Overview of Active Fault Research at Geological Survey of Japan

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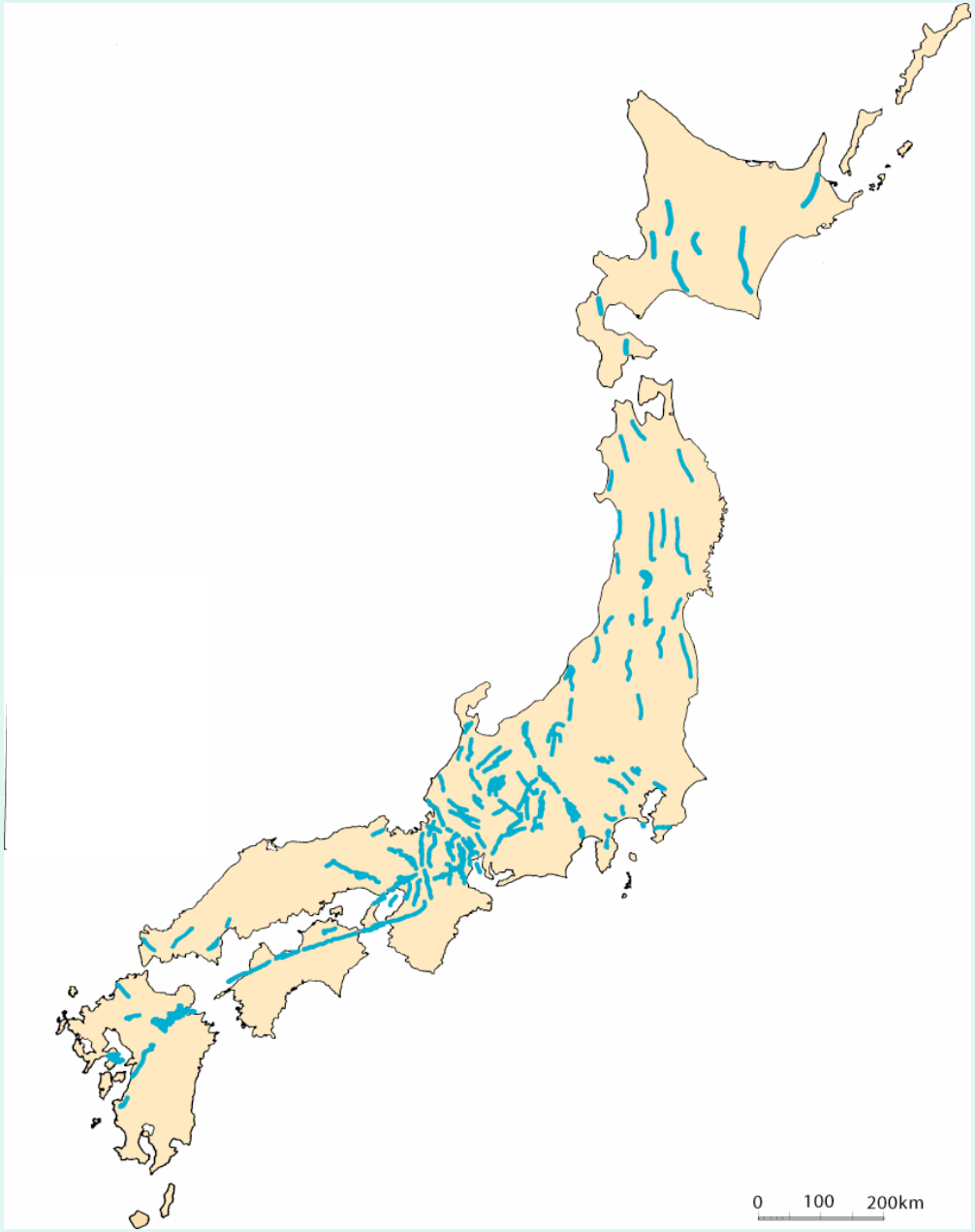
Main Subjects on Active Fault Research

- Paleoseismological investigation
- Segmentation and scaling relations
- Prediction of earthquake magnitude

