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Special session: Can our models only predict the irrelevant?

# Forecasting large earthquakes and eruptions: is it a scientific issue?

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The forecast of (large) events is of primary importance for two very different purposes. The first one is practical since reliable and skillful forecasts are the basic components for establishing sound risk mitigation actions. The second one is more philosophical, and it is related to the fact that forecasting is a cornerstone of scientific knowledge. At this purpose, the World's Largest General Scientific Society AAAS reports "the growing ability of scientists to make accurate predictions about natural phenomena provides convincing evidence that we are really gaining in our understanding of how world works" (AAAS 1989, 26). The basic problem in forecasting turns to be if we are able to check reliability and skill of forecasts. In general, this is not a problem if large amount of data are available. For instance, in seismology and volcanology we can usually check the reliability and skill of forecasting models for small to moderate events. The largest earthquakes and eruptions that are obviously the most important to forecast are rare and it is impossible to get a reasonable amount of events in a reasonable period of time to conduct satisfactory testing experiments. Seismology and volcanology face the lack of large events for testing purposes in two different ways: in one case, it is assumed that the largest events are a sample of the distribution of the small-to-moderate events (no "black swan" exists). This means that the statistical distribution of small-to-moderate events is extrapolated for the largest ones. The second strategy is to assume that largest events have some peculiarities that make them distinguishable from smaller events (black swans do exist!). This means that the above-mentioned extrapolation is no longer valid and a specific statistical distribution is needed. The problem is that we do not have enough data to build the model and, even worse, we do not have enough data to check their reliability and skill. This is the domain where the expert opinion plays a basic role. Scientists tend to abandon the scientific domain based on hypothesis and testing, in order to build consensus models based on expert opinion or, equivalently, on the so-called "best available science". In this presentation I will discuss these issues, showing recent examples derived both from volcanology and seismology, and trying to give some insights on the basic question "Can our models only predict the irrelevant?"