abstracts
Vol. 19, EGU2017-13843, 2017
EGU General Assembly 2017

Hazard Assessment in a Big Data World

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Open data in a Big Data World provides unprecedented opportunities for enhancing scientific studies and better understanding of the Earth System. At the same time, it opens wide avenues for deceptive associations in inter- and transdisciplinary data misleading to erroneous predictions, which are unacceptable for implementation. Even the advanced tools of data analysis may lead to wrong assessments when inappropriately used to describe the phenomenon under consideration. A (self-) deceptive conclusion could be avoided by verification of candidate models in experiments on empirical data and in no other way. Seismology is not an exception. Moreover, seismic evidences accumulated to-date demonstrate clearly that most of the empirical relations commonly accepted in early history of instrumental seismology can be proved erroneous when subjected to objective hypothesis testing. In many cases of seismic hazard assessment (SHA), either probabilistic or deterministic, term-less or short-term, the claims of a high potential of a model forecasts are based on a flawed application of statistics and, therefore, are hardly suitable for communication to decision makers, which situation creates numerous deception points and resulted controversies. So far, most, if not all, the standard probabilistic methods to assess seismic hazard and associated risks are based on subjective, commonly unrealistic, and even erroneous assumptions about seismic recurrence and none of the proposed short-term precursory signals showed sufficient evidence to be used as a reliable precursor of catastrophic earthquakes. Accurate testing against real observations must be done in advance claiming seismically hazardous areas and/or times. The set of errors of the first and second kind in such a comparison permits evaluating the SHA method effectiveness and determining the optimal choice of parameters in regard to a user-defined cost-benefit function. The information obtained in testing experiments may supply us with realistic estimates of confidence and accuracy of SHA predictions. If proved reliable, but not necessarily perfect, forecast/prediction related recommendations on the level of risks in regard to engineering design, insurance, and emergency management can be used for efficient decision making.