
Some Issues in Seismic Hazard Assessment for the Next Generation Map

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Introduction

- Seismic zonation plays a role of governmental policy for earthquake fortification, as a national standard in China.
- Seismic zonation in the world initiated at the end of 19 century in Russia.
- The related study started in 1920's after the Haiyuan earthquake, and the first regional seismic zoning map in China was published in 1923 and the first national map in 1957.
- Some researchers mainly worked on statistics of historical data (河角廣, 1951; Lomniz, 1967; Milne & Davenport, 1969), while some others emphasized the tectonic cause of earthquake (Gubin, 1978).

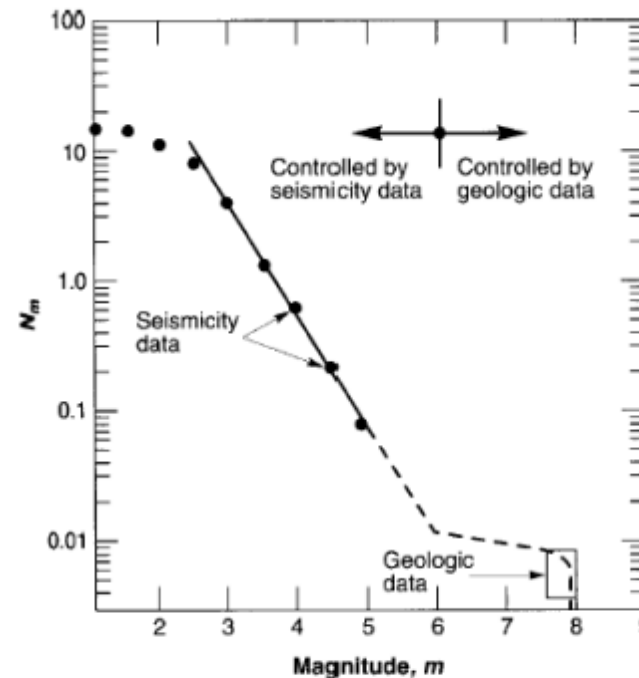
Introduction

- Long term earthquake prediction from a comprehensive understanding of quake occurrence mainly on seismological and tectonic consideration has been a basis of the zoning.
 - Engineering seismic hazard assessment (Cornel, 1968; McGuire, 1973), so called PSHA, is now widely adopted in zoning maps in the world at national, regional and city level.
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1. Fundamentals

