

# Namazu and Earthquake Prediction

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Thank you for inviting me to the conference and for considering my opinions.

I have left the quest for earthquake prediction because I felt I was not making progress,  
but am glad you continue the struggle.

Having policemen of claims is important, but it lacks the key element of science: New  
discoveries.

Now I am trying to help earthquake victims by estimating fatalities 30 minutes after  
large earthquakes worldwide and for future likely disasters. This is new science.



## ICES FOUNDATION

At the beginning of history: All phenomena can be explained by stories. The more colorful a story, the more believable it was.

In Japan, Namazu wiggles: Earthquake!



## The light of thinking begins to shine.

**In Europe:** Greek philosophers: Gases escaping under pressure cause earthquakes (volcanoes). **A step up** about 500BC.

## The light of thinking is dimmed.

**In Europe:** Christian religion rules that God controls everything

**A step back** all through middle ages and renaissance. Proponents of new insight were **burned at the stake**.



Giordano Bruno (infinite universe)

## Reactions in 1755 to destructive earthquake and tsunami

**King of Portugal:** Live in tents henceforth

**Monk:** God punished people, repent!

**Marquis de Pombal:** Rebuild the city, but better.

**Voltaire:** People in churches dead (Good Friday), thus not God, but mother Nature did it. We must figure out the mechanisms for everything.

**John Mitchell 1760:** Earthquakes are caused by rock movements, the shaking is due to the propagation of elastic waves within the earth.



Lisbon, Portugal after an M8+ in the Atlantic Ocean somewhere





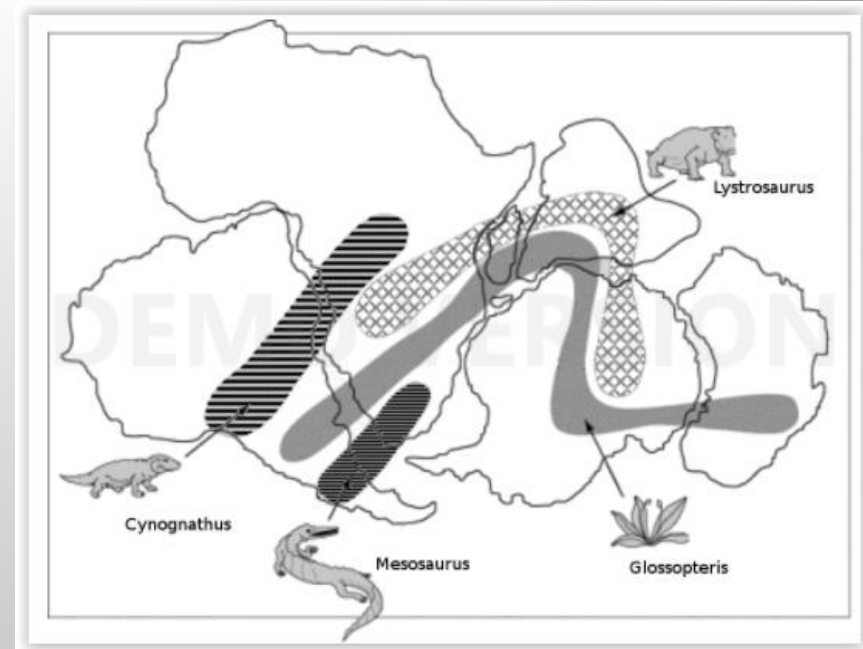
Wegener (1929):  
Continental drift

Established scientists:  
Nonsense, impossible

Geller et al. (1997): Learning how to predict earthquakes “would require immense effort ... with no guarantee of success”.

No true researcher ever asks for a guarantee of success.