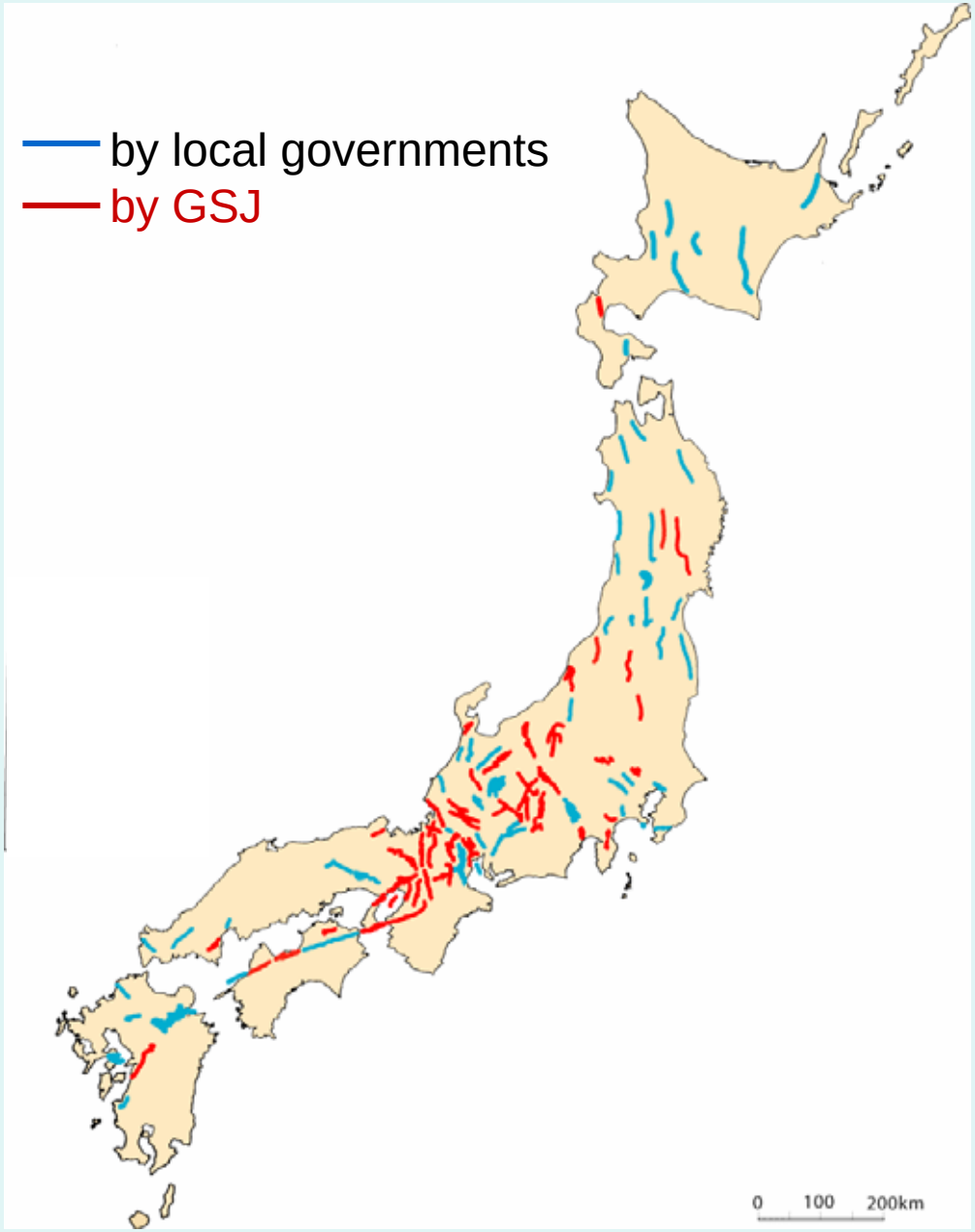
Paleoseismological Investigation

Active Fault Research Project in Japan, 1st Stage



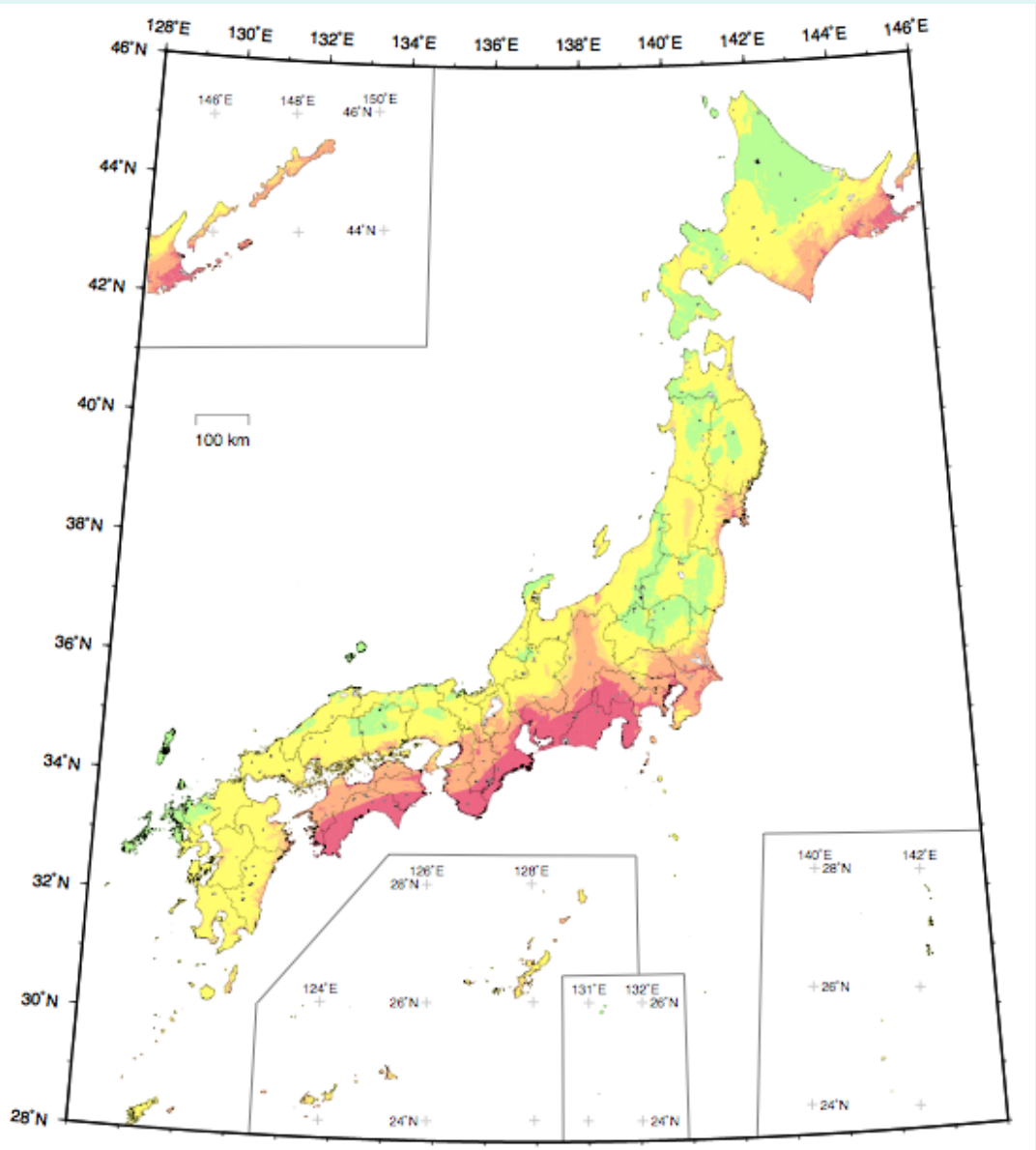
■ 1995 to 2004 FY

Active Fault Research Project in Japan, 1st Stage



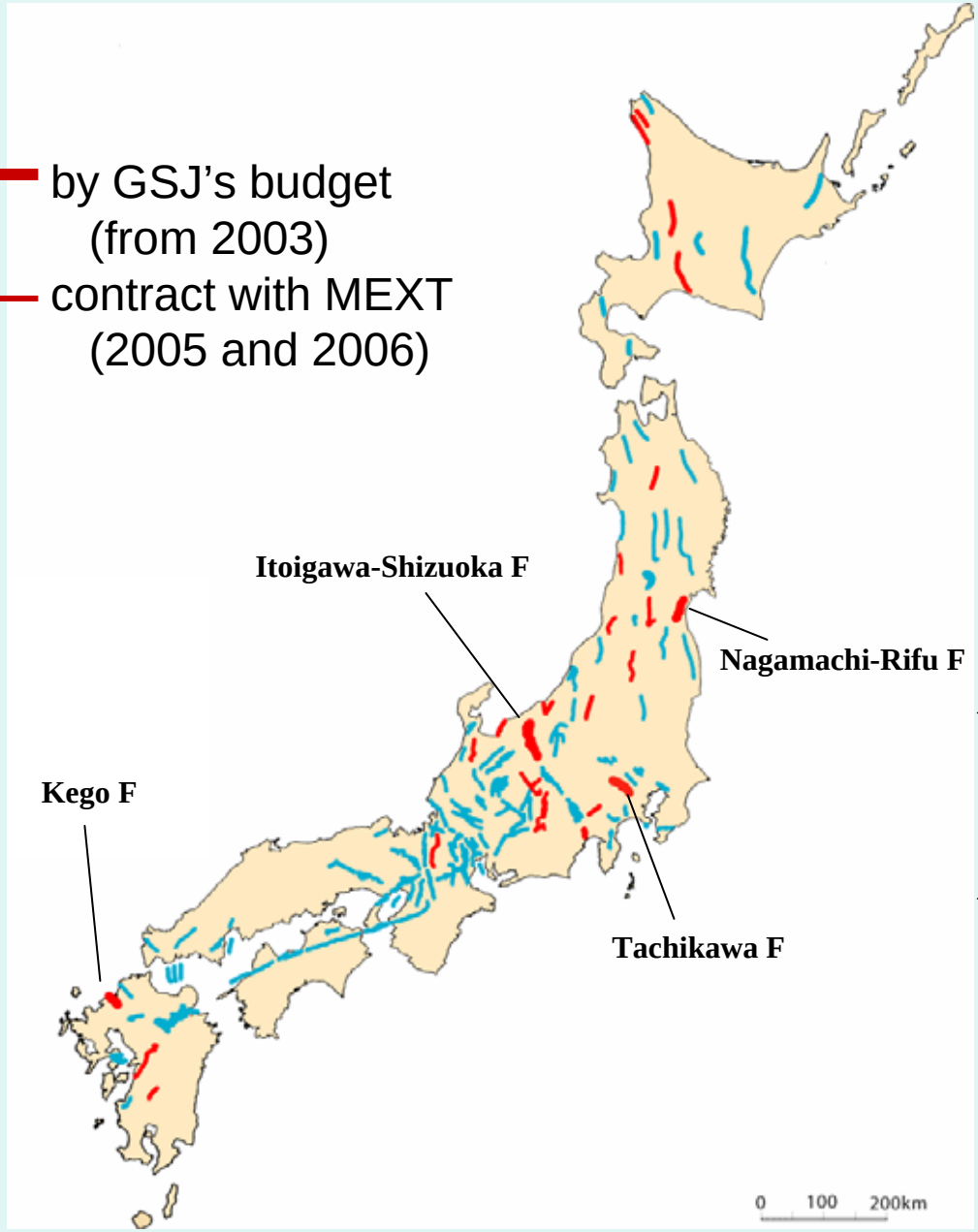
- 1995 to 2004 FY
- 98 Active fault regions
- Investigated mainly by local govern. and GSJ
- Evaluated by ERC, HERP

Probabilistic Shaking Map for Coming 30 Years
(ERC, 2005)



- ✓ Active faults
- ✓ Subduction boundary
- ✓ Other sources

Active Fault Research Project in Japan, 2nd Stage



- From 2005 FY
- 18 faults re-investigated by GSJ, in 2005 - 2006

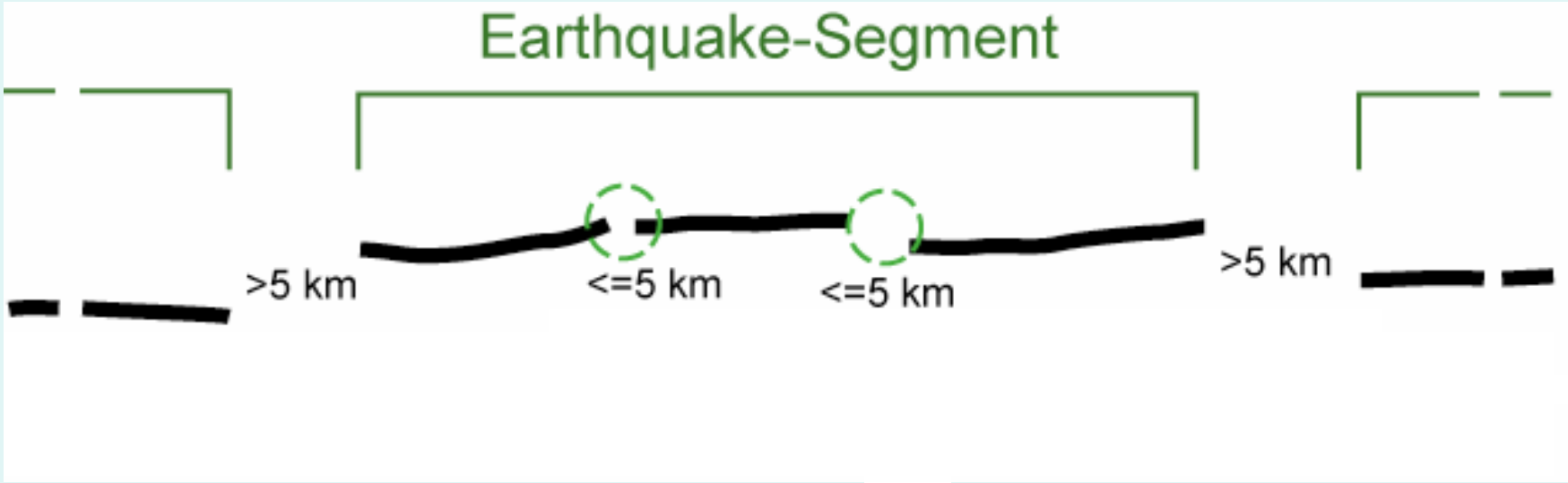
- ✓ 40 fault regions will be re-investigated
- ✓ Improved segmentation and scaling relations will be used ?

Paleoseismicty of an Active Fault, Which Triggered during the 2004 Mid-Niigata Earthq.

Triggered surface rupture,
with a slip of 0.2 m

Characteristic two faulting events
each with a slip > 1.5 m

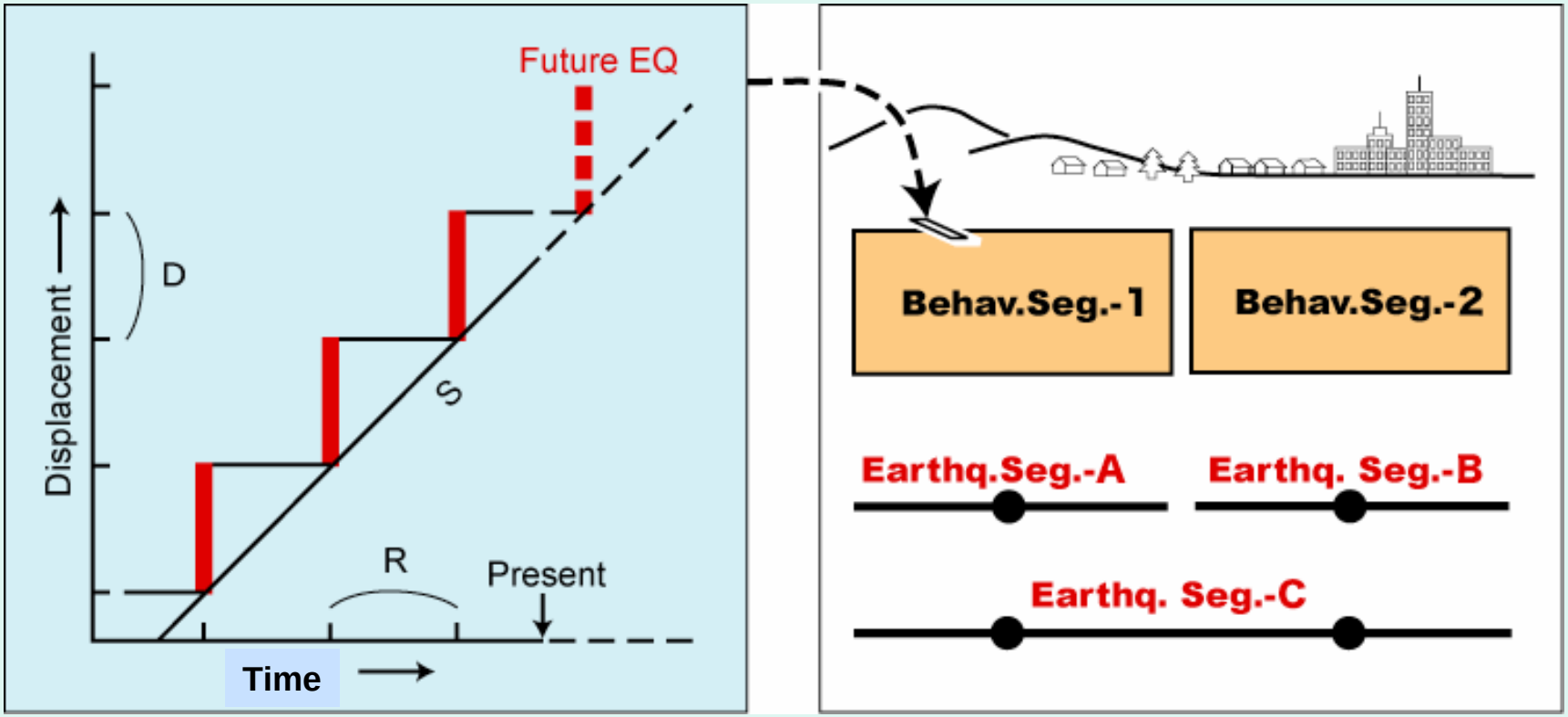
Prediction of "Most-Likely Earthquake-Segment" by ERC