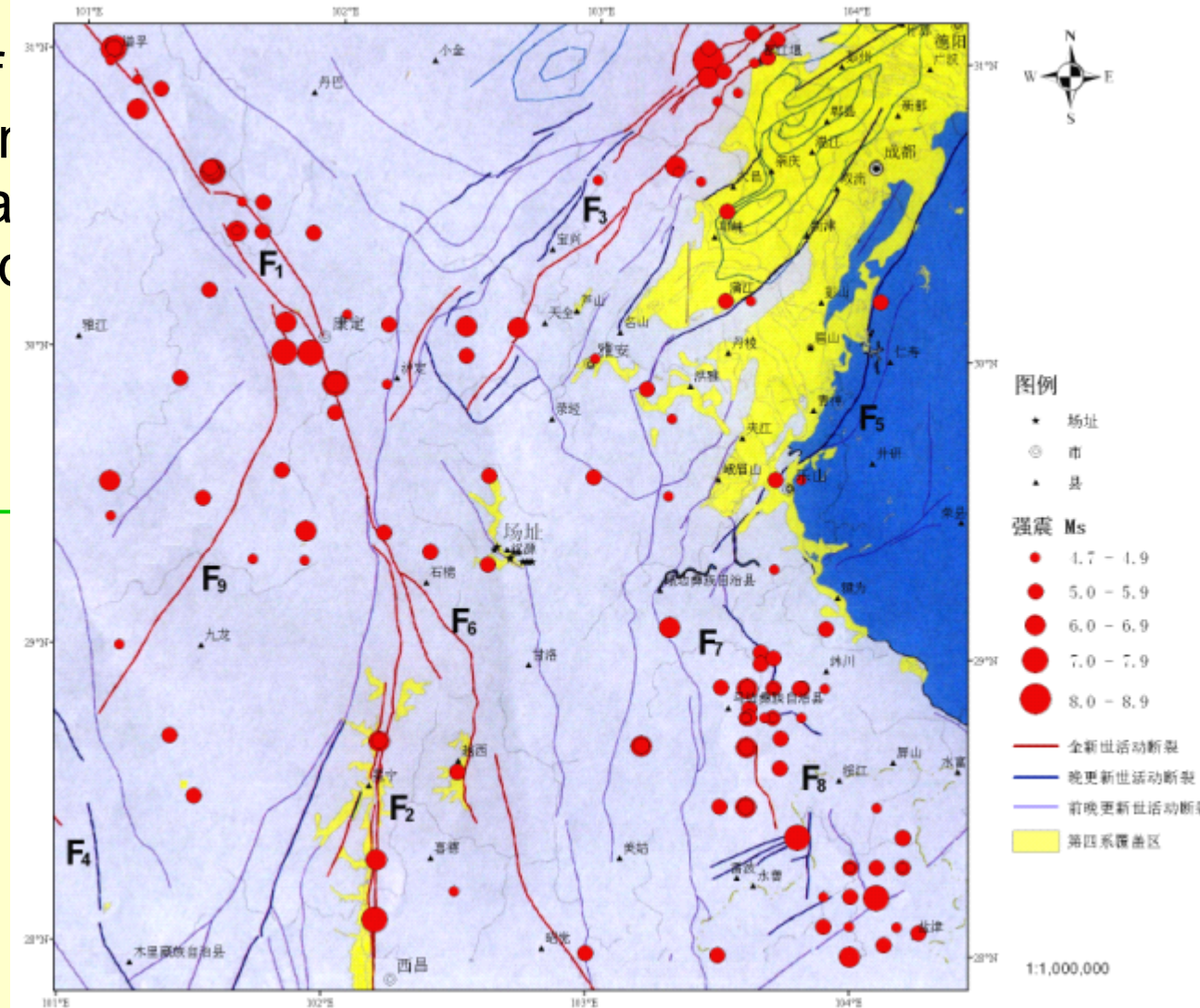
- The fundamentals of strong earthquake occurrence from regional seismicity and tectonic condition (Lee, 1957) may be restated from what have been learned from the recent large quakes.
- Strong earthquake may occur at a place where a destructive shock occurred with the similar magnitude-
in what space-time area?
- Strong earthquake may occur at a place where the tectonic condition is similar with another place where a destructive shock occurred-how to characterize the tectonical condition and to define the similarity?

- Immunity--It takes time to accumulate enough energy in the crust for the next strong earthquake.
- Migration--Develops along the whole rupture process
- Filling--Linking the

