INFORMATION THEORIC FRAMEWORK FOR THE EARTHQUAKE RECURRENCE MODELS : Methodica Firma Per Terra Non-Firma

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Abstract

This paper has the Great Expectations to end the complaints of the seismologists that the earthquakes are unpredictable and to replace the traditional methodology with the new one based on the Information Theoric Framework. In words of Charles Dickens (1812-1870) It was the best of times,.. .it was the Age of Wisdom, , since we are living in an Extra Ordinary time at the turn of the Millennium, Age of Information...

On 17 August 1999, a destructive magnitude 7.4 earthquake occurred 100 km east of Istanbul on the North Anatolian Fault. What is the probability of an earthquake of M=7.4 will occur before the year 2030 in Istanbul ? A group of seismologists found a 62 15

International Conference during 1-4 Nov. 2005 in Lisbon, on the occasion of the 250th Anniversary of the 1755 Lisbon Earthquake that influenced not only Portugal but the all Europe & North African countries, was to foster an integrated view of global perception of natural disasters. [http://www.lisbon1755.org]

100th Anniversary of the 1906 San Francisco Earthquake to be held during 18-22 April 2006 shall also include the Centennial Meeting of the Seismological Society of America , where the next 10 steps our communities must take to avoid catastrophic disasters. [http://www.1906eqconf.org]

Paper maintains that the attempts to forecast or predict earthquake occurrence can be studied chronologically under 3 types of models :

1-) Models developed between years 1968-1976 can be designated as the First Generation Models that were based on earthquake probabilities independent of time & geographical location. 2-) Second Generation Models during the next two decades introduced the space & time dimension by considering the local geological & seismological conditions in the estimation of random probabilities. 3-) Third Generation Models developed after 2000, in addition to the above considerations, compute probabilities with respect to the interactions between the local stress changes & the occurrence of large & small earthquakes. [1]

In these three types of models above, many researchers have thought that there ought to be some precursory phenomena that could be consistently observed & identified as the basis for making reliable prediction. There was an intense optimism

about prediction in the early mid-1970s.[3]. But this optimism was soon recognized to be unwarranted. This change of viewpoint from optimism to pessimism had important reasons :

i-) There exists no satisfactory theory of earthquake source process at the present : The Earths crust, where almost all earthquakes occur, is highly heterogeneous & stress and stored elastic strain energy are not homogeneously distributed. The inaccessibility of the fault zone to direct measurement imposes further difficulties. ii-) The earthquake source process seems to be extremely sensitive to small variations in the initial conditions. iii-) Empirical prediction would require the existence of observable precursors with high degree reliability. There are no objective definitions of anomalies that link the alleged precursors to earthquakes. iv-) Geological time dimension, involving hundreds of years, or much more, are incomparable to the human lifetime & engineering time of our buildings. v-) A number of candidate statistical models have been proposed for the computation of probabilities of future earthquakes , such as Poisson, Double Exponential, Gamma, Gaussian, Weibull and Log-Normal. Ellsworth (et.al.,1999) [4] complaint that At the present, it is not possible to discriminate between such candidate models The prediction obtained from these specific models differ significantly from one another. Yet, the memoryless Exponential distribution is the basis of new US National Earthquake Hazard Map.

For those familiar with the Information Theory, above descriptions of the prevailing methodology to develop earthquake recurrence models, and the continuing complaints corresponds exactly the pre-Maxent Age of the its state-of-the -art. Paper maintains that the Bayesian & Maxent methodology provide the necessary toolkit to analyze the earthquake precursors, to assign recurrence probabilities and select among the candidate generic probability distribution models that are maximally consistent with the known information. Authors ¡google¿ search has found No Matches on this topic & it seems that Working Groups on Long-Term Earthquake Probabilities at research institutes in USA, Japan & in other countries under the earthquake risk have not used them yet.

The introduction of Information Theoretic Framework to the earthquake models will generate a Terra Firma for the foundation of the Fourth Generation Models. This is also a precondition for the achievement of European Unions Lisbon Strategy (2000) of transformation to an Information Society by 2010 : It is the best of Times to start

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