- **5-km-thresould (Matsuda, 1990)**
- Scaling relation between total rupture length and slip
- 145 :Most likely earthquake segments
- 12 :further segmented based on paloseismicity alone

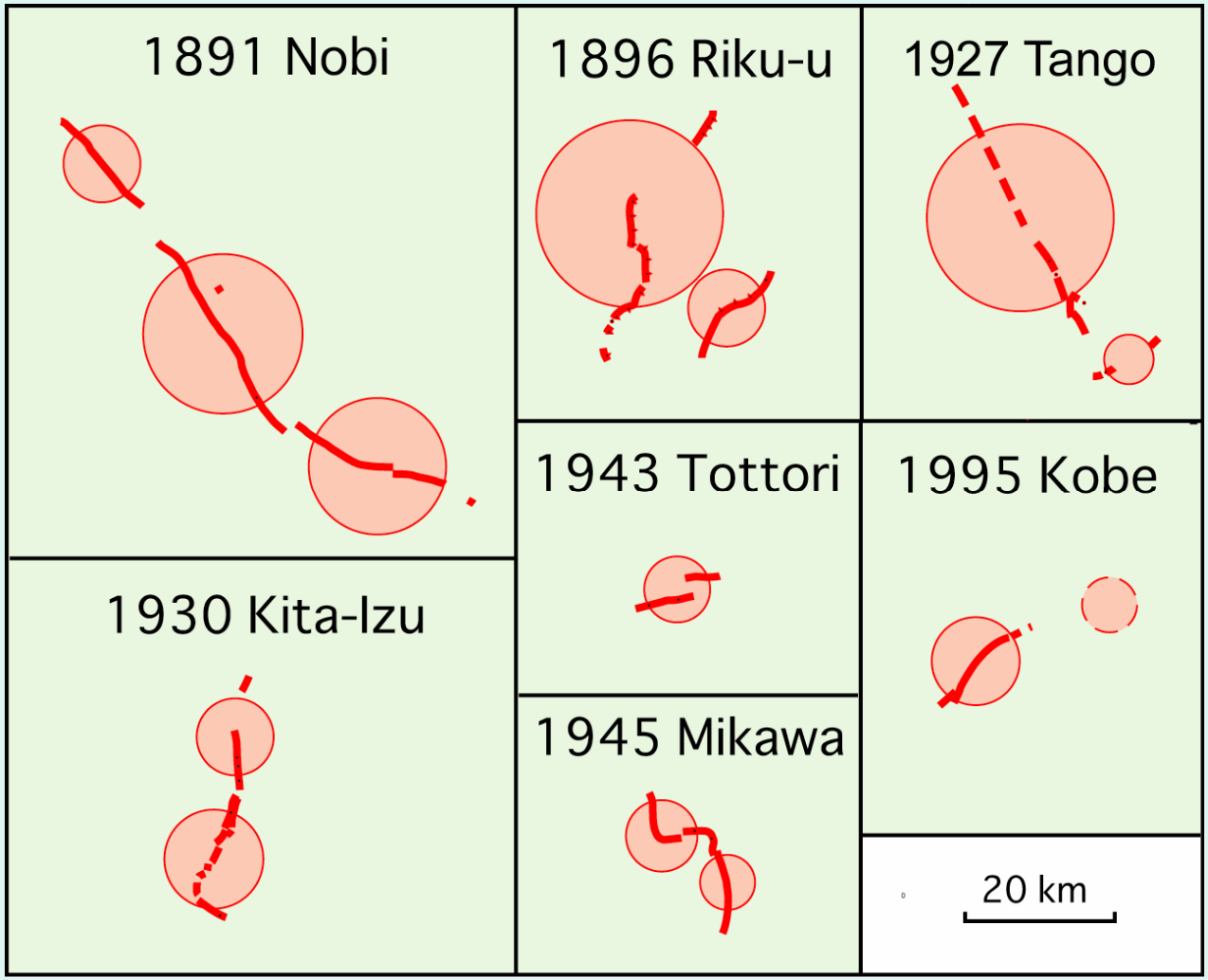
Fault Segmentation and New Scaling Relations

Behavioral Segment & Earthquake Segment



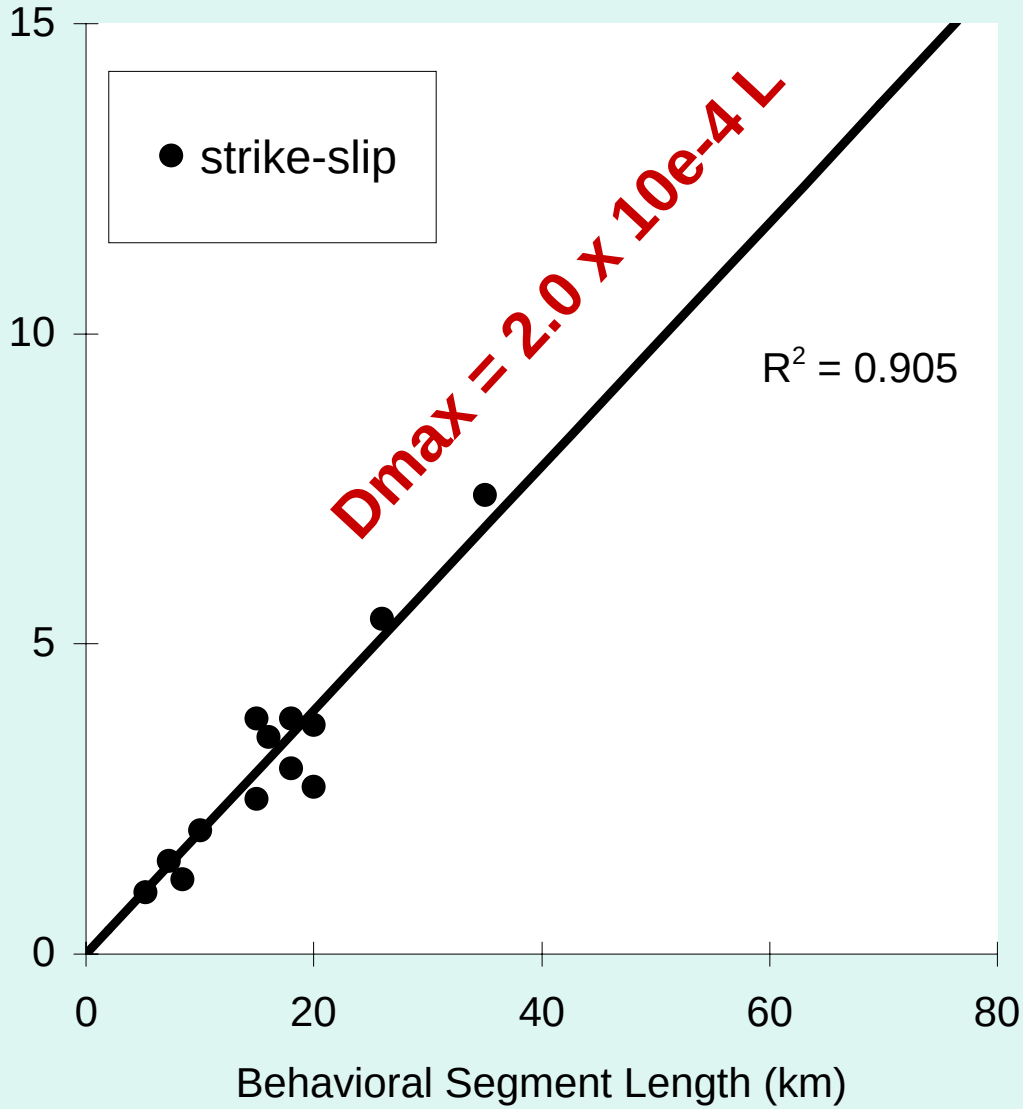
- Estimate the extent of **behavior segment** ?
- Probabilistic prediction of **earthquake segment** ?

Segmentation of 15 Surface Ruptures in Japan



- Paleoseismicity, Rupture process, Geometry
- Segment length <= 35 km
- Jog and Gap >= 2 km

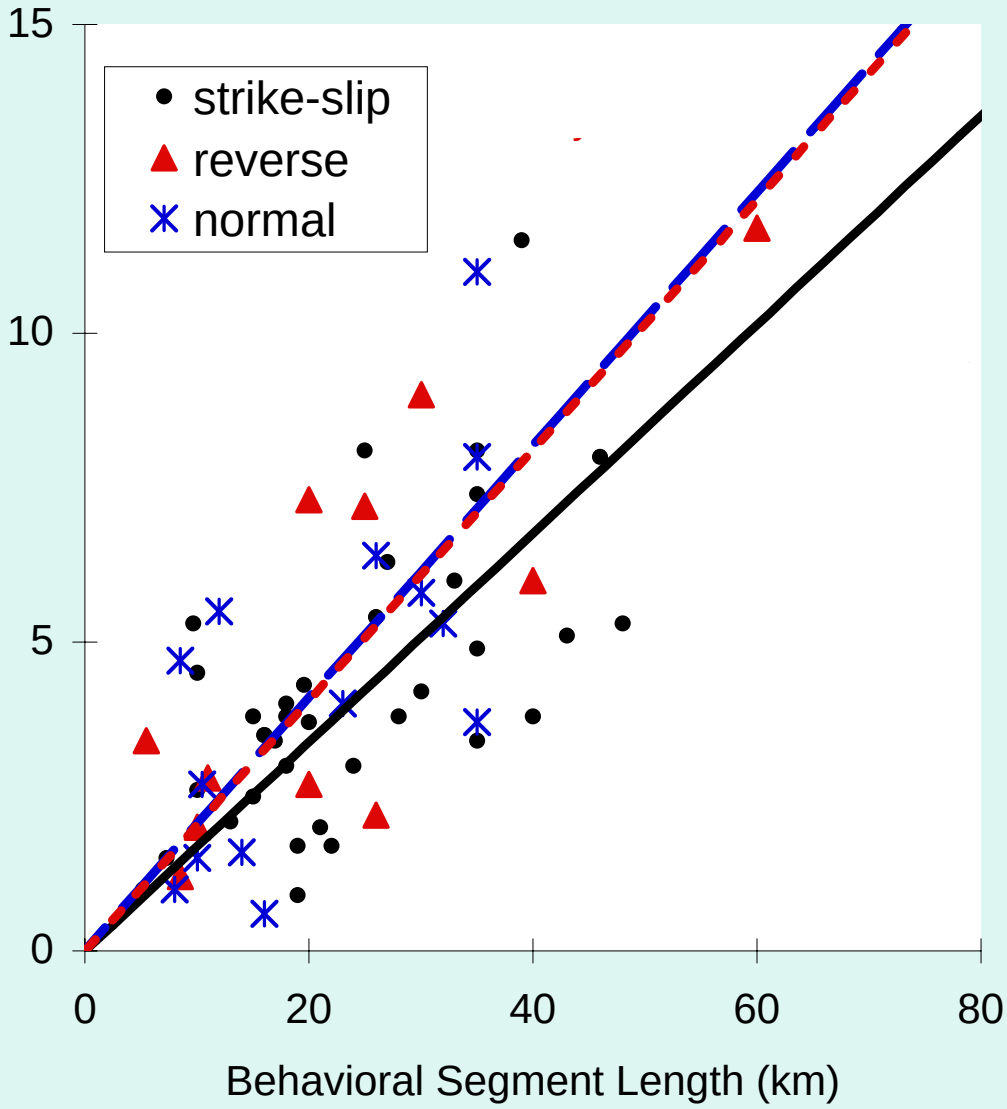
Scaling Relation : for Behavioral Segments



