The Kanto Subduction Zone: Seismicity, Slab Deformation and Earthquake Potential in and around the Two Subducting Oceanic Plates

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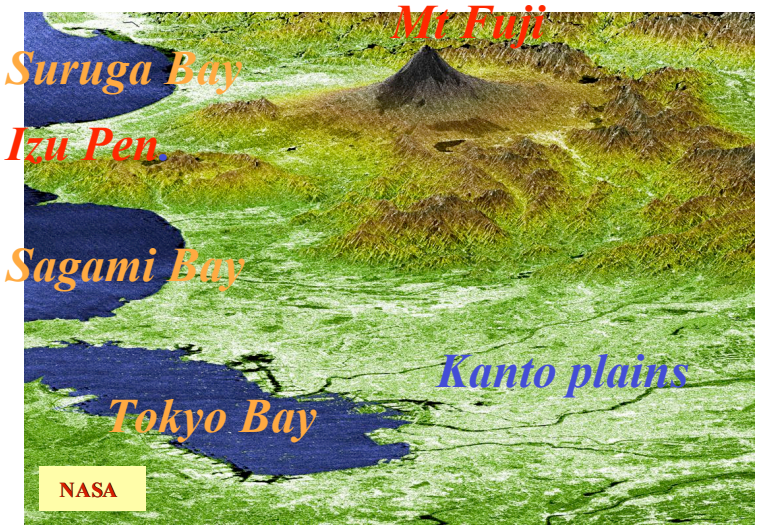
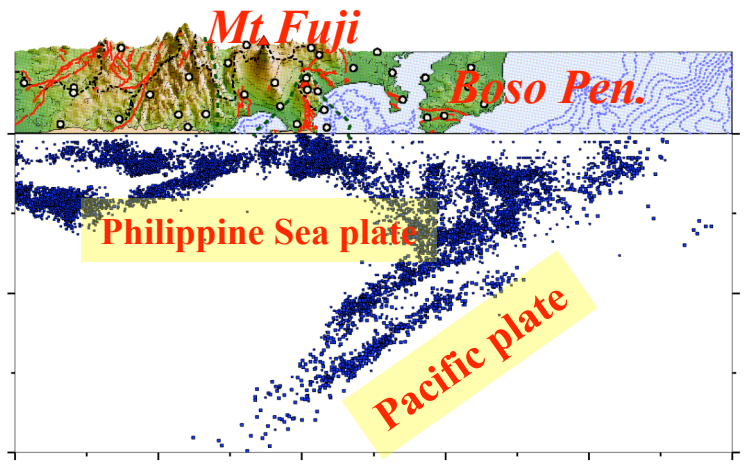


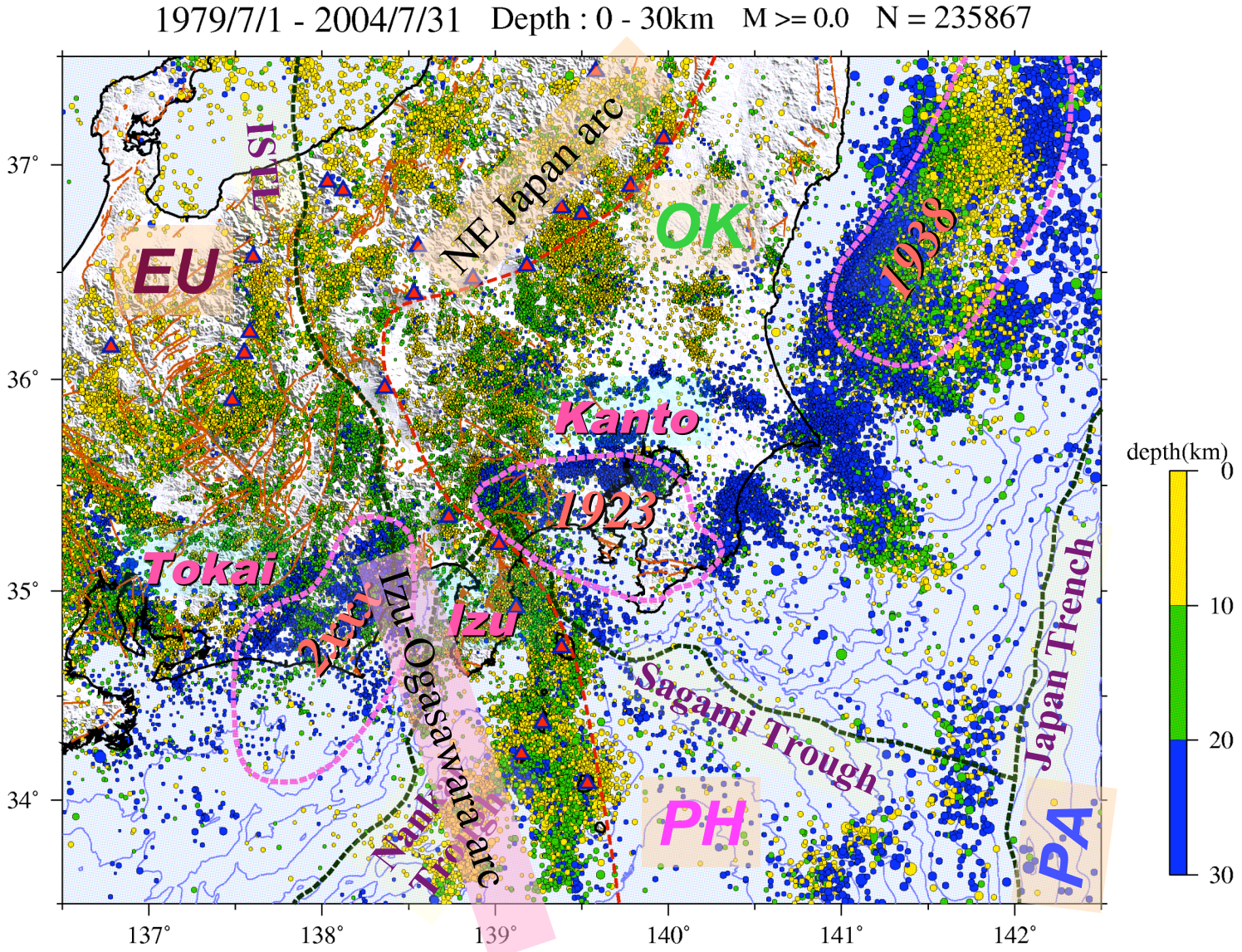


Topics:

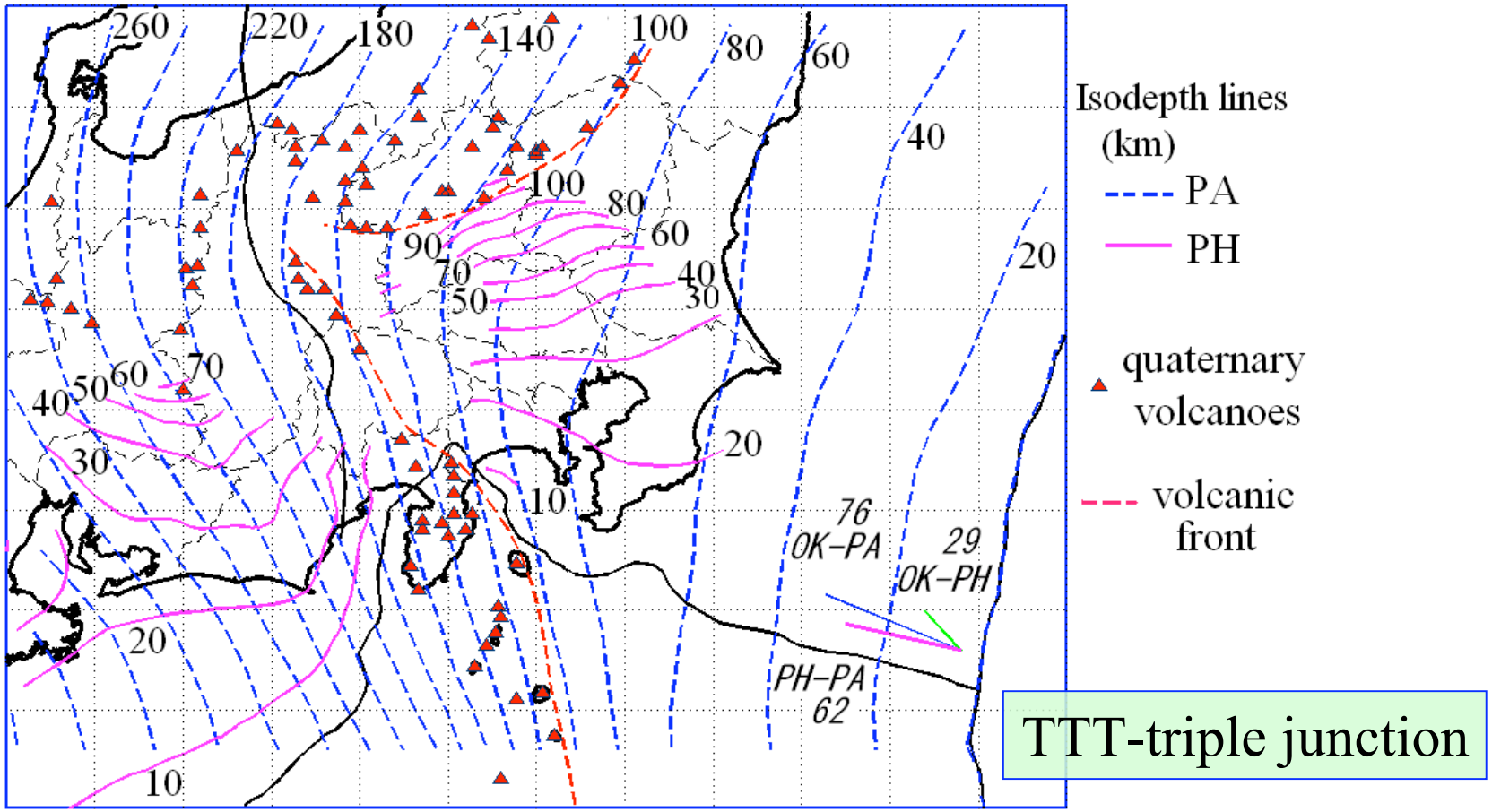
1) Convergence mode of three plates in the Kanto subduction zone associated with the TTT-triple junction: Overview of large scale plate geometry, extent of plate interface and elastic deformation of two subducting plates.

2) Earthquake potential associated with long-term evaluations of M8 and M7 class earthquakes reported by The Headquarters for Earthquake Research Promotion (2004).

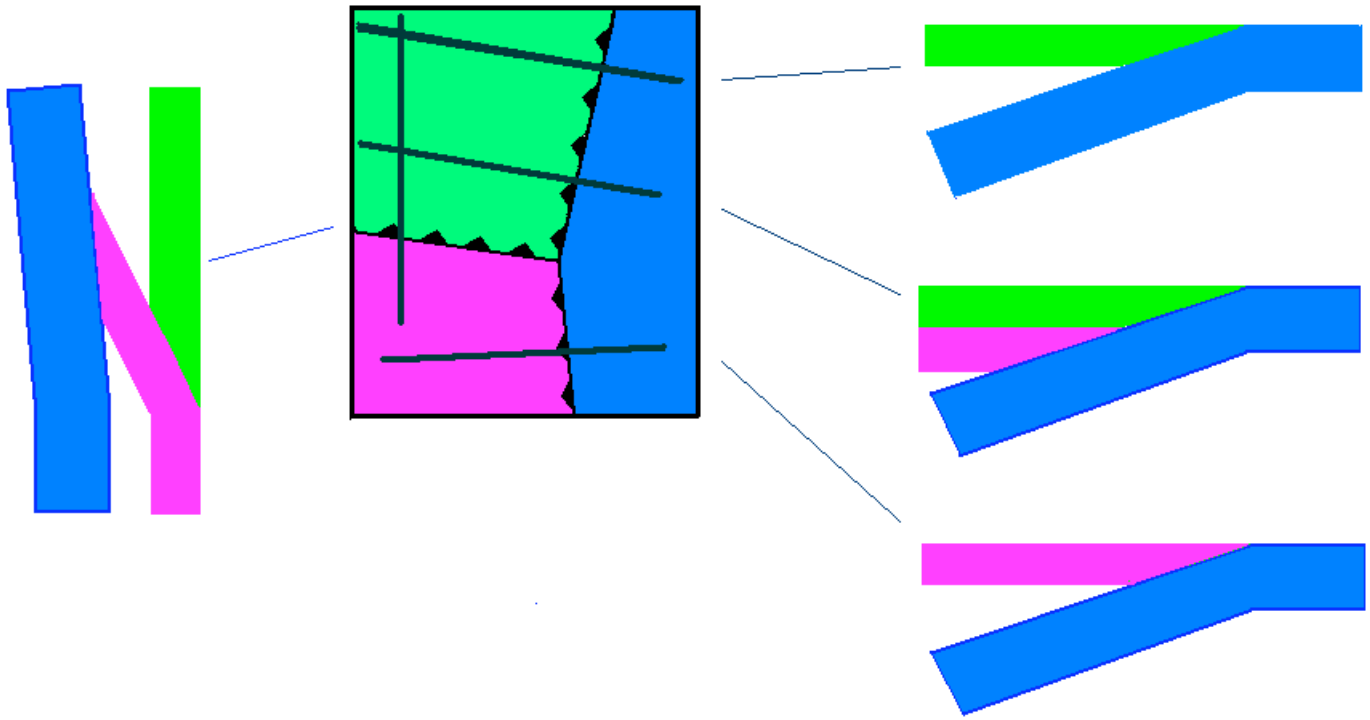
Shallow seismicity in central Honshu where four plates are converging