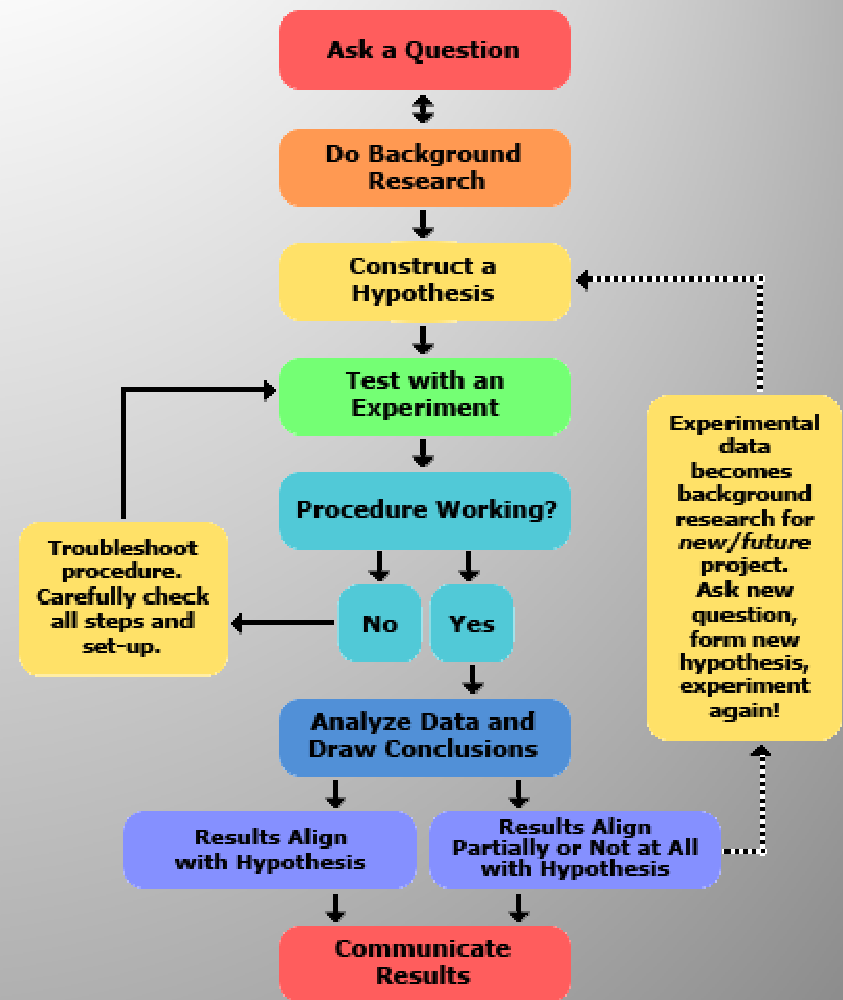
Thinking outside the «box» brings sometimes the greatest advances



## Scientific method.

Geller et al. (1997) try to discredit earthquake prediction by quoting Richter: “(Prediction) provides a happy hunting ground for amateurs, cranks, and outright publicity-seeking fakers”.

I heard **Richter** say something like that (I worked under his guidance) and it is true, but he did not say that prediction was impossible. All he said was: **No Namazu stories please!**



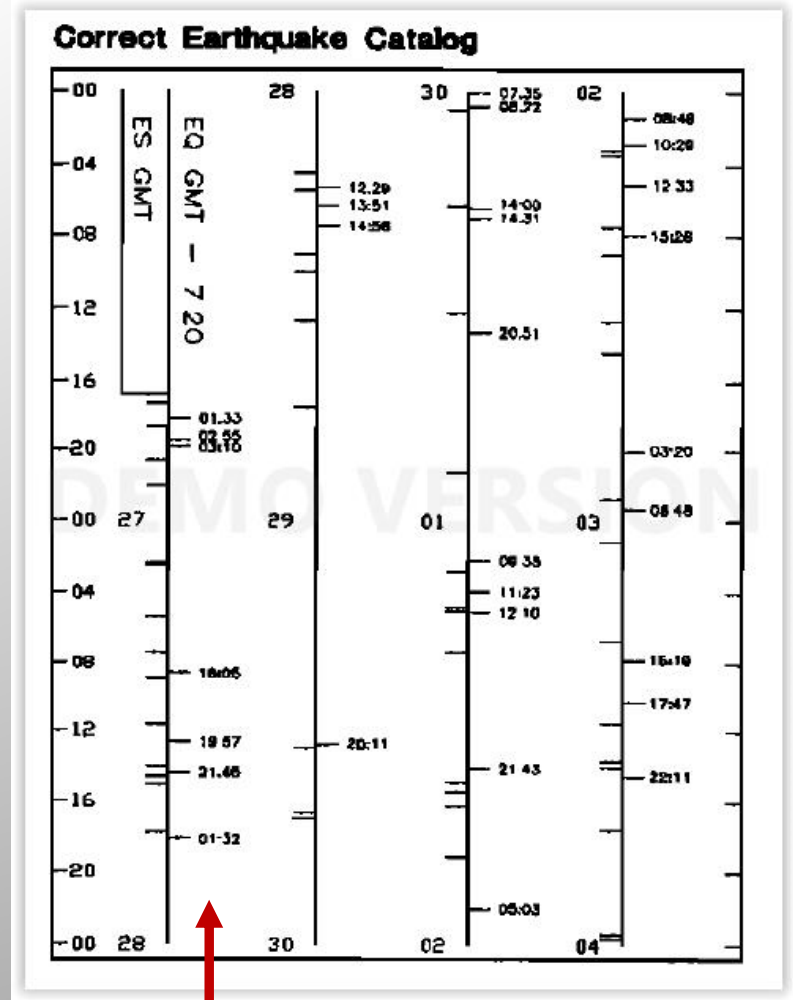
## Earthquake Prediction: The enthusiastic approach

