Nowcasting Global Earthquakes

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The term "nowcasting" refers to the estimation of the current uncertain state of a dynamical system, whereas "forecasting" is a calculation of probabilities of future state(s). Nowcasting is a term that originated in economics and finance, referring to the process of determining the uncertain state of the economy or markets at the current time by indirect means.
We have applied this idea to seismically active regions, where the goal is to determine the current state of a system of faults, and its current level of progress through the earthquake cycle (http://onlinelibrary.wiley.com/doi/10.1002/2016EA000185/full).
We wish to estimate how far the fault system has progressed through the "cycle" of large recurring earthquakes. We use the global catalog of earthquakes, using "small" earthquakes to determine the level of hazard from "large" earthquakes in the region. As an application, we can define a small region around major global cities, for example a "small" circle of radius 150 km and a depth of 100 km, as well as a "large" earthquake magnitude, for example M6.0. Also, the region of influence of such earthquakes is roughly 150 km radius x 100 km depth, which is the reason these values were selected.
The statistics are computed from a "large" 10^{o} x 10^{o} region surrounding the "small" 150 x 100 km circle. The current count of earthquakes that is used to compute the nowcast is obtained from small earthquakes in the small region. The basic assumption is that both the "large" and "small" regions are characterized by the same Gutenberg-Richter magnitude frequency statistics.
If one defines a "model" as a calculation system in which there exist free parameters that must be optimally fit to data, then it can be said that there is no model involved in our nowcasting analysis. Our methods involve only plotting and interpreting data, once the magnitude threshold and spatial region have been selected.
We have used these techniques to compute the relative nowcast rankings of large global cities at risk for damaging earthquakes. In this talk we discuss these rankings. We also discuss the results of sensitivity analyses of the rankings to variations in the selected magnitude, small and large regions.

Keywords: Global Earthquakes, Nowcasting, Sensitivity testing