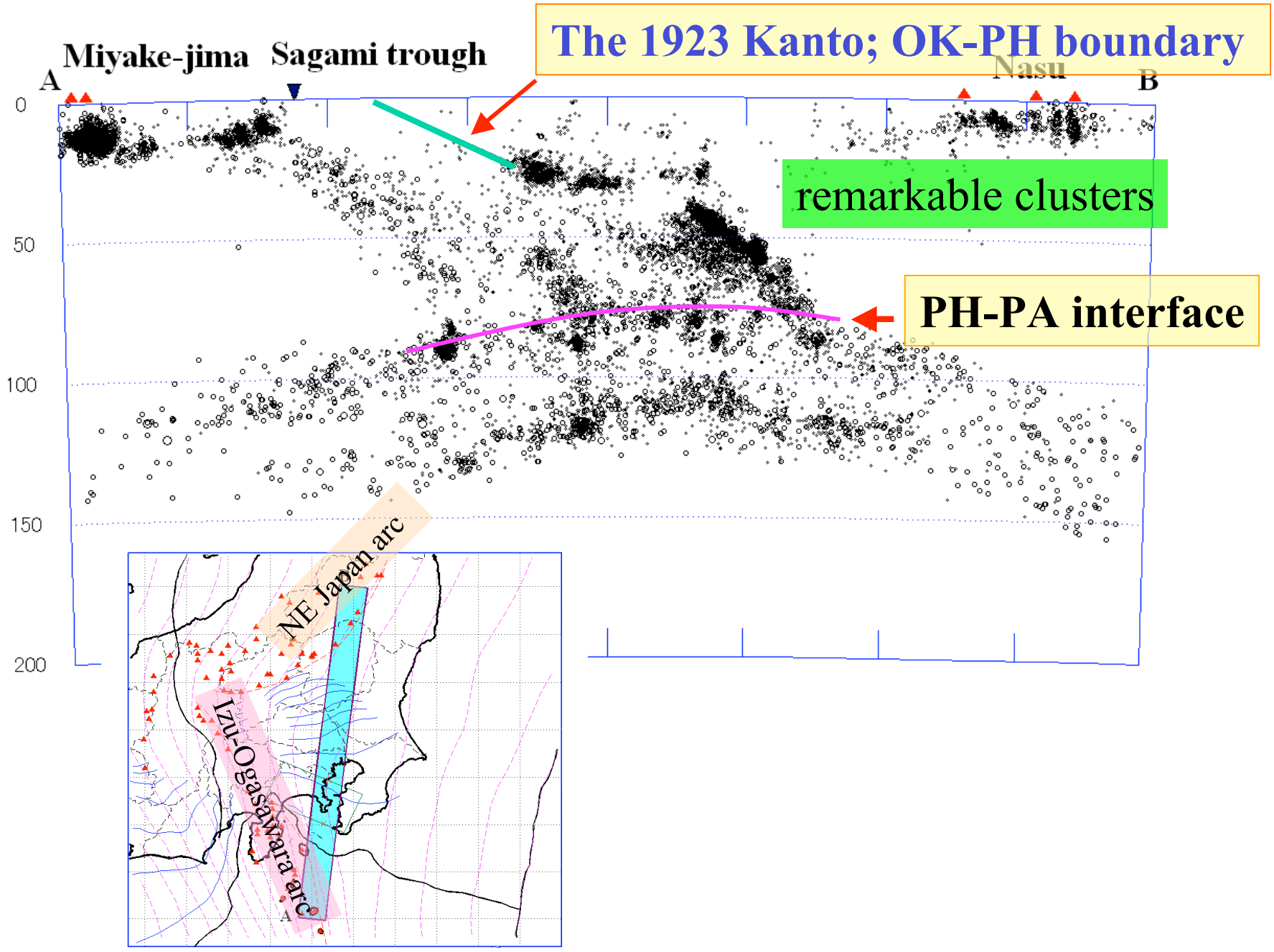
Isodepth contours of the upper boundaries of seismic planes of the two subducting plates