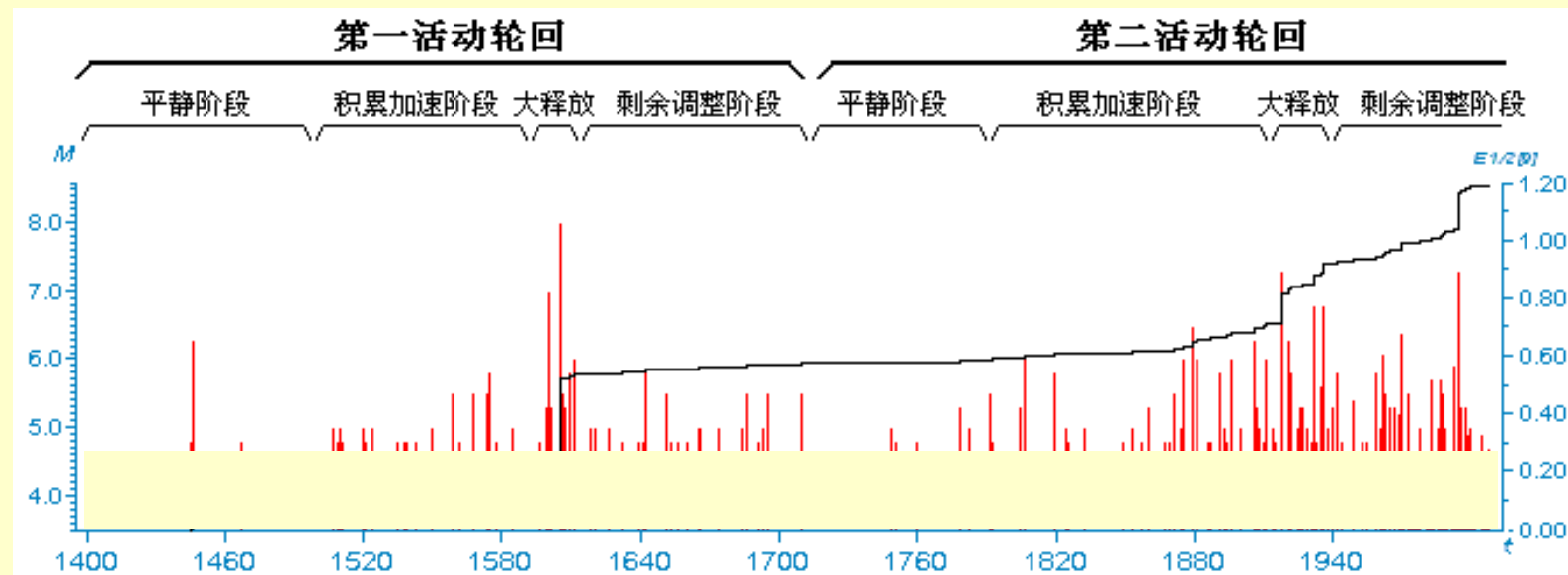


Inconsistency Of Mean Annual Rate Of Exceedance As Determined From Seismicity Data And Geologic Data (Youngs And Coppersmith, 1985)

- Case of at Longr than tha occurred



- The seismicity fluctuation must be taken into account in seismicity parameter estimation.



- M-T plot of the South-eastern seismic zone

2. What data to be adopted

- Available and necessary
 - Seismicity data, destructive and small event
 - Tectonic data, active fault and basin, blocks
 - Geodetic data, such as GPS
 - Geophysical data, for the crust structure and deep structure
 - Geodynamic understanding
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3. How to process the data