13 segments
/ in 6 ruptures

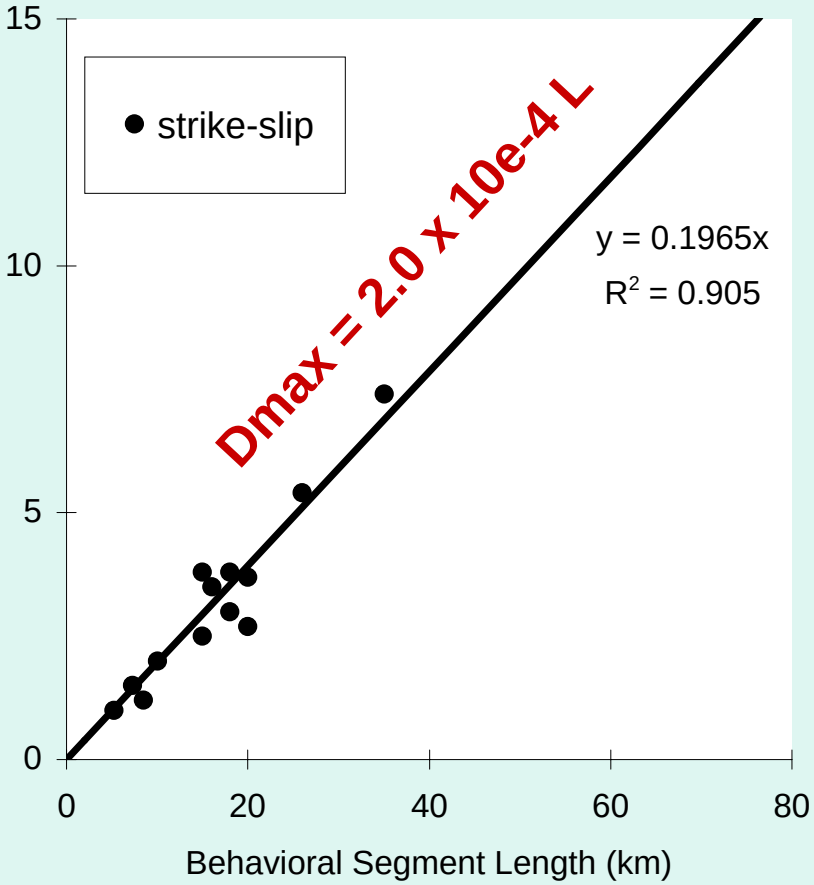
Japan (strike-slip)

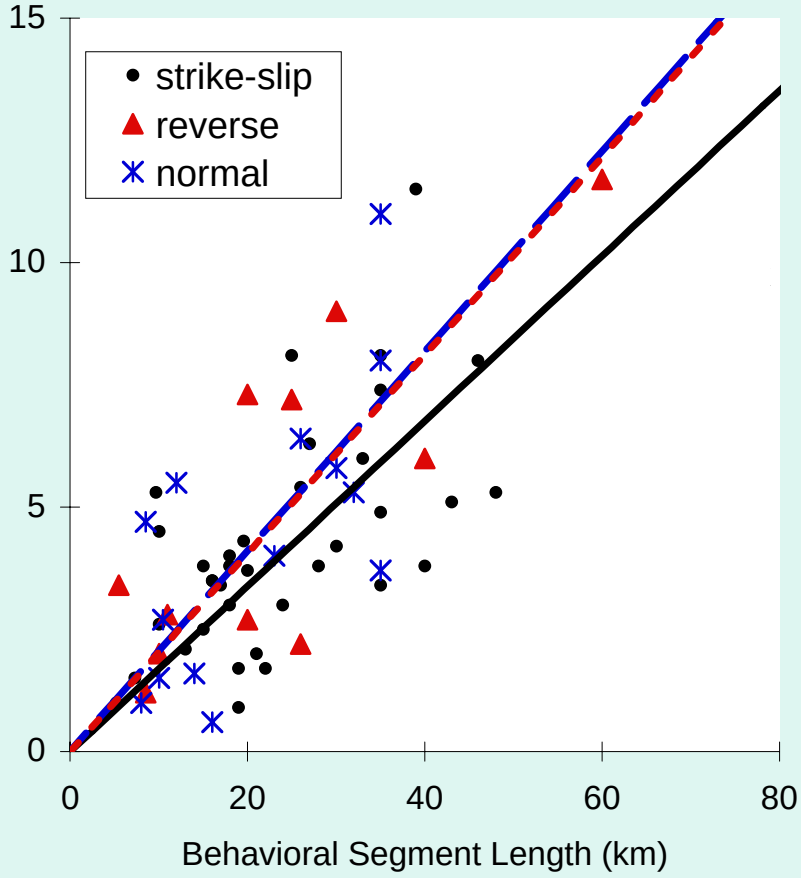
Scaling Relation : for Behavioral Segments



World (all types)

Scaling Relation : for Behavioral Segments

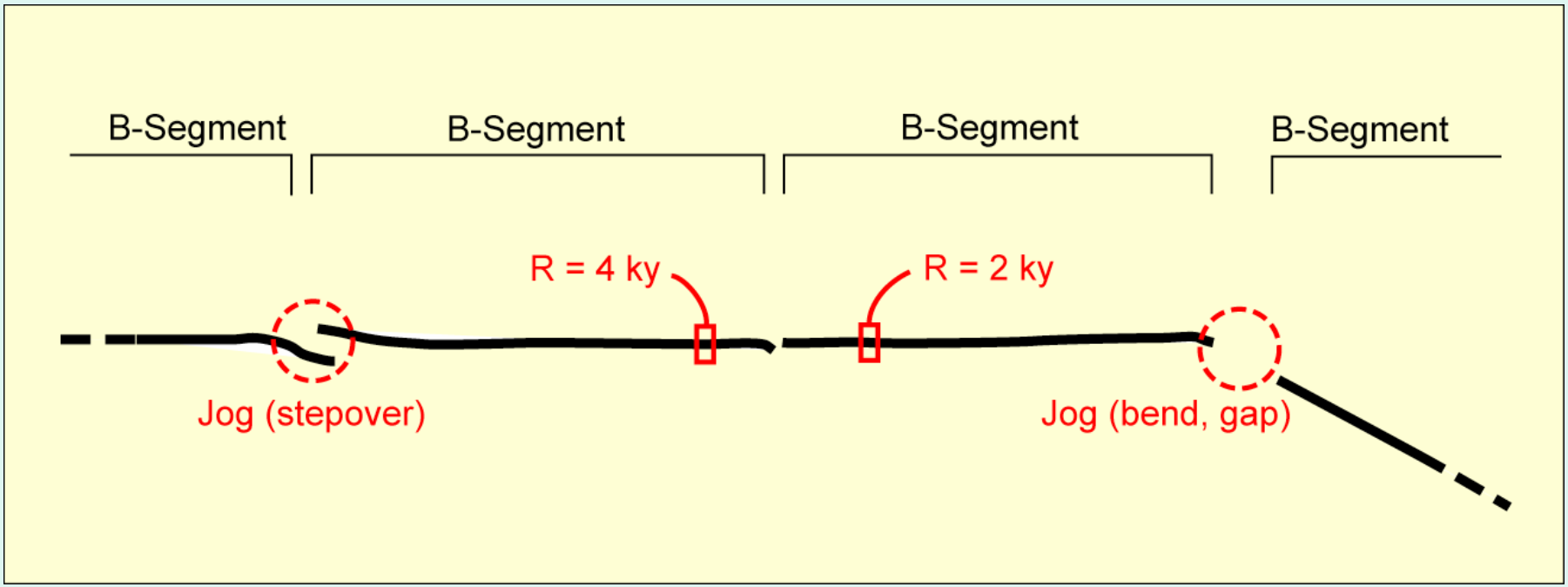




Japan (strike-slip)

World (all types)

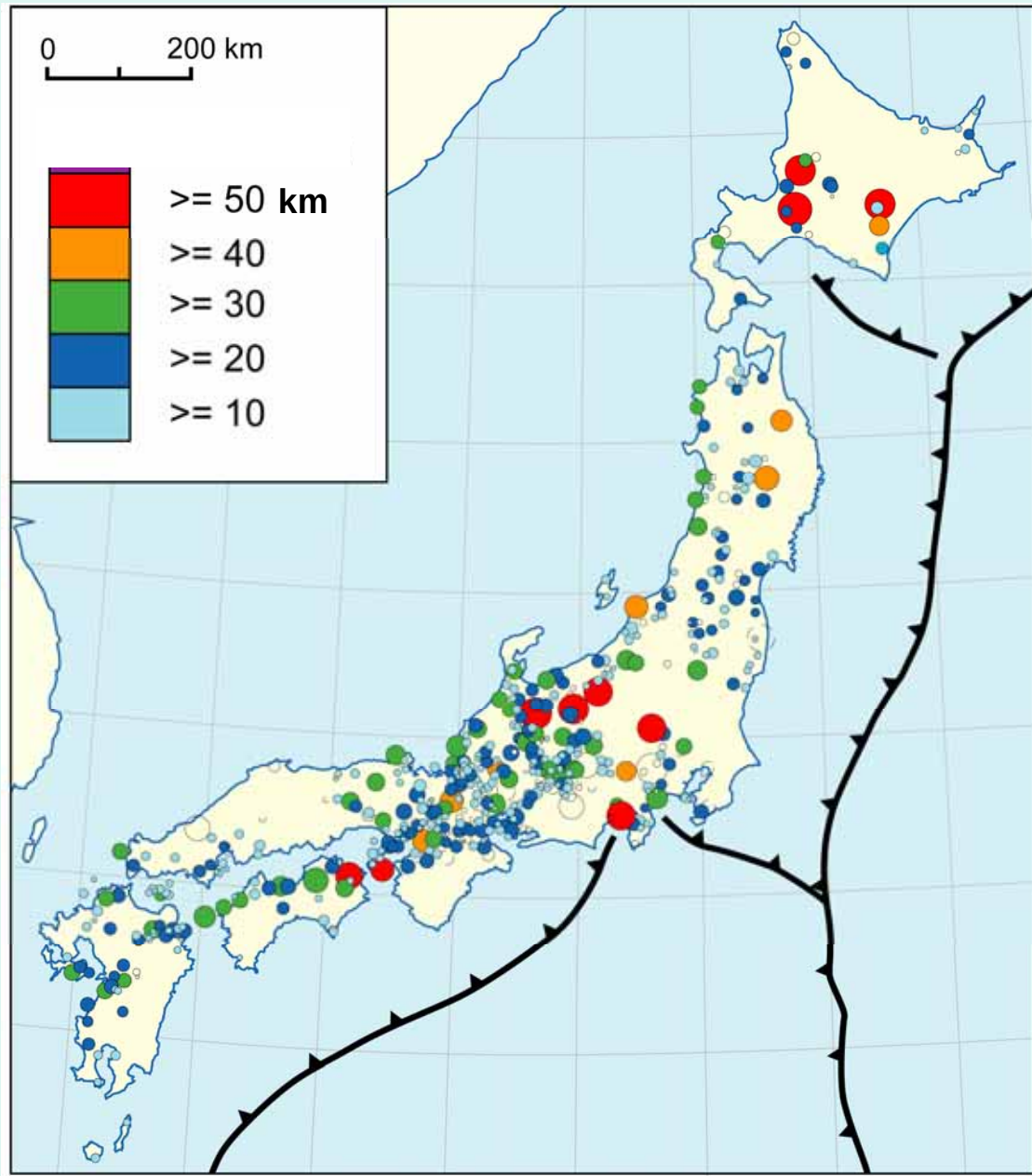
Criteria for Behavioral Segment



- ❑ Geometry :Jog & Gap >= 2 km
  :Bend >=20 deg.
- ❑ Paleoseismicity :Timing of faulting event
  :Recurrence interval