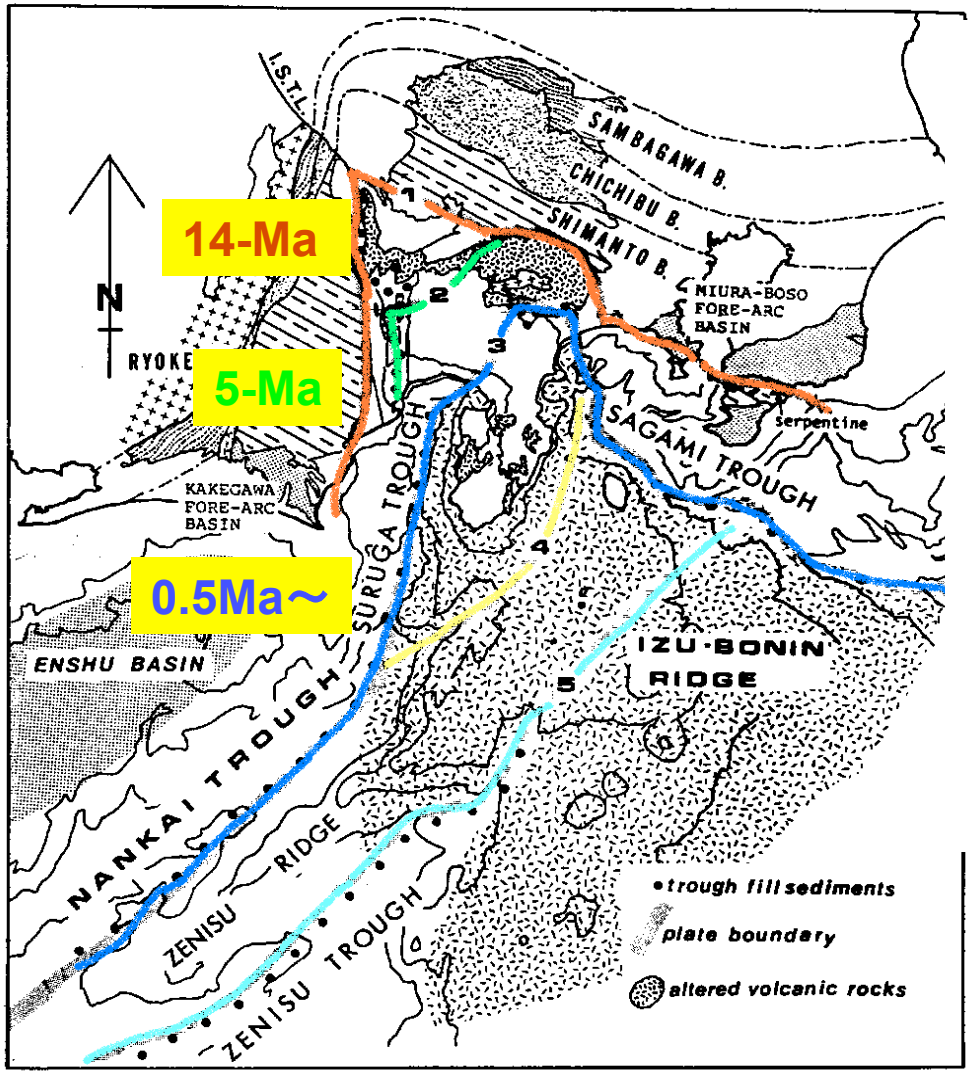


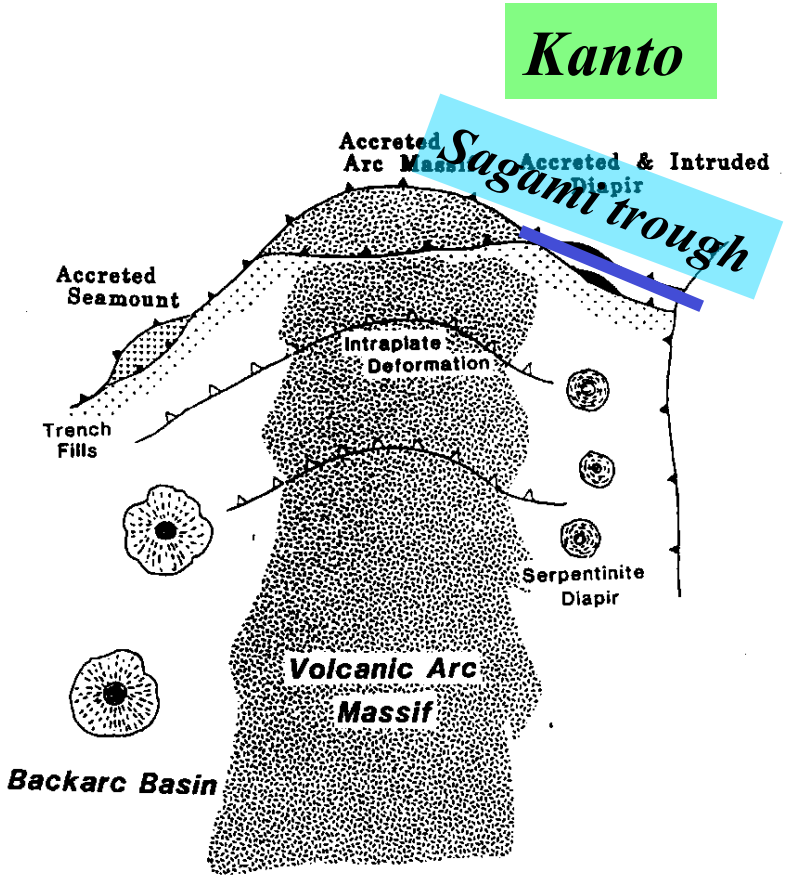
Relative location of three plates near TTT triple junction



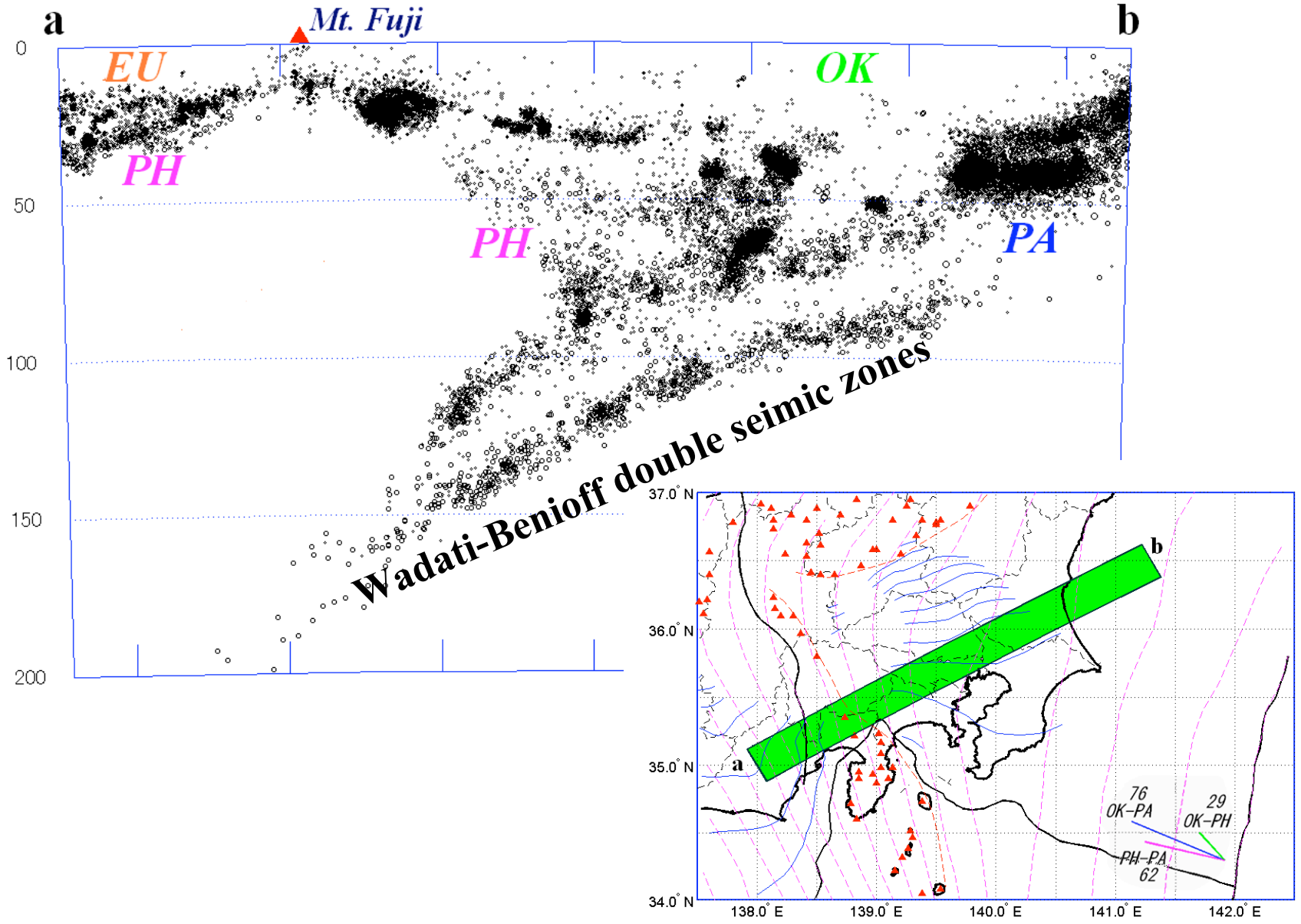
Important factors constraining subduction in Kanto:
relative velocity of three plates, location and extent of interface, and slab thickness