- ?
 - ?
 - ?
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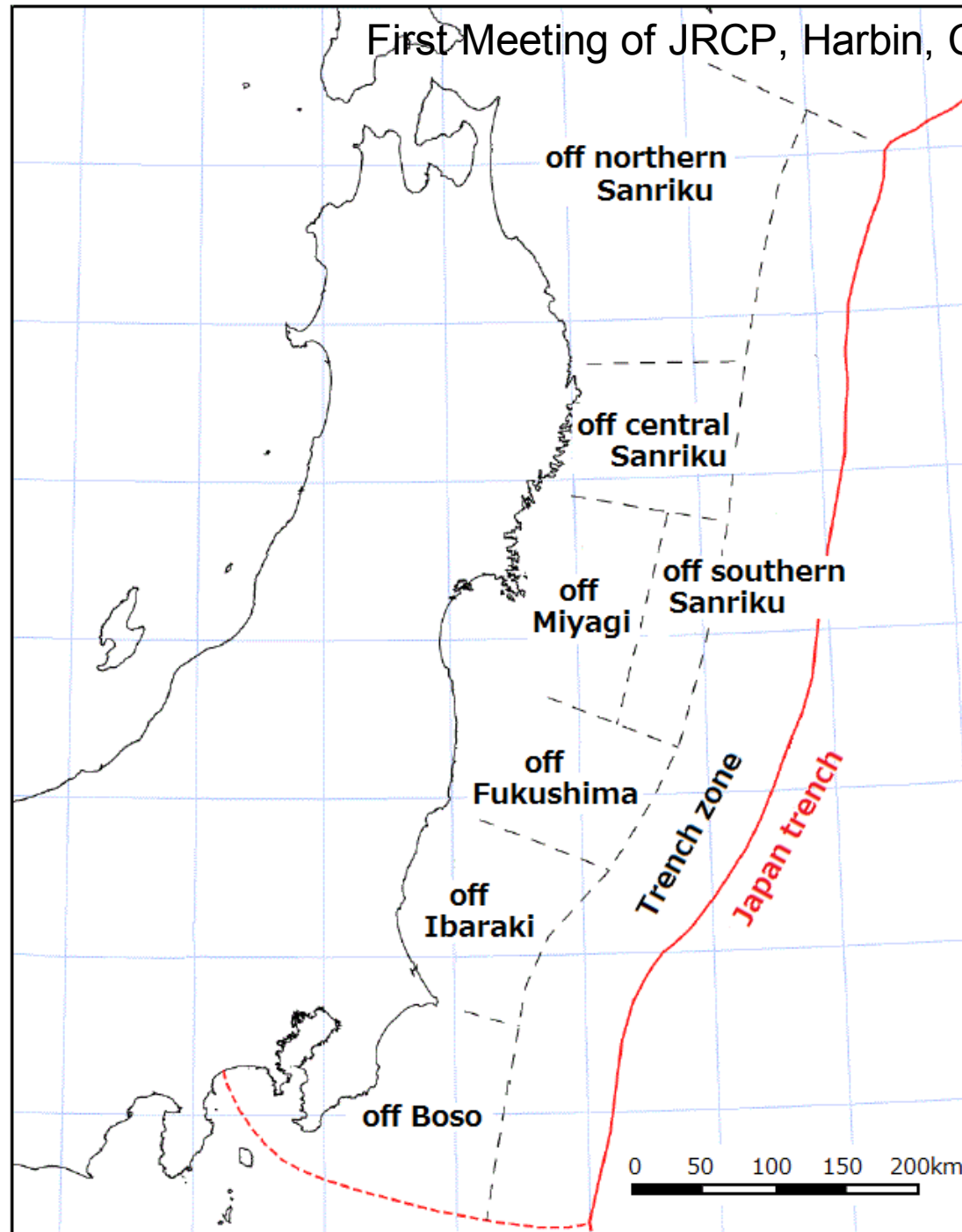
How to pr

- For example, the past 200 occurred in 1897(M7.4), occurrence p

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Table 1 Long-term forec

Region
off northern Sanriku
off central Sanriku
off southern Sanriku
off Miyagi
off Fukushima
off Ibaraki
off Boso
Trench zone



(HERP)