**Claim:** one-to-one correlation of electric signals( SES) with 100% of the earthquakes listed with  $M_L > 2.9$  by the National Observatory Athens. Delay constant = 7h 20min (Varotsos et al, 1981).

**Corrections show** (Wyss, 1996):

40% of eqs claimed by VAN not on the list of NOA (some added without epicenter and M, based on signals on a seismograph next to Varotso's house in Athens).

37% of eqs on the list of NOA not in the list of VAN.



This side false: corrected



In addition, several articles show the **artificial origin of SES signals** in Greece claimed as precursors by Varotsos et al.

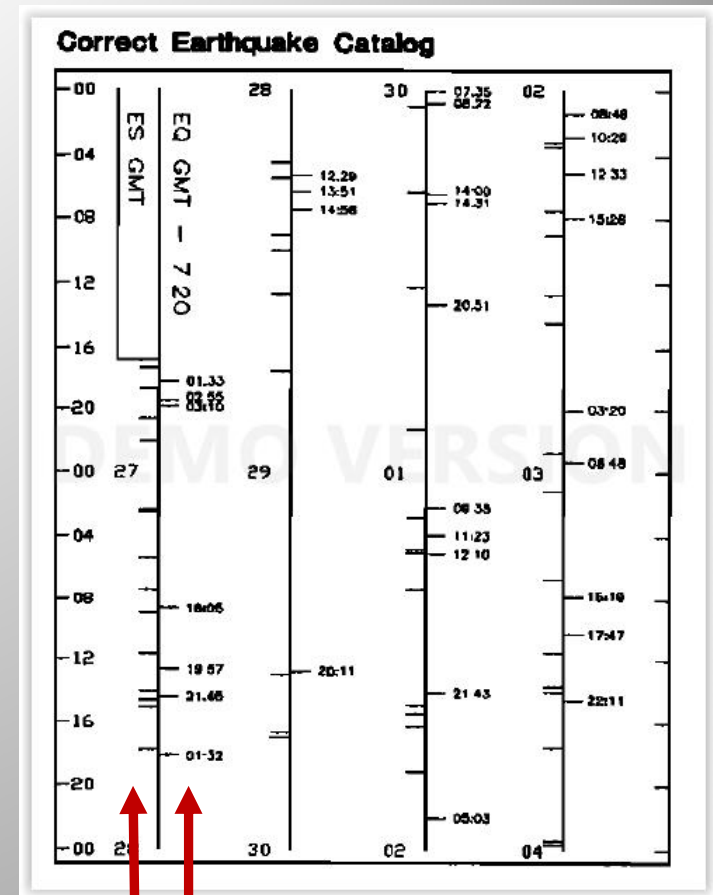
Gruszo, S., J. C. Rossignol, A. Tzanis, and J. L. Le Mouel (1996). Identification and analysis of electromagnetic signals in Greece: the case of the Kozani earthquake VAN prediction, *Geophys. Res. Lett.* **23**, 162025-2028.

Pham, V. N., D. Boyer, G. Chouliara, J. LeMouel, J. C. Rossignol, and G. Stavrakakis (1998). Characteristics of electromagnetic noise in the Ioannina region (Greece); a possible origin for so called 'seismic electric signals'(SES), *Geophys. Res. Lett.* **25**, 2229-2232.