The 1923 Kanto; OK-PH boundary
Miyake-jima
Sagami trough
Nasu
A
B
0
50
100
150
200
remarkable clusters
PH-PA interface
NE Japan arc
Izu-Ogasawara arc
A'

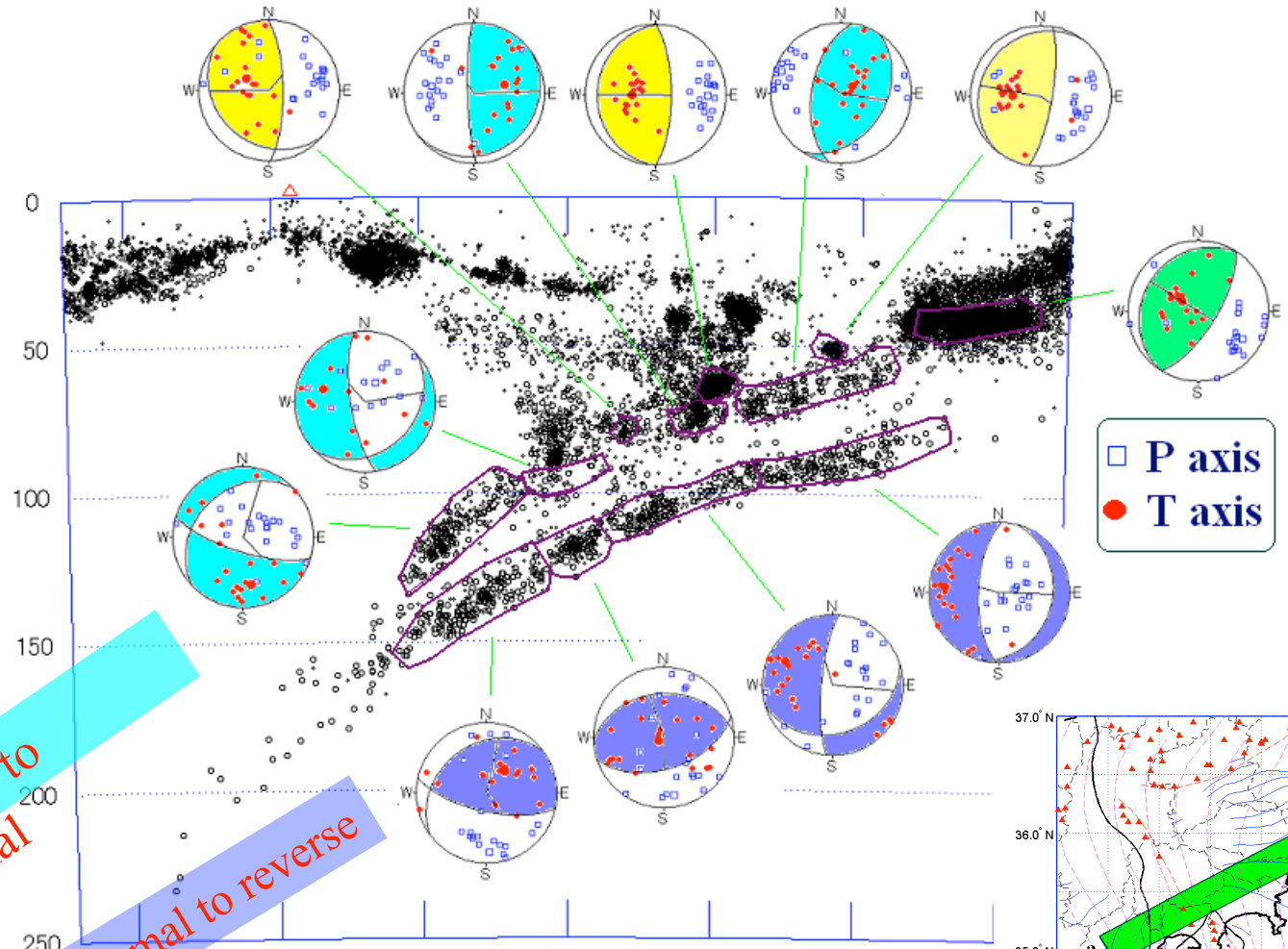


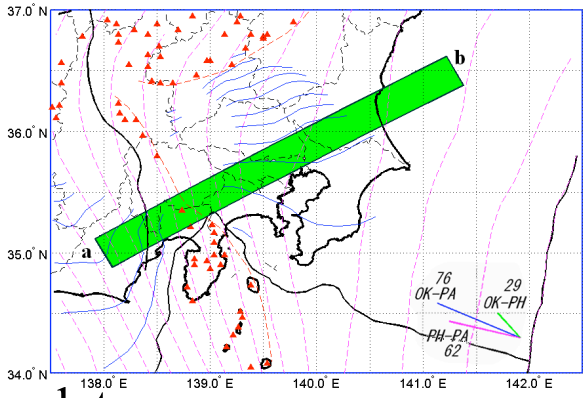


Taira, A. et al., 1989, Accretion tectonics and evolution of Japan

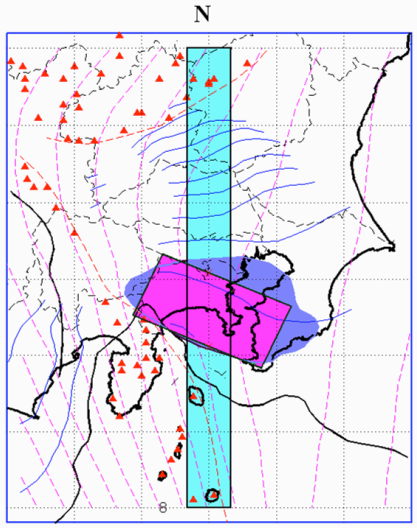

a
Mt. Fuji
b
0
50
100
150
200
EU
OK
PH
PH
PA
Wadati-Benioff double seimic zones
37.0° N
36.0° N
35.0° N
34.0° N
138.0° E
139.0° E
140.0° E
141.0° E
142.0° E
a
b
76
OK-PA
29
OK-PH
PH-PA
62