Behavioral Segments - Fault Length

- 431 behavioral segments
  (Length >= 10 km)
  (Slip rate >= 0.1 mm/y)



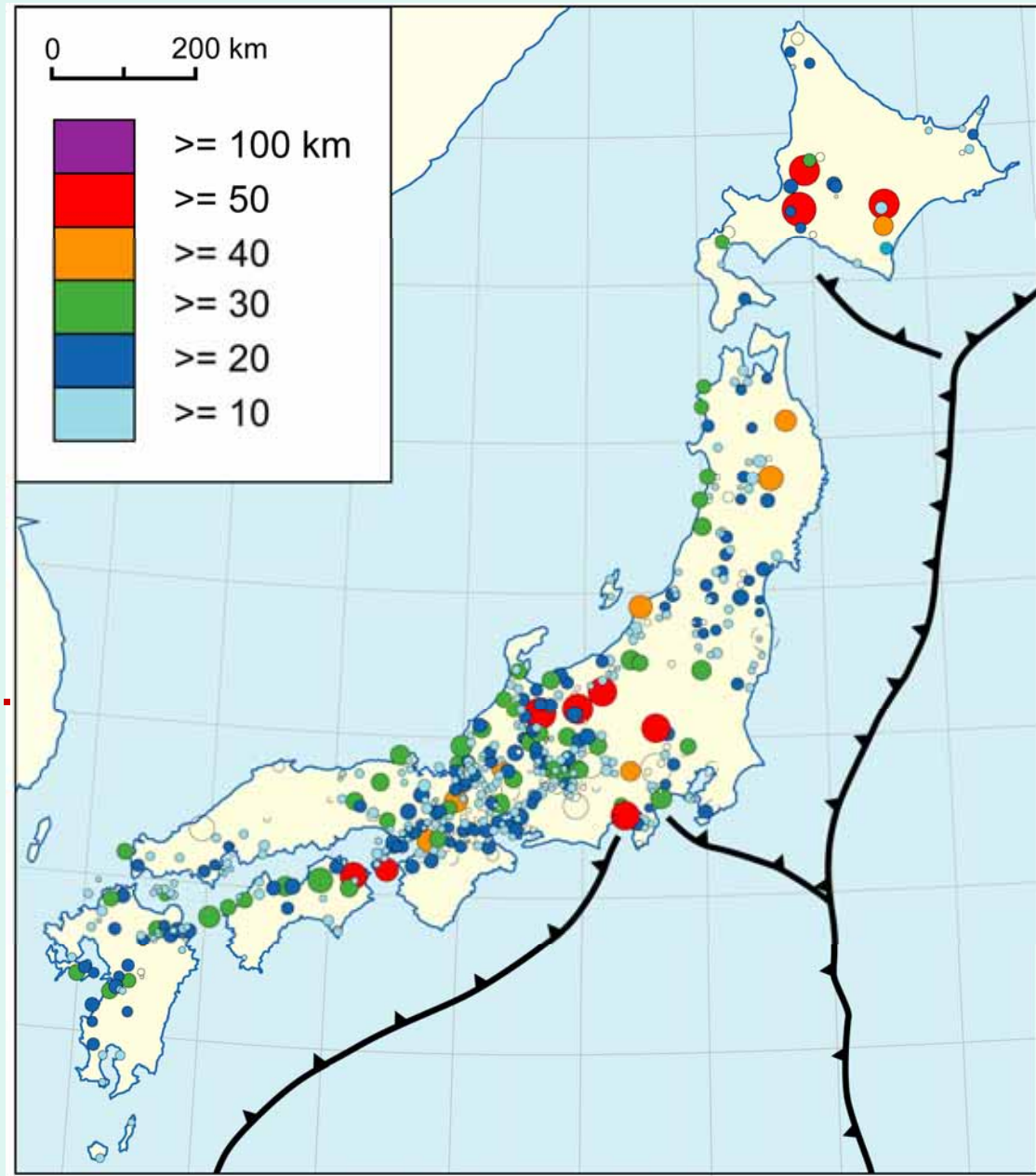
Behavioral Segments - Fault Length

- 431 behavioral segments
  (Length >= 10 km)
  (Slip rate >= 0.1 mm/y)

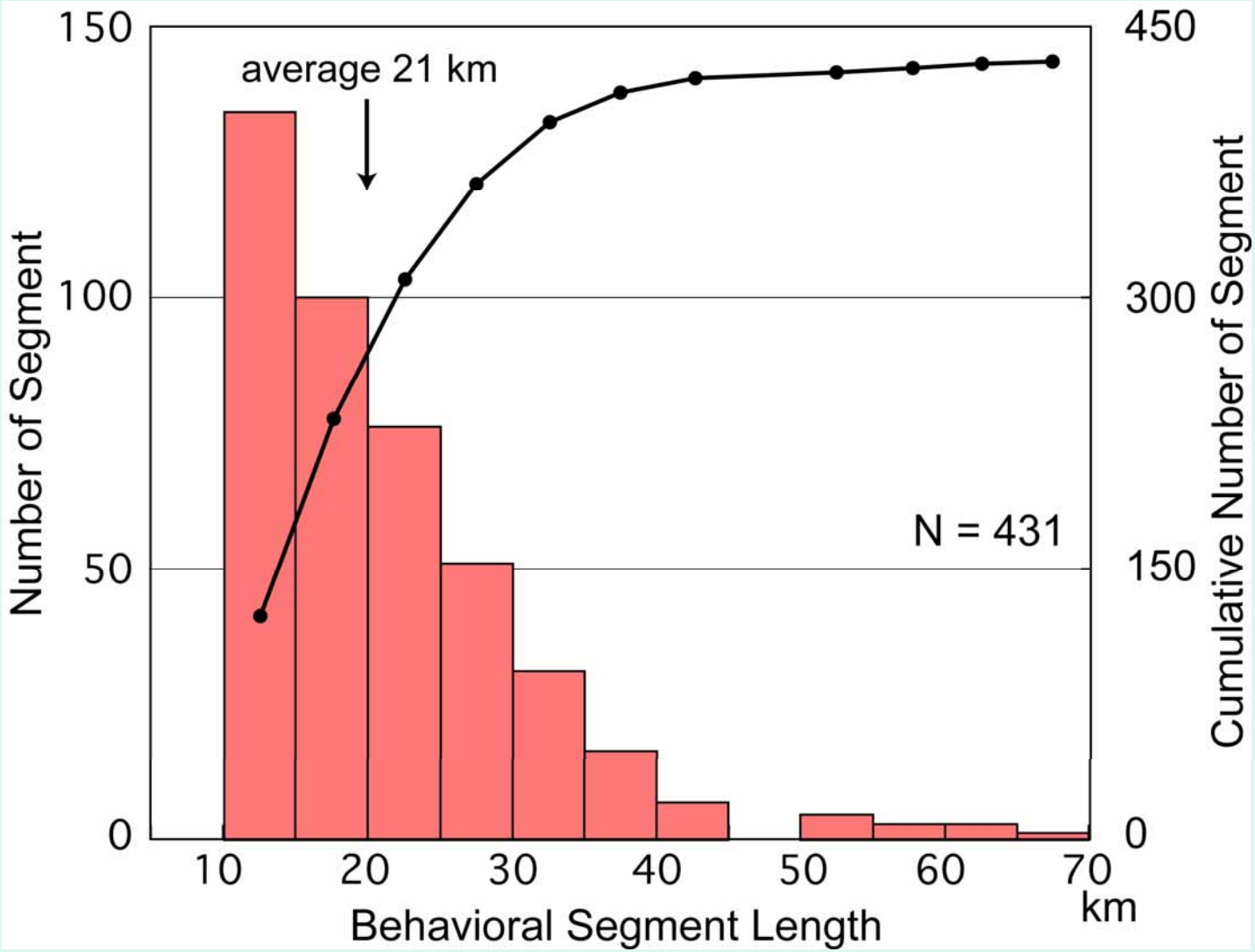
145 prob. earthq. segments.
(by ERC, 2005)