erage
erval

97 yrs

05 yrs

7 yrs

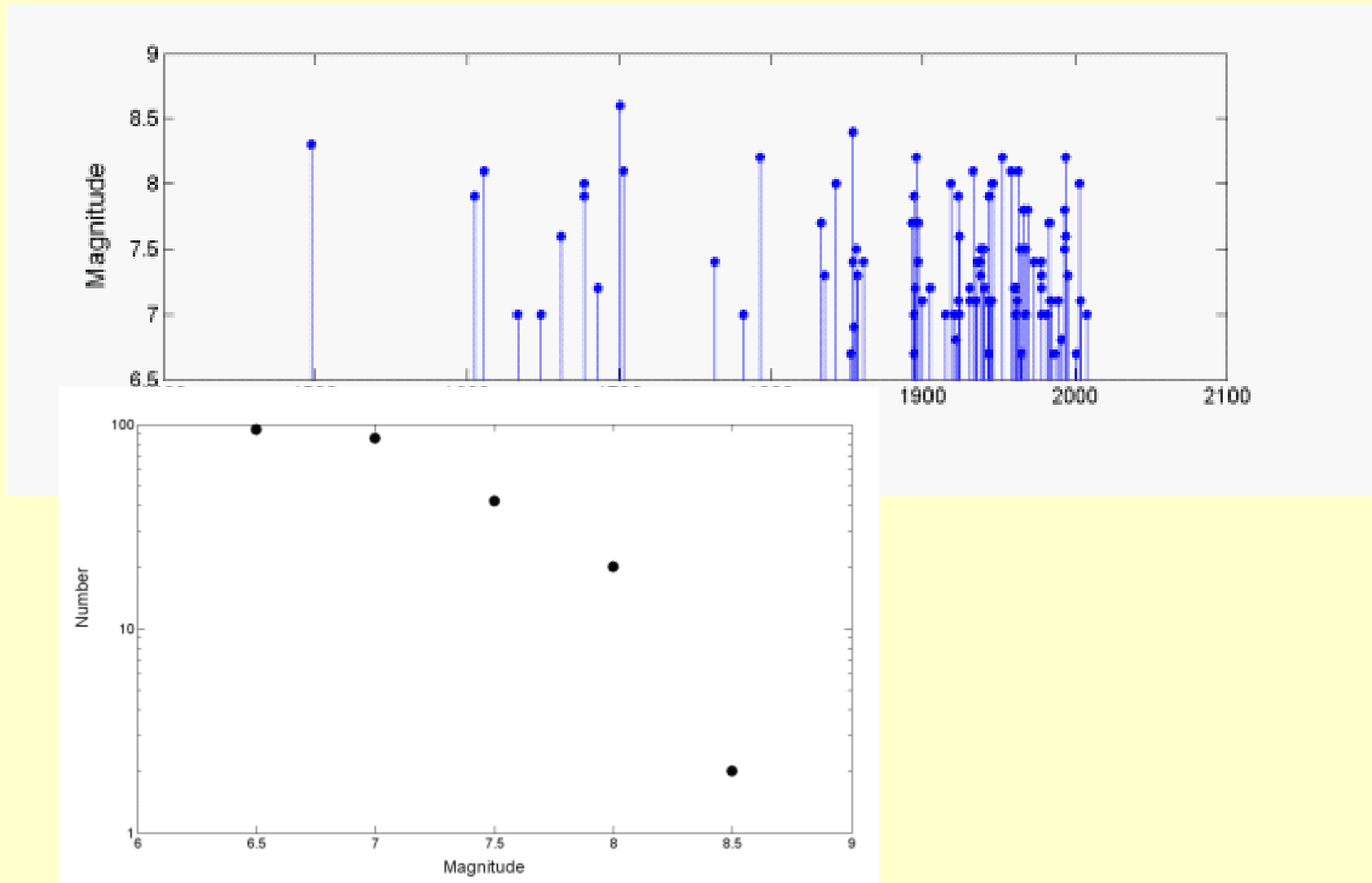
400 yrs

21 yrs

33 yrs

750 yrs

How to process the data



Two rank potential source area delineation

- The first rank PSA, seismic province or zone, for is quite large for enough data to statistics.
- The second rank PSA evaluated with its own upper bound magnitude, to be assigned with seismicity parameters by a set of weighting factors.