Composite focal mechanism solutions along PA slab (lower hemisphere)



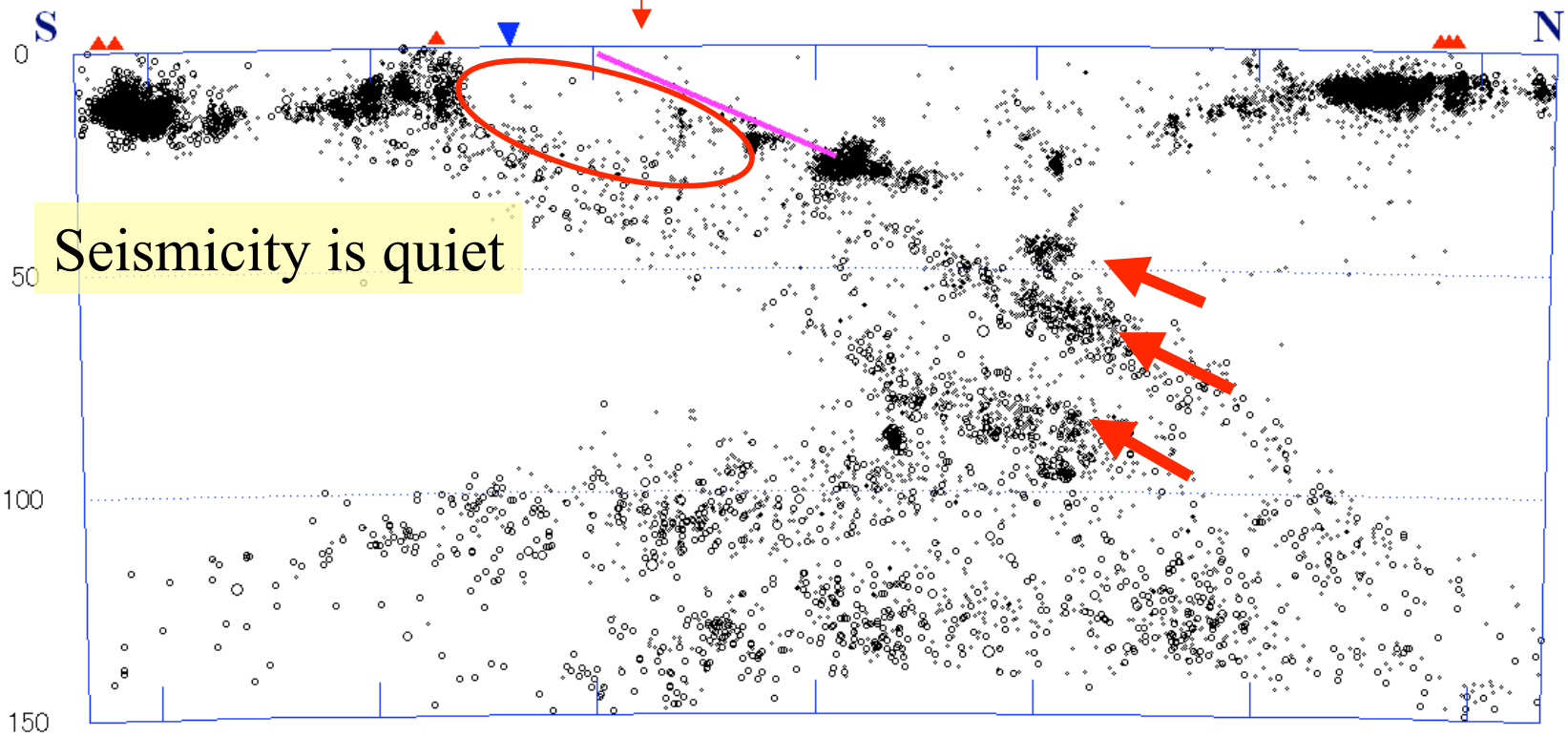


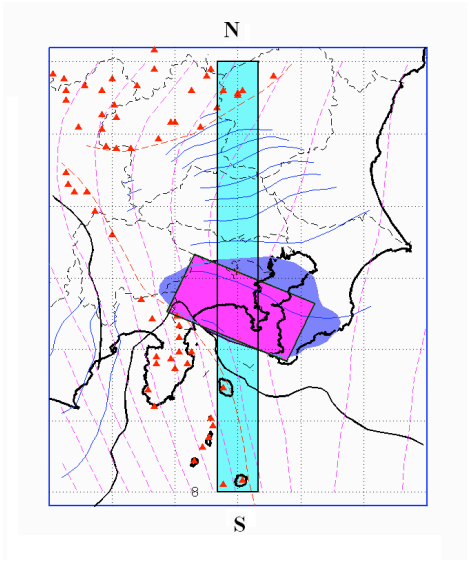
Elastic deformation of Pacific slab due to the loading of the overriding Philippine Sea plate