Pham, V. N., D. Boyer, J. L. Le Mouël, G. Chouliaras, and G. Stavrakakis (1999). Electromagnetic signals generated in the solid Earth by digital transmission of radio-waves as a plausible source for some so-called 'seismic electric signals', *Physics of the Earth and Planetary Interiors* **114**, 141-163.

Pham, V. N., D. Boyer, G. Chouliaras, A. Savvaidis, G. Stavrakakis, and J. L. Le Mouël (2002). Sources of anomalous transient electric signals (ATESs) in the ULF band in the Lamia region (central Greece): electrochemical mechanisms for their generation, *Physics of the Earth and Planetary Interiors* **130**, 209-233.

50 false claims



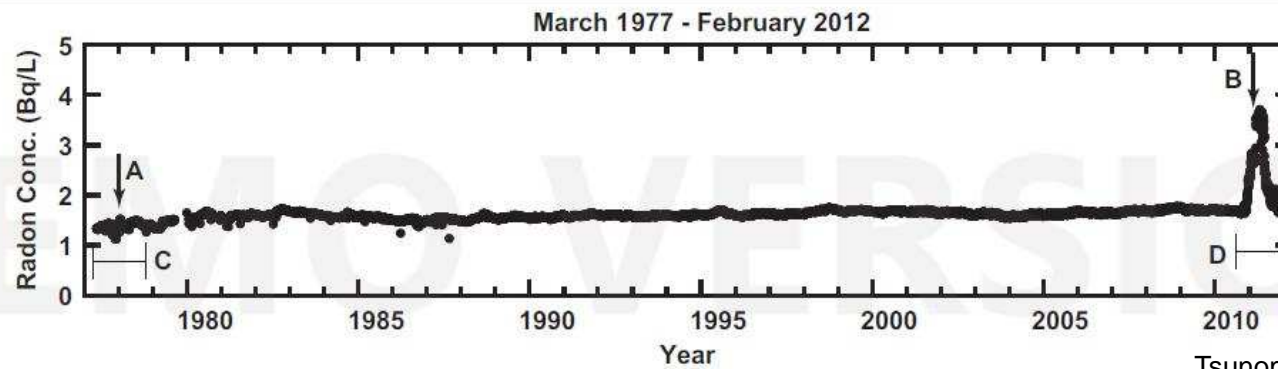
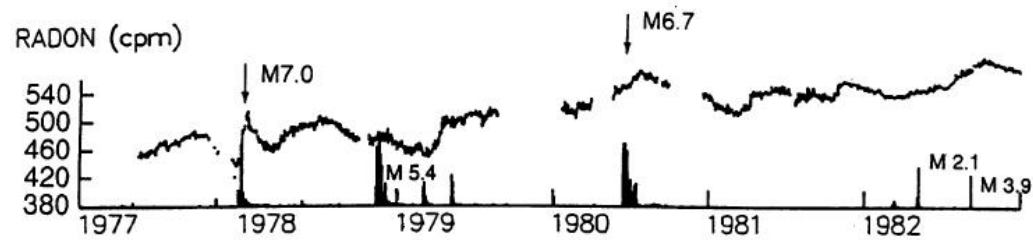
Worse than careless: unacceptable, a Namazu story

Both sides false  
This side also false

## Earthquake Prediction: The careful approach

3784 Colloquium Paper: Wakita

*Proc. Natl. Acad. Sci. USA 93 (1996)*

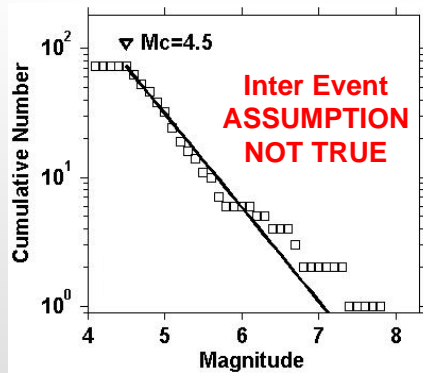
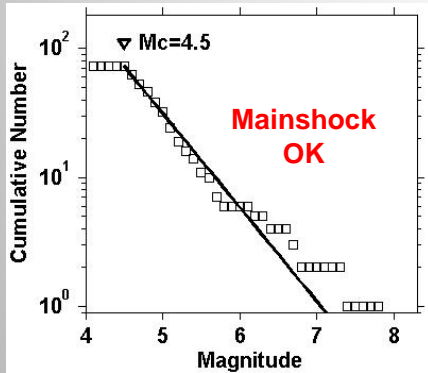


Tsunomori & Tanaka, 2014

Fig. 3. Radon concentration data from March 1977 to February 2012. A: onset time of 1978 Izu-Oshima-Kinkai earthquake, B: onset time of 2011 Tohoku earthquake, C: period considered in Wakita et al. (1980) and Tsunomori and Kuo (2010), D: period considered in present study.