↓

290 behavioral segments

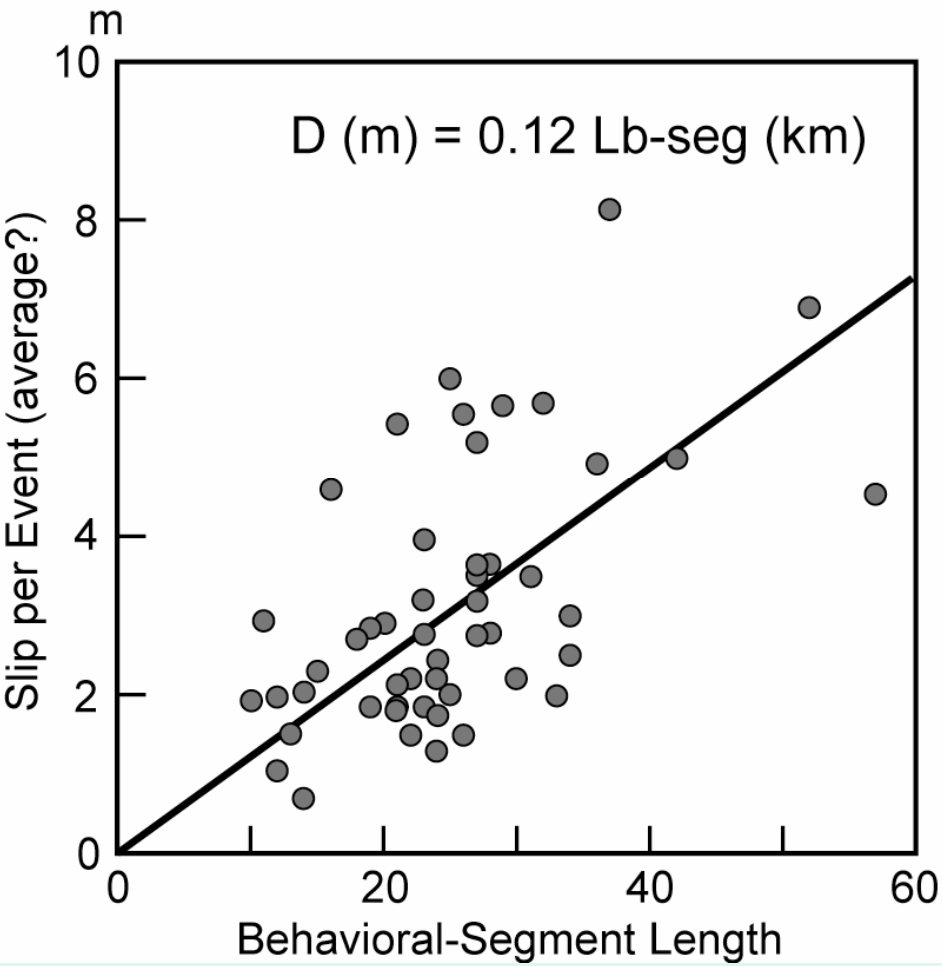


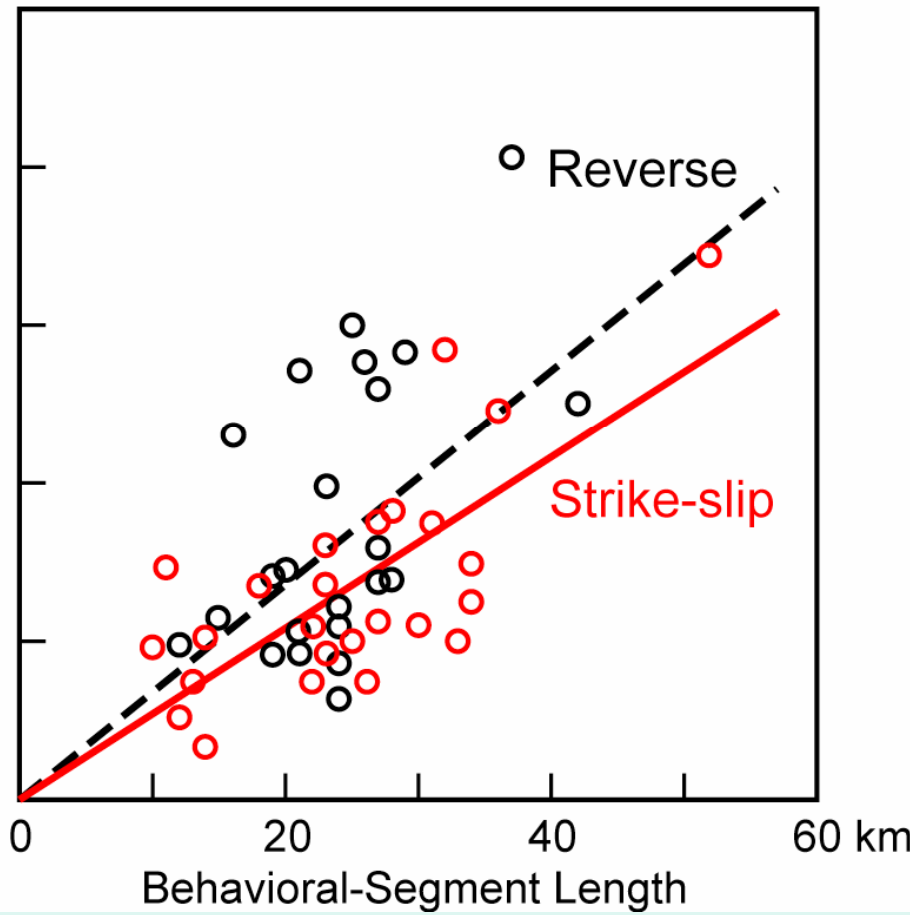
Behavioral Segments - Fault Length



Mostly <= 40 km

Fault Length v.s. Slip per Event

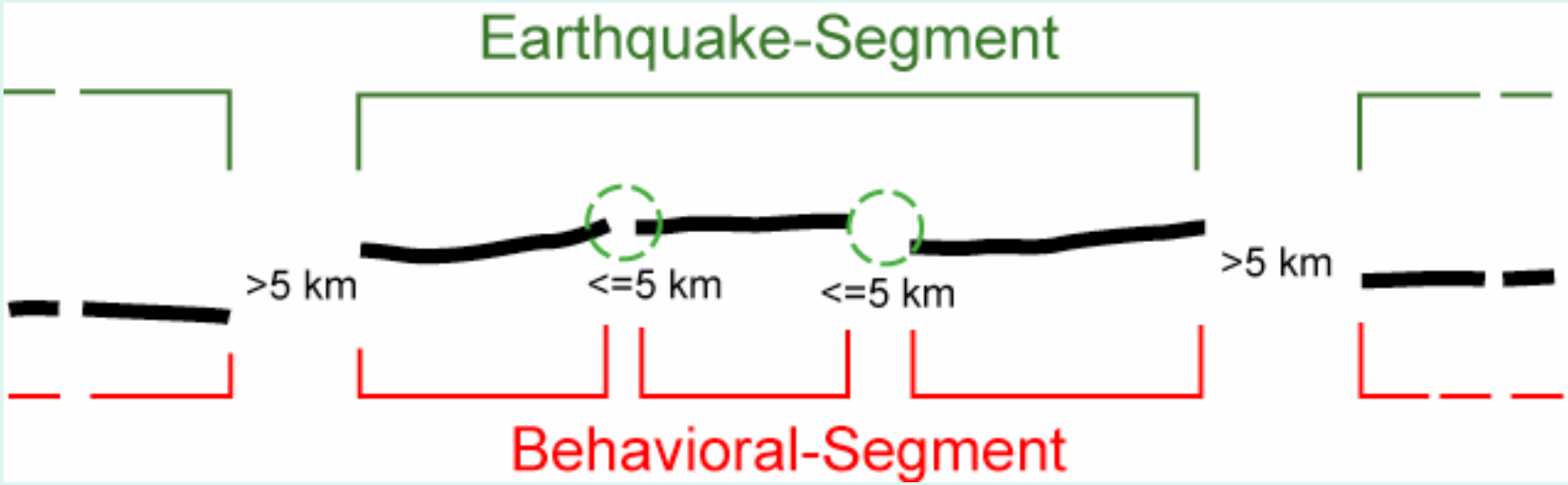




Dave. = 1.2 x 10e-4 L = ~ 0.6 Dmax

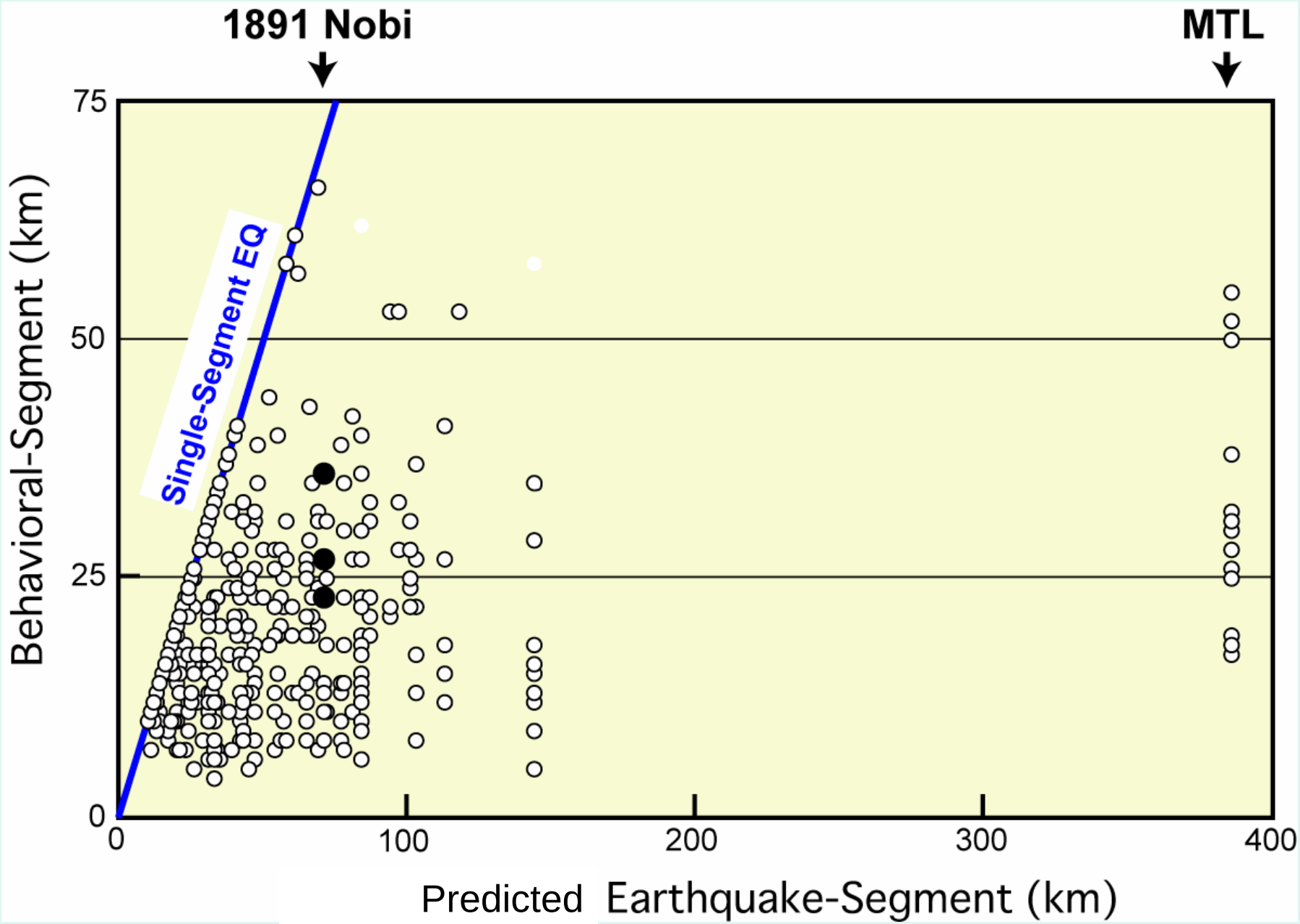
Prediction of Future Earthquake Segments