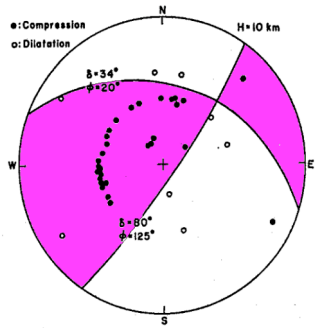


N-S cross section of seismicity across the 1923 Kanto earthquake source area

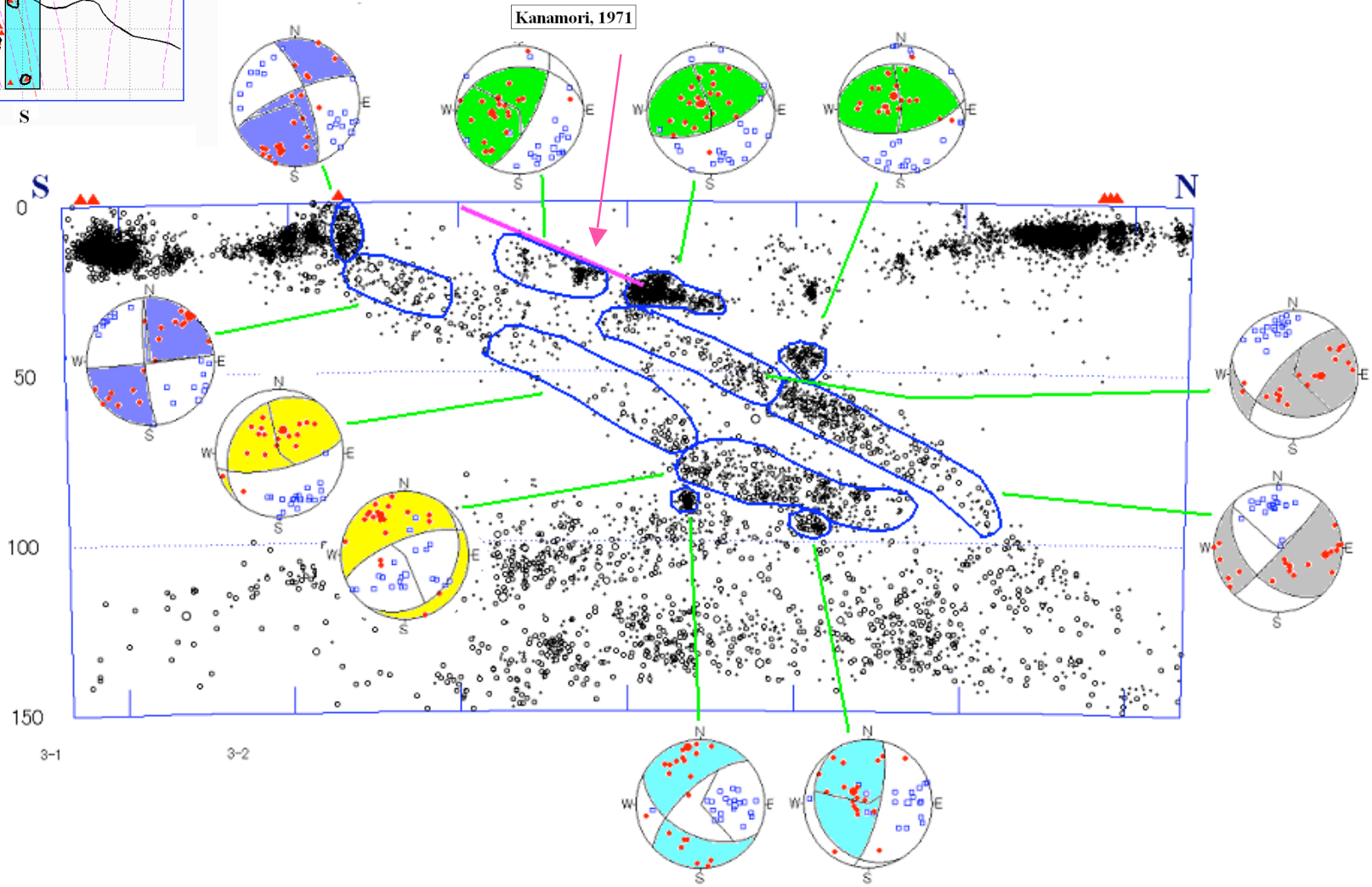
Fault plane of the 1923 Kanto earthquake (Matsu'ura, 1980)







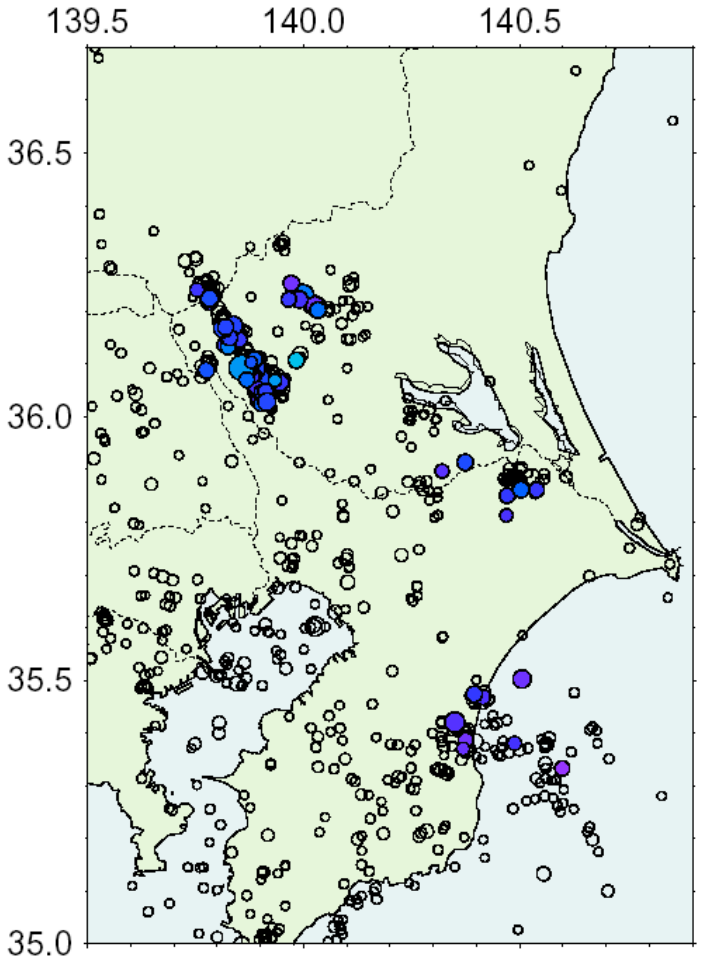
1923 Kanto M7.9
Kanamori (1971)