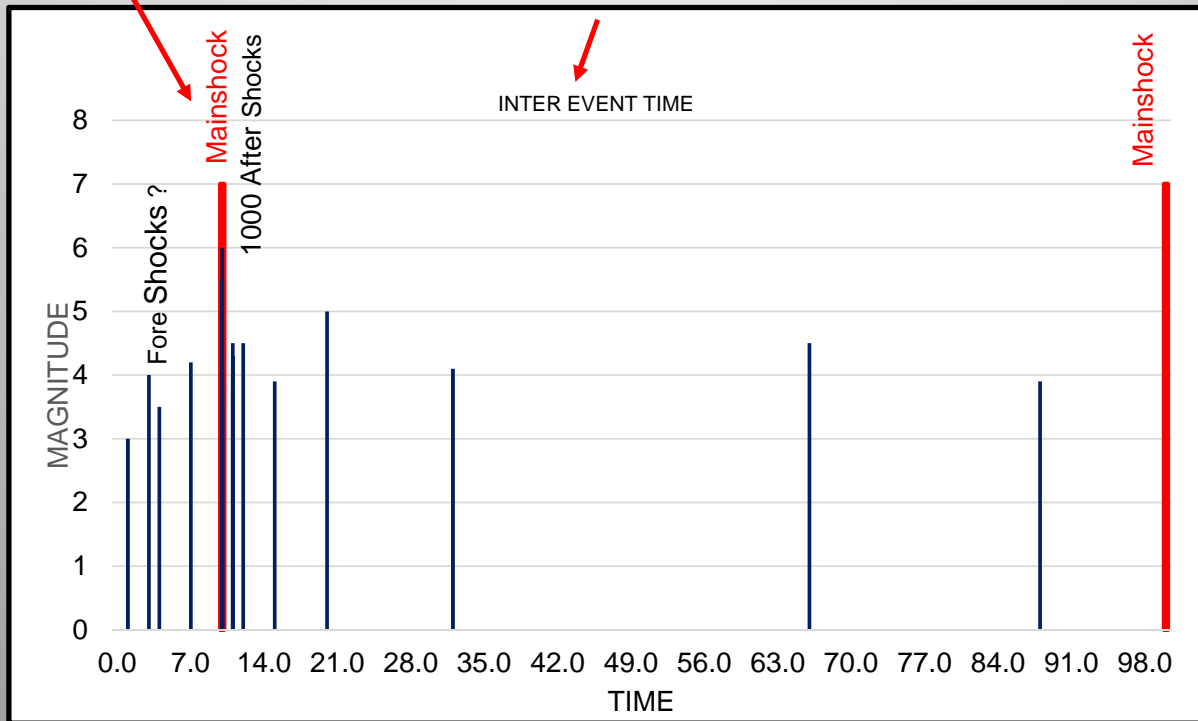
FIG. 3. Long-  
around Izu Peninsula.