Prediction of Most Likely Earthquake Segments

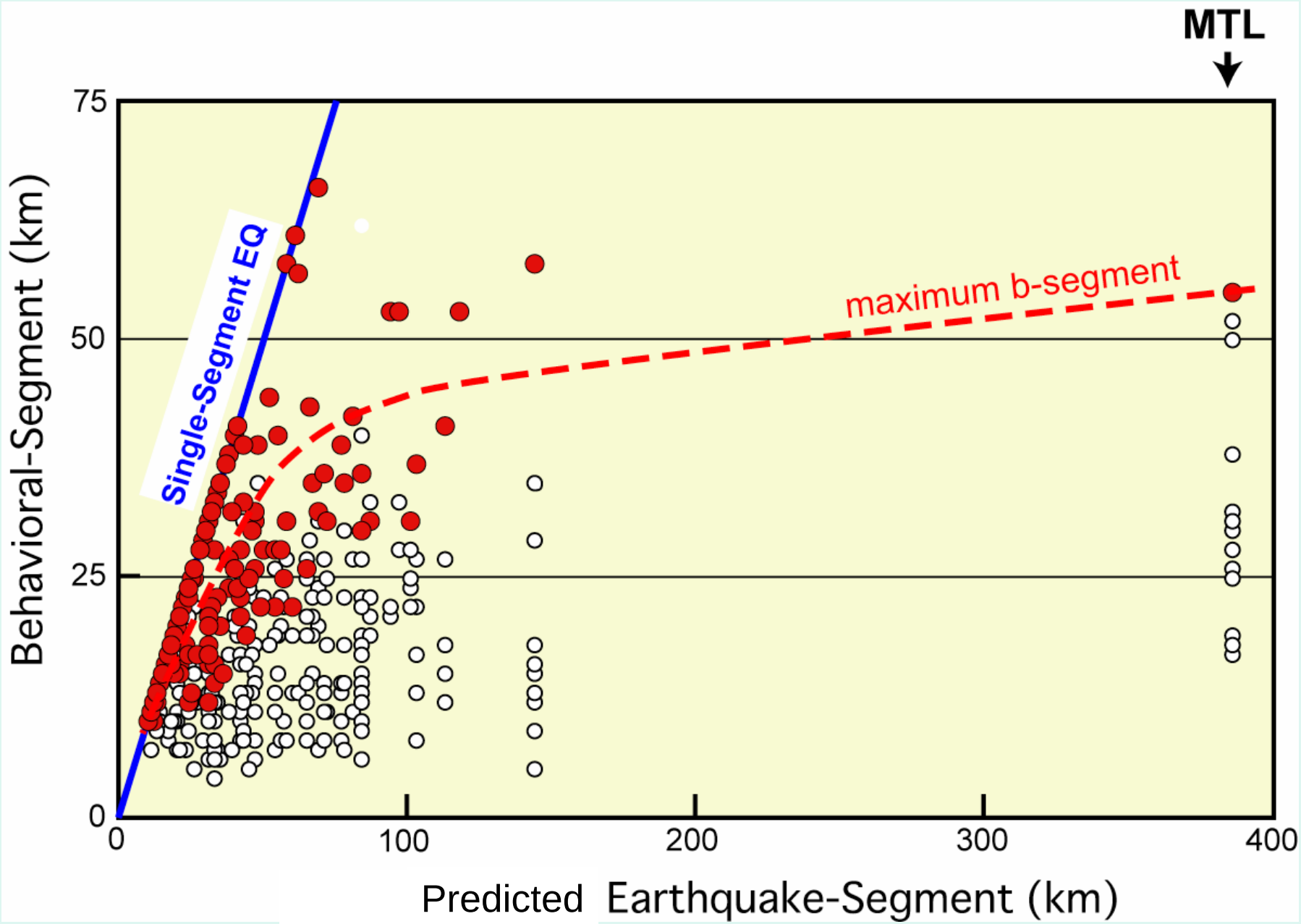


- **Application of 5-km-thresould (Matsuda, 1990)**
- 431 b-segments → 256 earthquake-segments

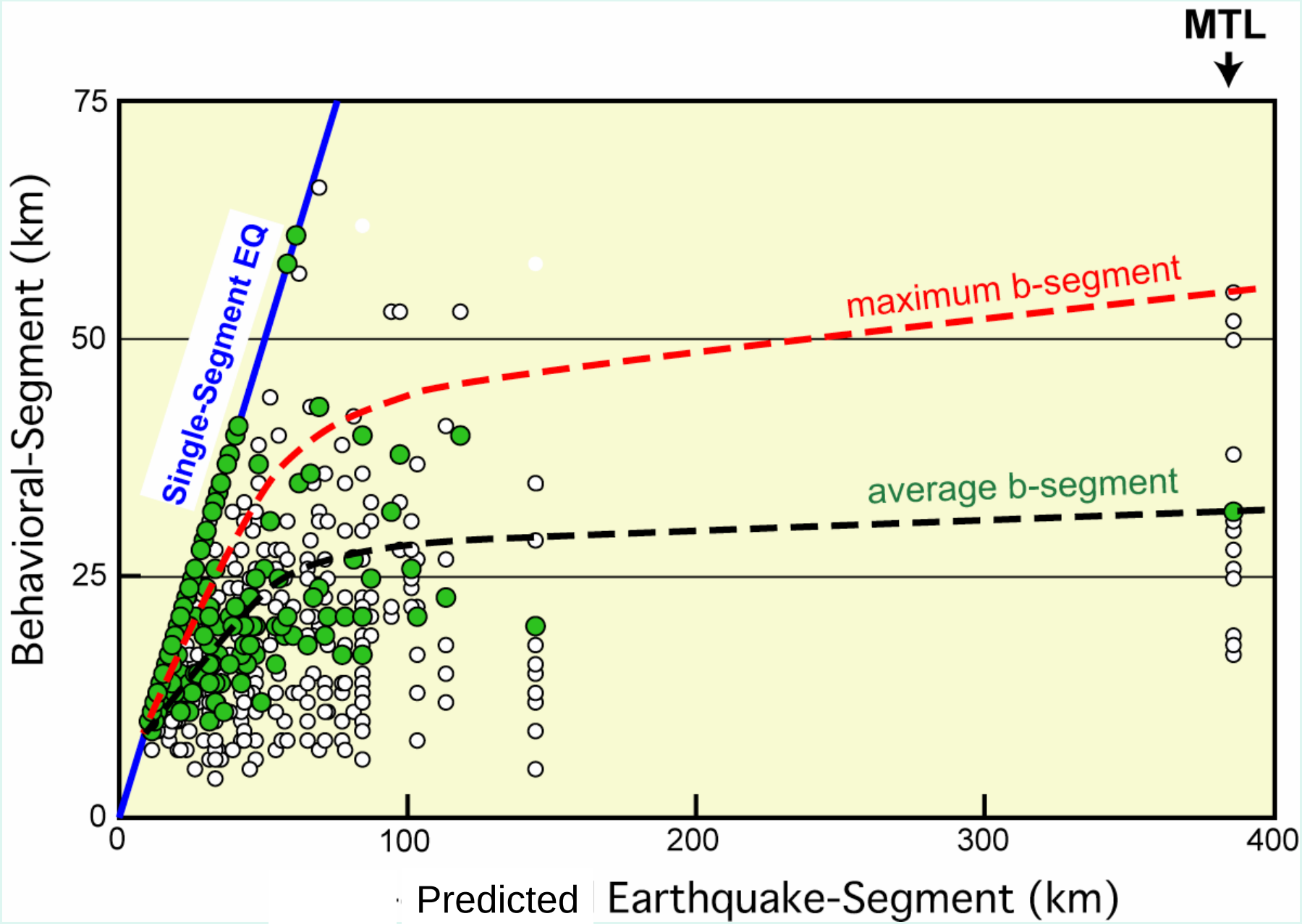
Scaling Relation : Between B- & E-Segments



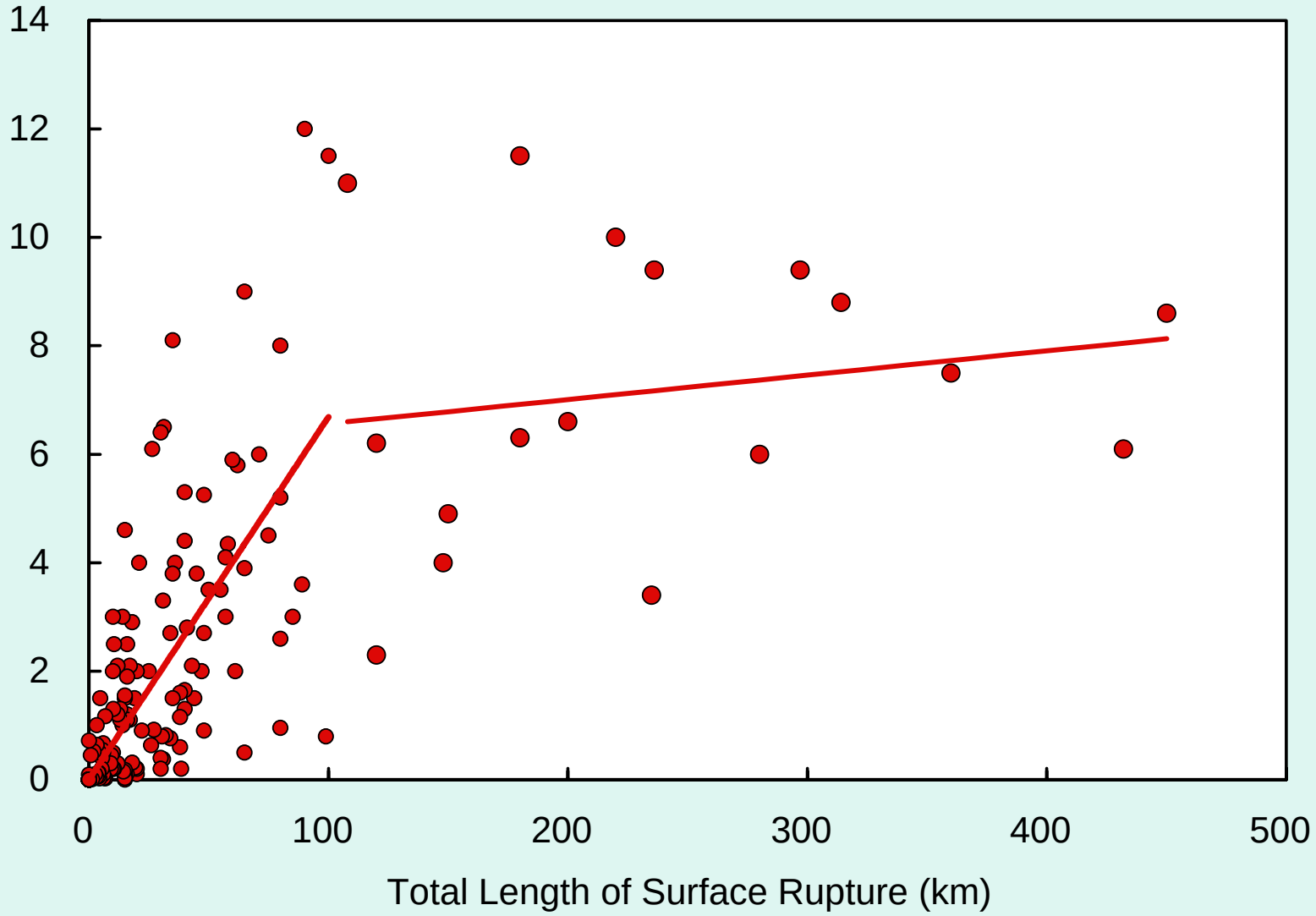
Scaling Relation : Between B- & E-Segments



Scaling Relation : Between B- & E-Segments



Scaling Relation : for Historical Ruptures
Total Length v.s. Maximum Slip



Data from Wells & Coppersmith(1994) and others after 1994

Summary

- We have been contributing
  to the Paleoseismological investigation.