$$\sum_i W_{ij} = 1.0$$

- The values of factors are evaluated from a comprehensive summary

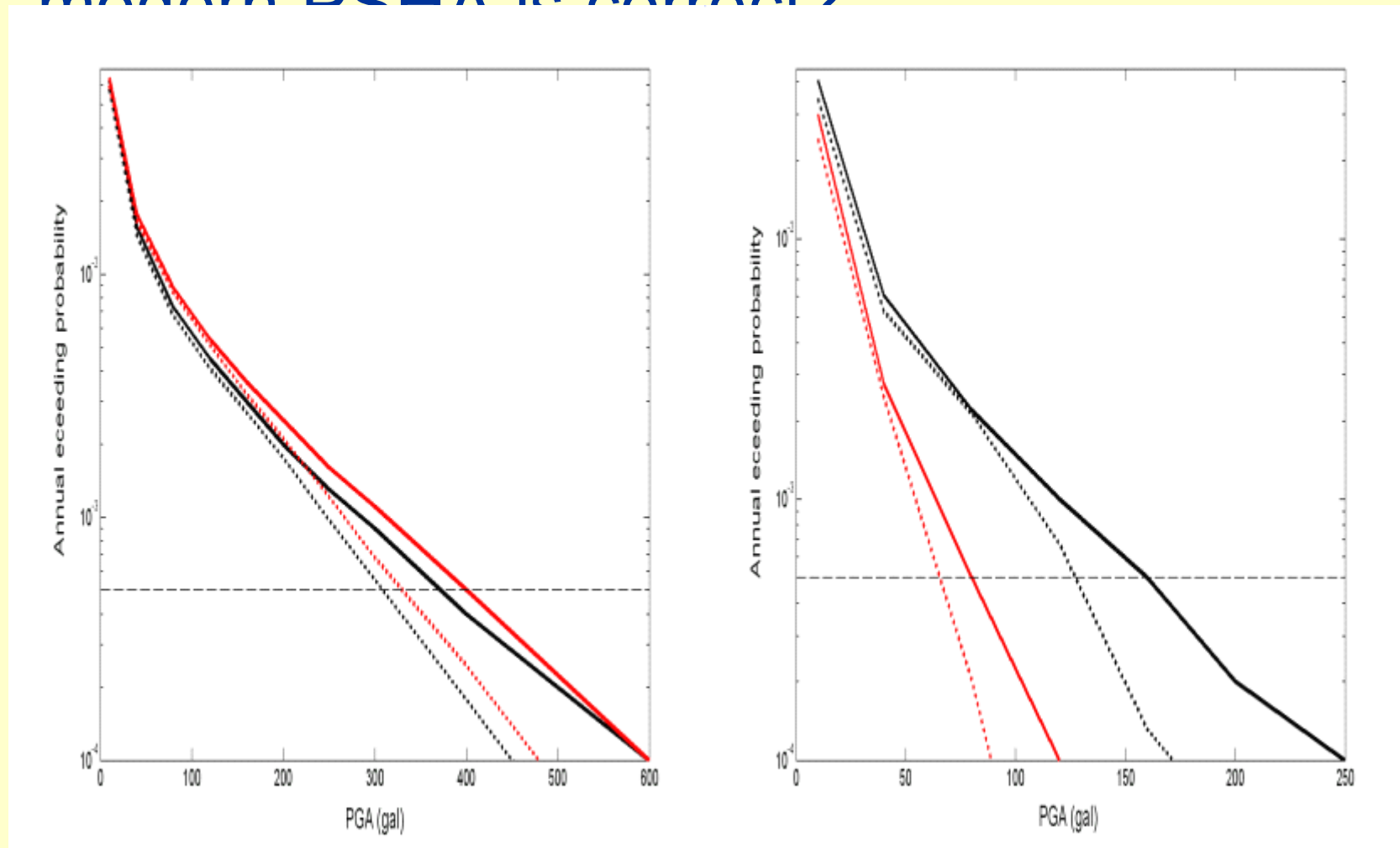
$$W_{ij} = \sum_k f_{ijk}$$

- can all factor values be summated together?