**Meticulous**

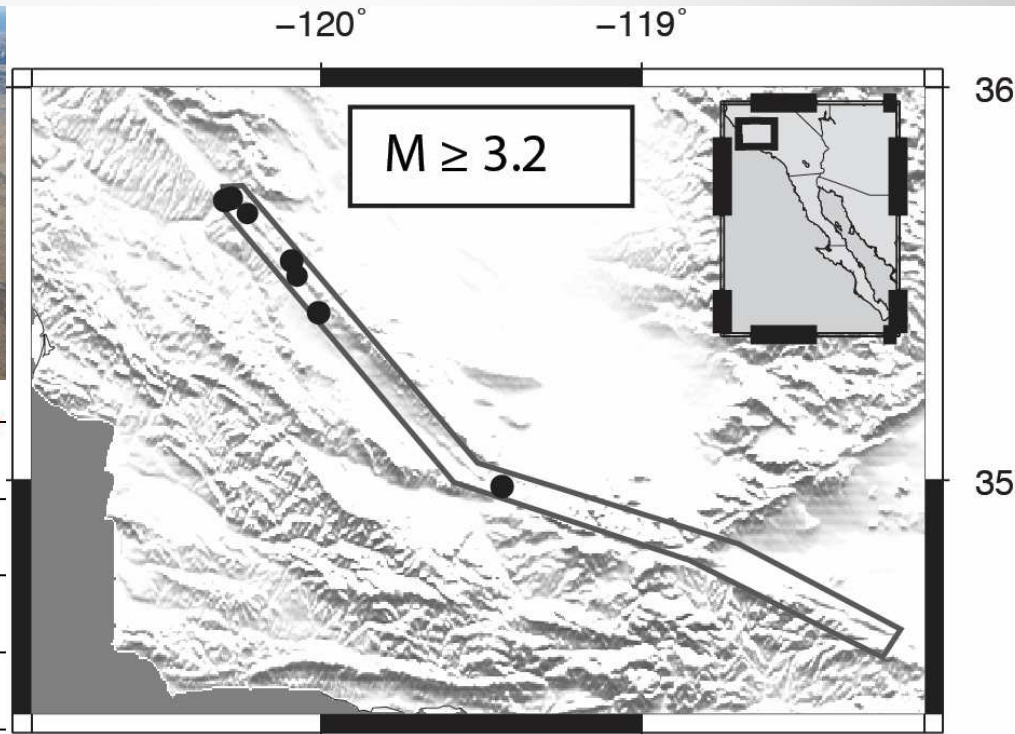
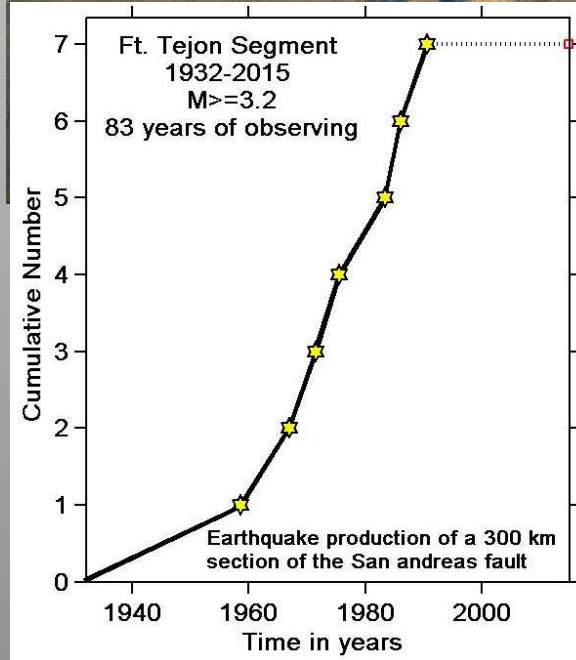


Schematic seismic sequence on a section of a major fault

**Log N = a - b\*M**  
**Assumption: "a" allows calculation of recurrence time of Mmax**



Why ask this question?



**Along the 300 km 1857 rupture of the San Andreas Fault there occurred only 7 M<sub>w</sub> ≥ 3.2 earthquakes during the last 83 years, instead of about 10,000 expected by assumption**