- We are working
  on fault segmentation and new scaling relations

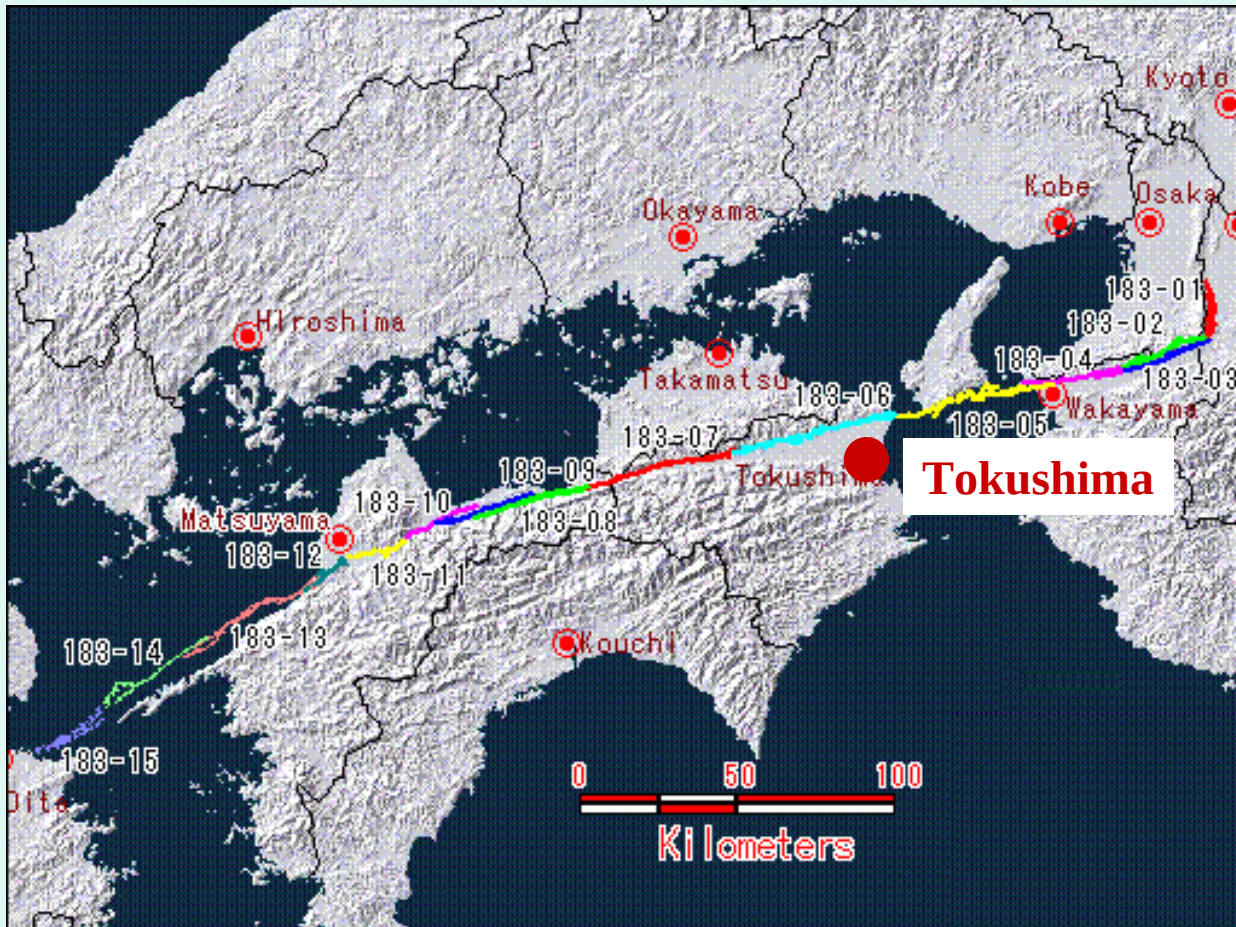
- We have to attack to the problems
  on the probabilistic prediction of future earthquakes

  (geology, mechanics of earthquake & faulting)

“Active Fault Database” at AFRC Website

(http://www.aist.go.jp/RIODB/activefault/)

- ✓ 500 segments with fault strand map
- ✓ Parameters of faulting
- ✓ Site information on long-term slip rate and paleoseismicity



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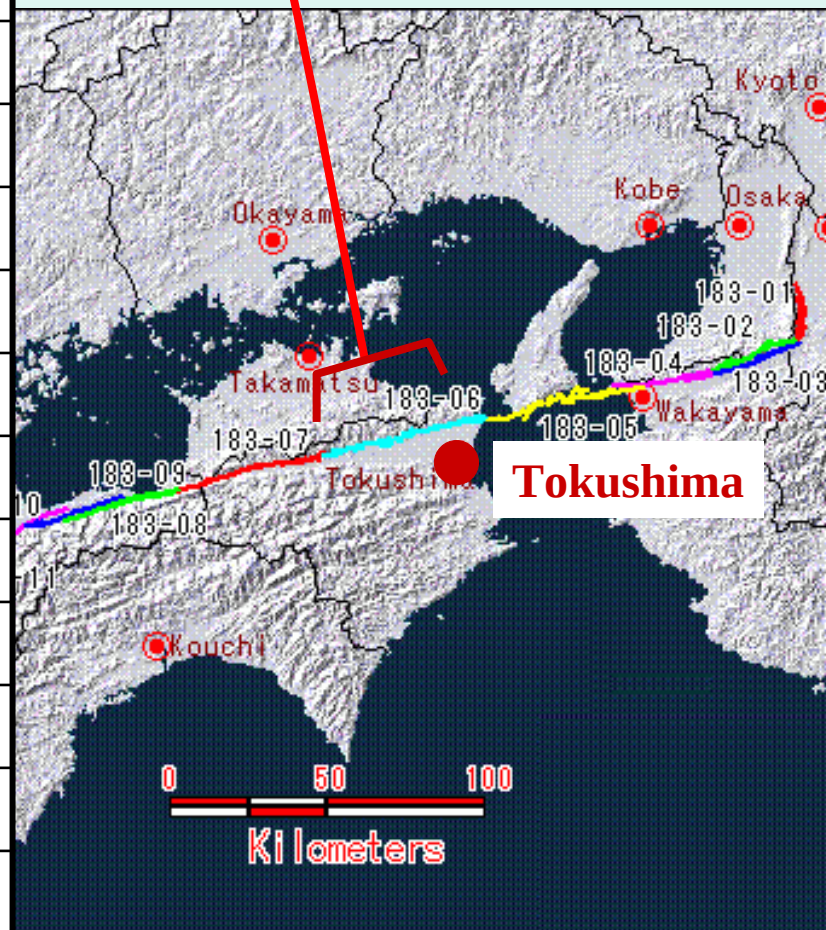
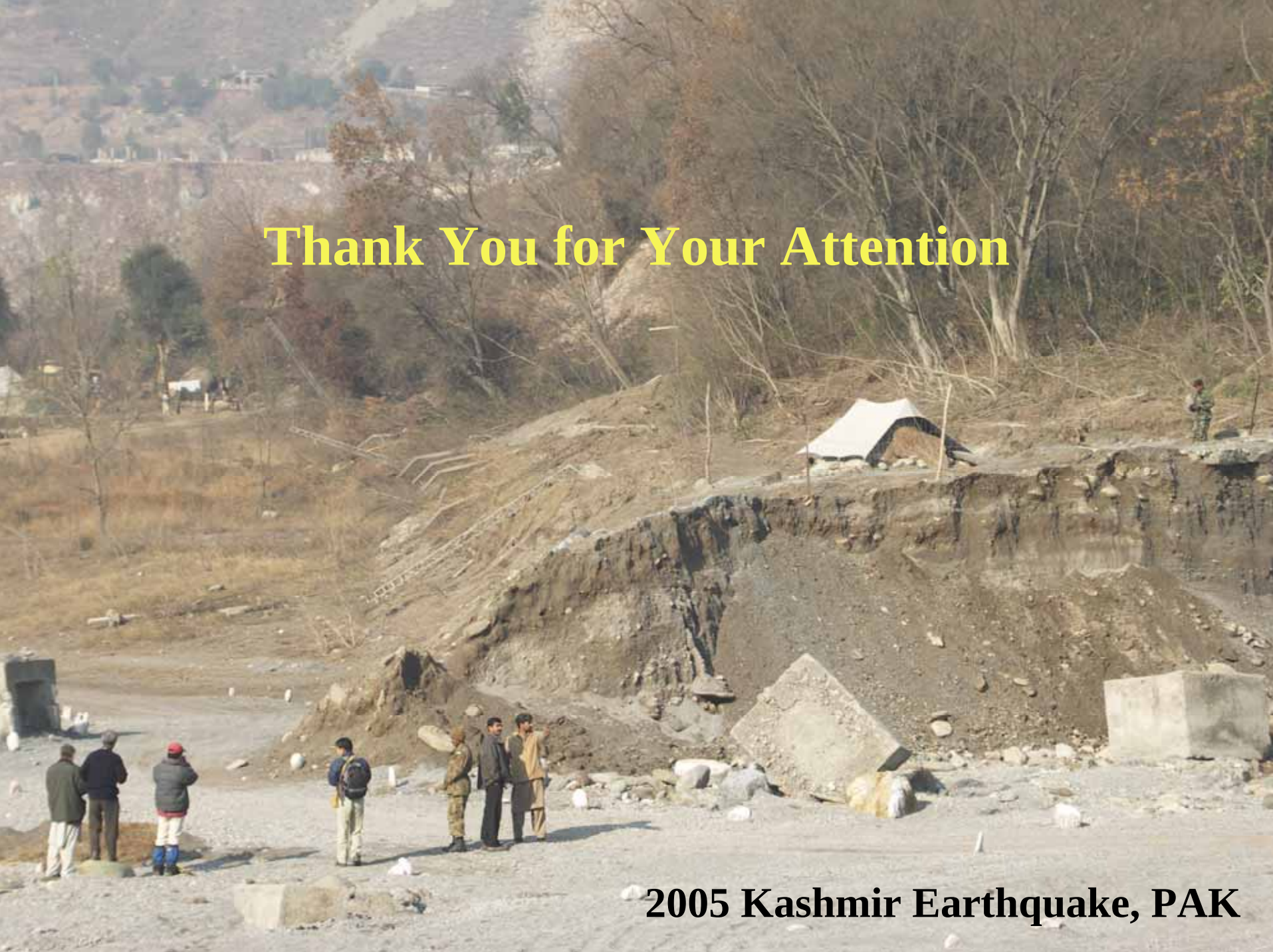
Chichio Segment

Strike	**N 80 E**
Dip	**45 N**
Length	**52 km**
Sense of Faulting	**Right-lateral**
Upthrown Side	**North-side**
Slip Rate	**4 m/ky**
Slip per Event	**6.9 m**
Recurrence Interval	**1.7 ky**
Age of Last Faulting	**AD 1500 to 1868**
	AD 1596 (documented)
Elapsed-time Rate	**0.18**
Rupture Probability in Next 30 years	**ca. 0 % by BPT**
	ca. 2 % by Poisson




Thank You for Your Attention
2005 Kashmir Earthquake, PAK