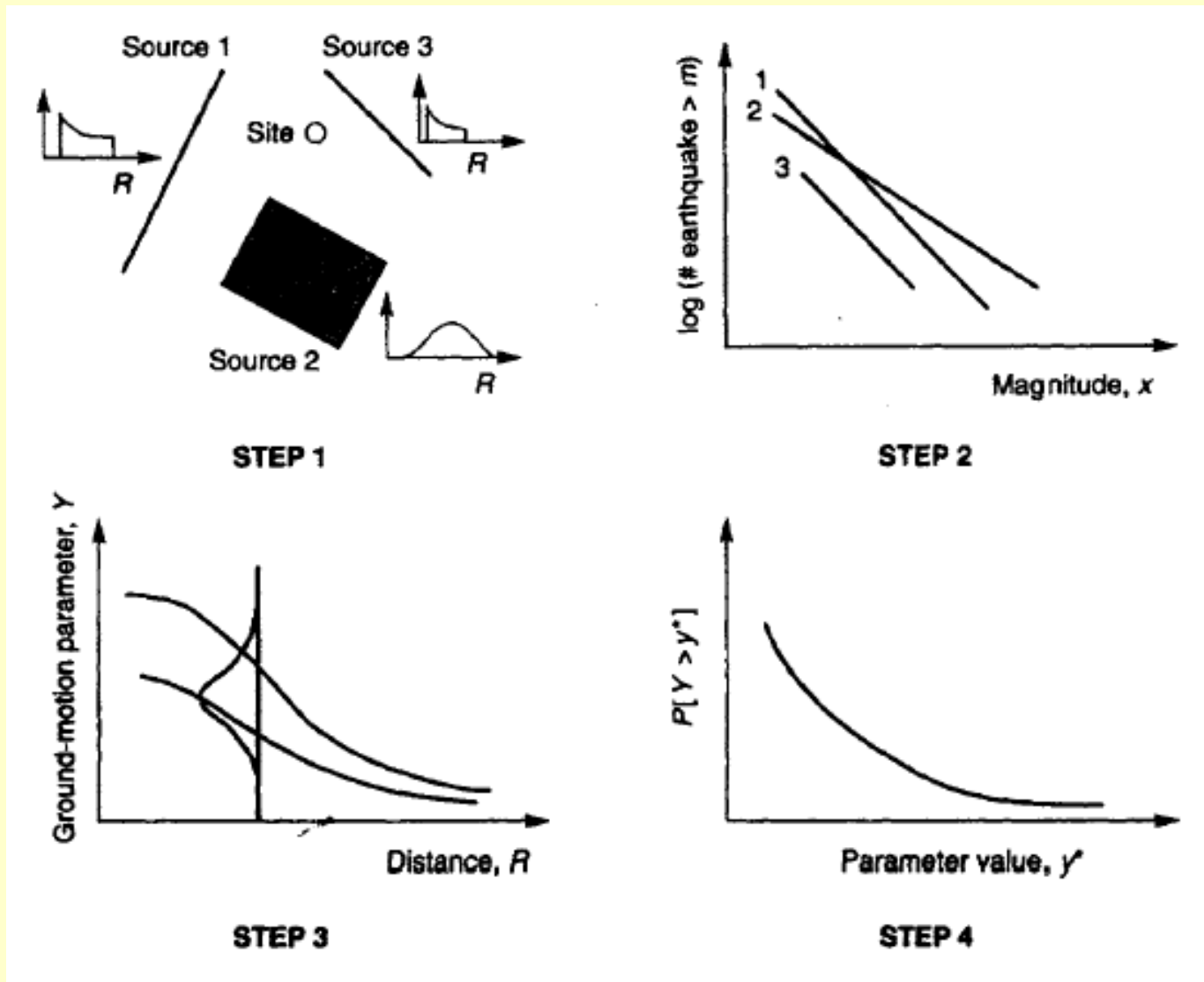
3. Ground motion attenuation relationships

- Statistical results of Japan.
- Modification of the result of another region by the intensity attenuation relationship comparison, in China.
- Based on seismological achievements for region without enough strong ground motion records.
- Dr. Tao is going to...