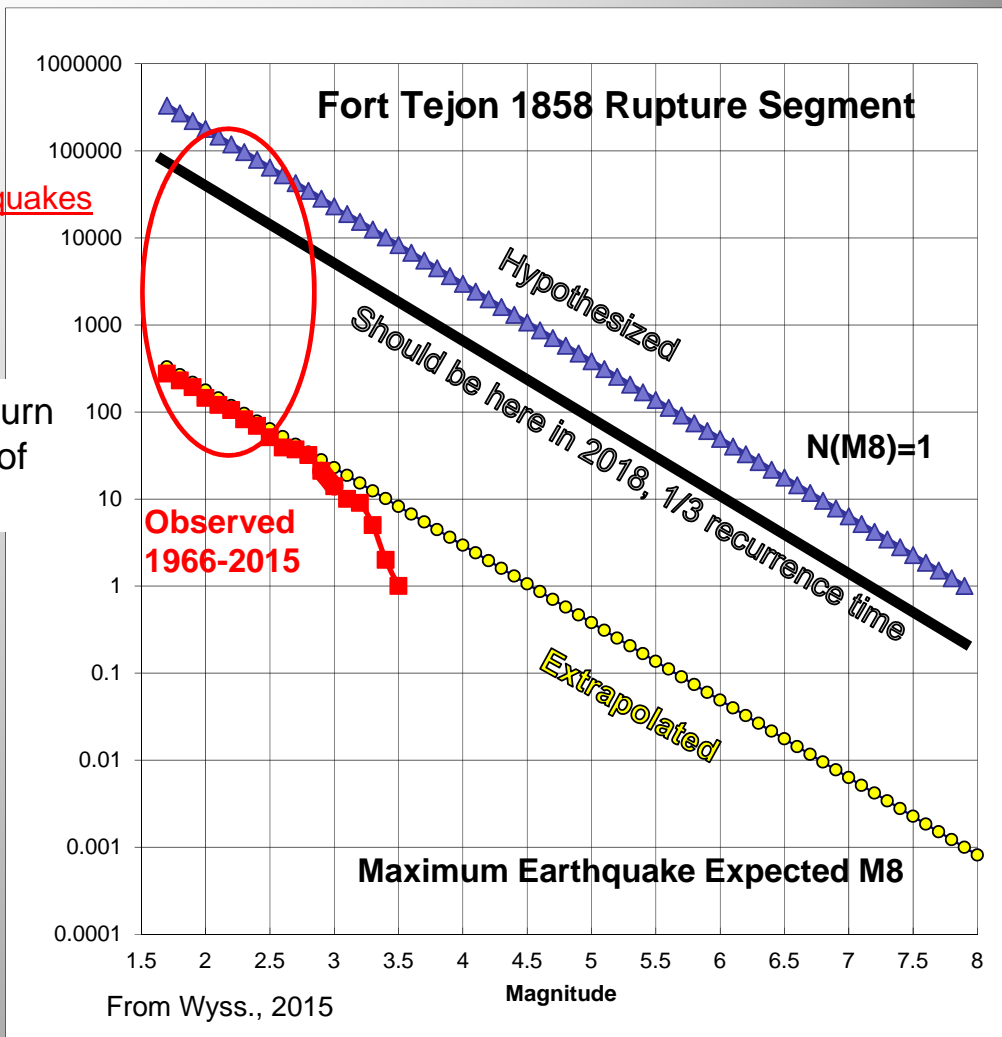
**a-value: Misuse of statistics because of a false assumption**

Assume probability of a large earthquake can be calculated, extrapolating  $\text{Log } N = a - b \cdot M$  during interseismic periods



Thousands of earthquakes are missing

Overestimate return times by factors of 4 to 400.



Information from trenches yields: Solid return times  $\pm$

Ishibe & Shimazaki 2012: same in Japan for 166 fault zones.

**Conclusion: Standard seismic hazard calculations are wrong.**



## Fundamental error of thinking by Geller et al. 1997

Geller et al. (1997): “Any small earthquake has some probability of cascading into a large event”.

Yes, the crust is generally under high stress: Small earthquakes are triggered almost anywhere one pumps fluids into it. No large earthquakes are triggered when large faults are absent.

However, only near large active faults one finds large accumulations of strain geodetically (GPS, INSAR).

Reid`s (1910) elastic rebound theory is correct. Strong fluctuations of strain continue to be **observed** near great faults and these are likely producing measurable signals.

Haicheng earthquake M7.3, 1975 & L'Aquila M6.3, 2009

Facts Haicheng : Swarm of eqs > damage > population frightened > red guard decision evacuate

Estimated benefit: 8,000 lives and 27,000 injured saved (Wyss & Wu, 2014)

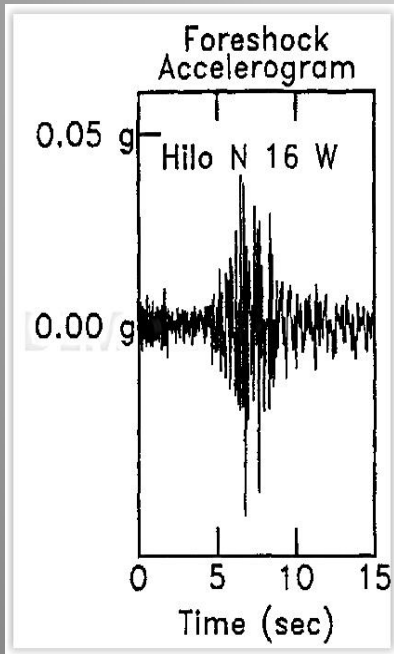
Scientific prediction: No

Emotion based protective measure: Yes, great success.

L'Aquila earthquake swarm > people frightened > no action: decision based on statistics. Statistics failed people: 308 dead

Conclusion1: Consider integrated probability over decades concerning family plus descendants

Cascading main shock earthquake model is correct  
 This can be seen without inversion from best strong motion record of separated sub-events



First documentation of fault creep Smith & Wyss (1968)

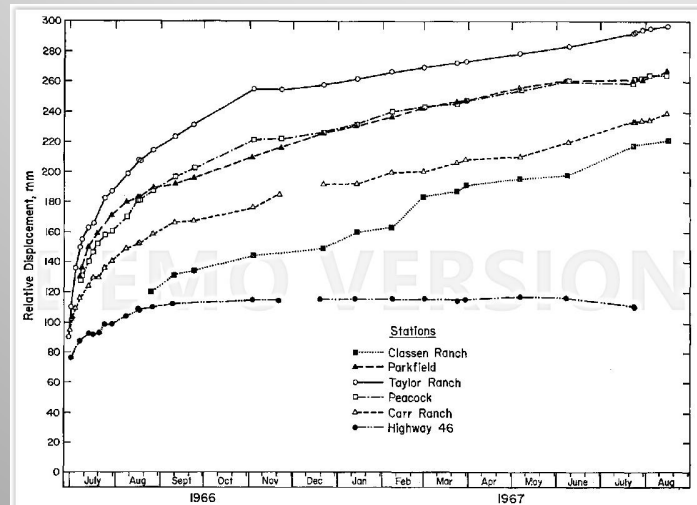
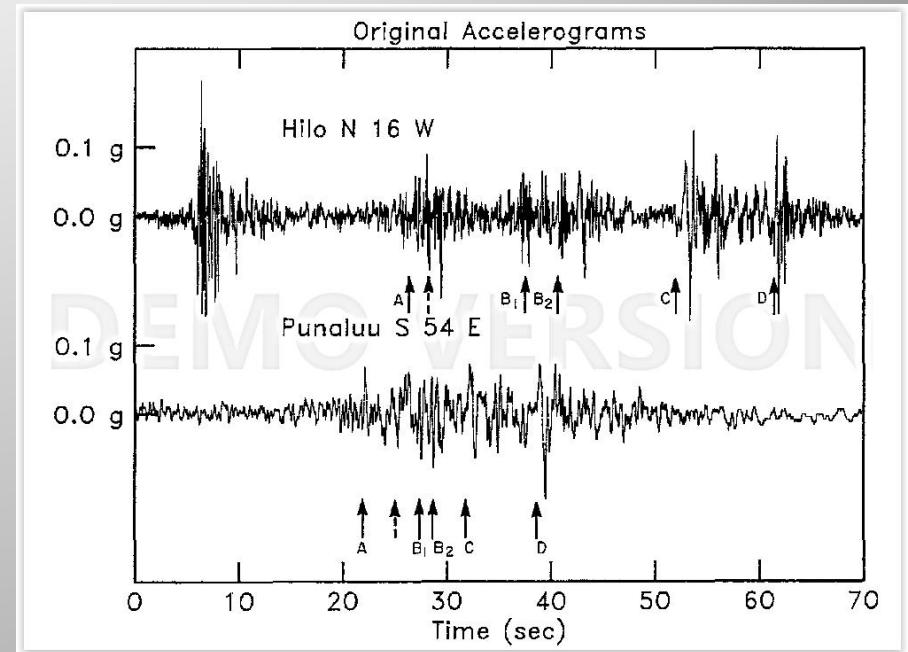


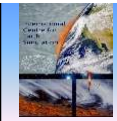
Fig. 4. Cumulative displacement across the fault trace measured geodetically at six stations in the Cholame Valley region. The locations of the stations along the fault are shown in Figure 2.

Harvey & Wyss, 1985



Foreshock M5.9 70 min before

Kalapana main shock M7.2, 1975



## QUESTIONS:

Are not physical processes predictable?

How can we marry long-term with short-term precursors?

**Earthquake prediction is orphaned by the establishment. How can we get it back into the main stream, when the Namazu approach still discredits it?**

Thank you for your patience

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