4. The mathematical formulation of modern PSHA is correct?

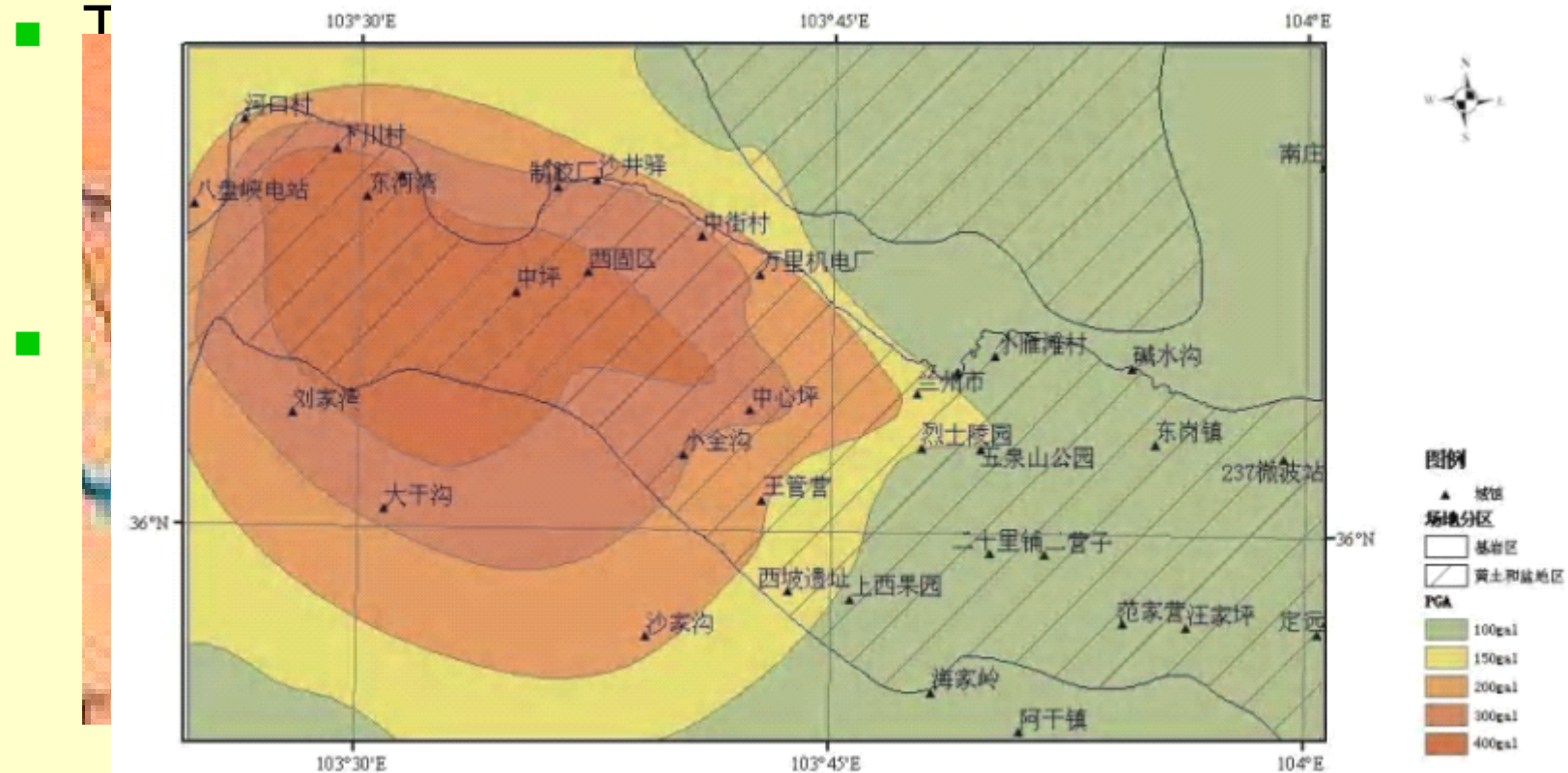


Truncate the distribution at what area?



5. A new idea

- To combine the probabilistic seismic hazard assessment and the scenario (deterministic) approach for the map.



- Peak ground acceleration zoning map in a basin and its vicinity for case study is presented with the different response spectra in two soil condition zones further.
- Is it possible to take into account the local site condition into account in a national map?
- Site condition is usually taken in microzonation next, not in national map or regional map, in China.
- In some cases, the map is prepared by different ground motion attenuation relations for plain and mountain regions respectively. Thus, is the site effect doubled ?

Conclusion

- Five issues in seismic hazard assessment are mentioned in this presentation.
- Some of them are considered well, and I have definite answers, while more are recognized without clear solutions.
- Please add anymore else on this meeting and in this project.
- Let us work together resolve them, at least some of them, even not all.

Thank you!

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