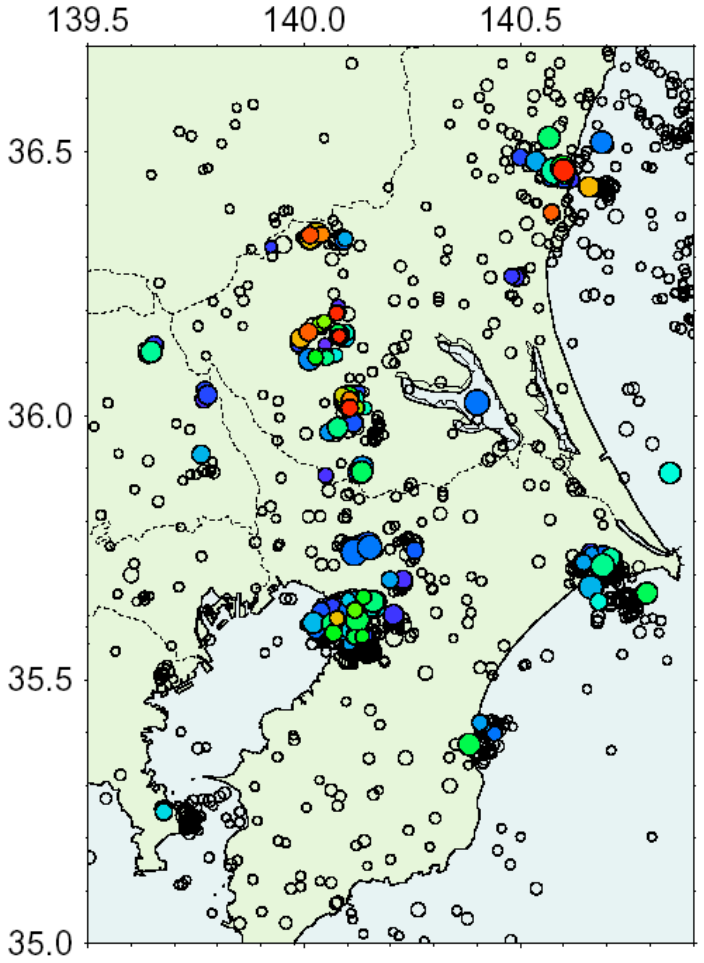
Similarity earthquakes in Kanto

Kimura, N., 2003

Upper plane of the Philippine Sea plate



Upper plane of the Pacific plate

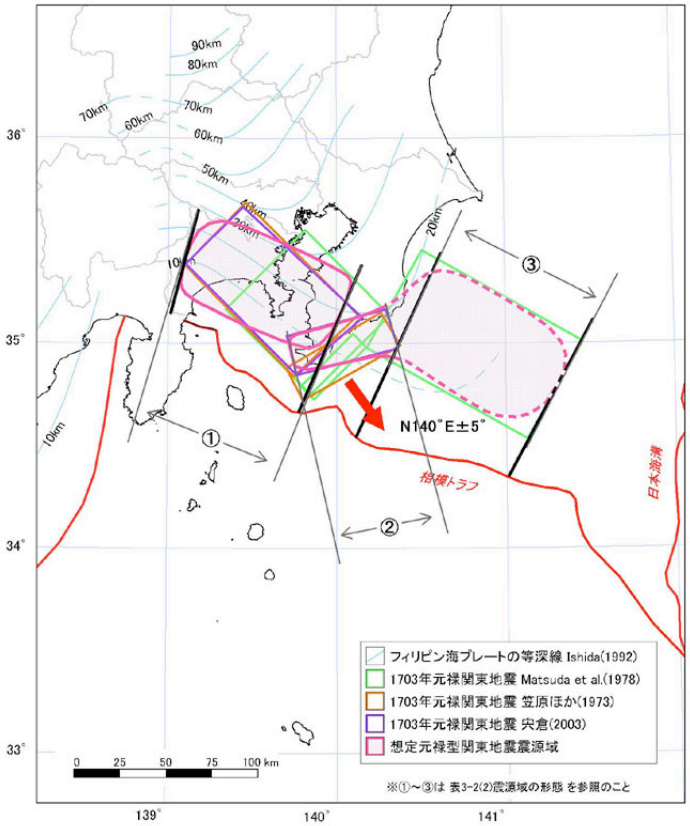


Background seismicity are base on observation by NIED
Kanto-Tokai network (1990/07/01/-2002/08/31 M≧3.0)

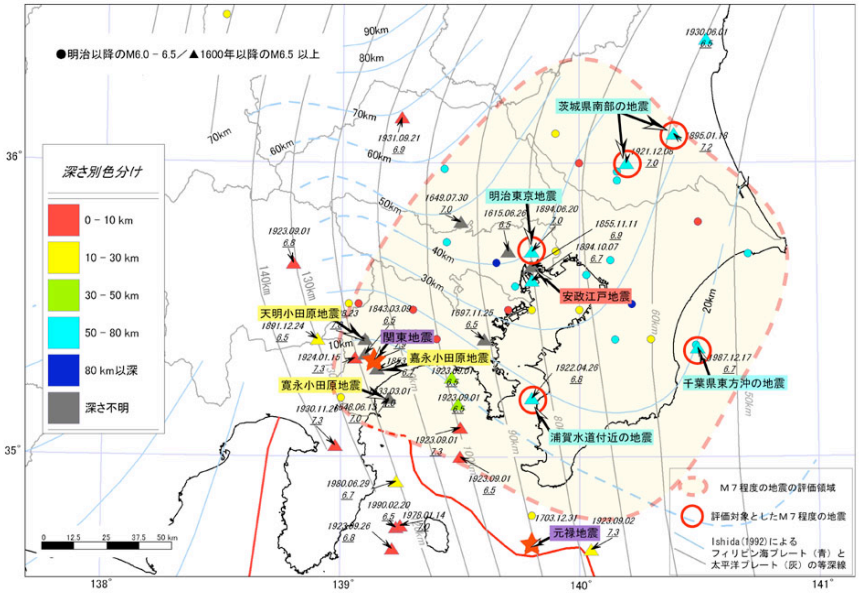
Slip velocity [cm/y]

Long-term evaluation of earthquakes along the Sagami trough
(The Headquarters for Earthquake Research Promotion, Earthquake Research Committee, August, 2004)

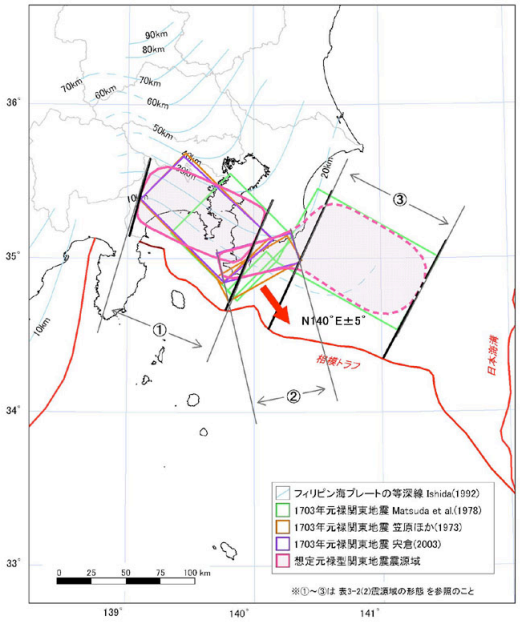
Source area of M8 class Earthquakes along the Sagami trough



Region of evaluated M7 class earthquakes and historical earthquakes in southern Kanto



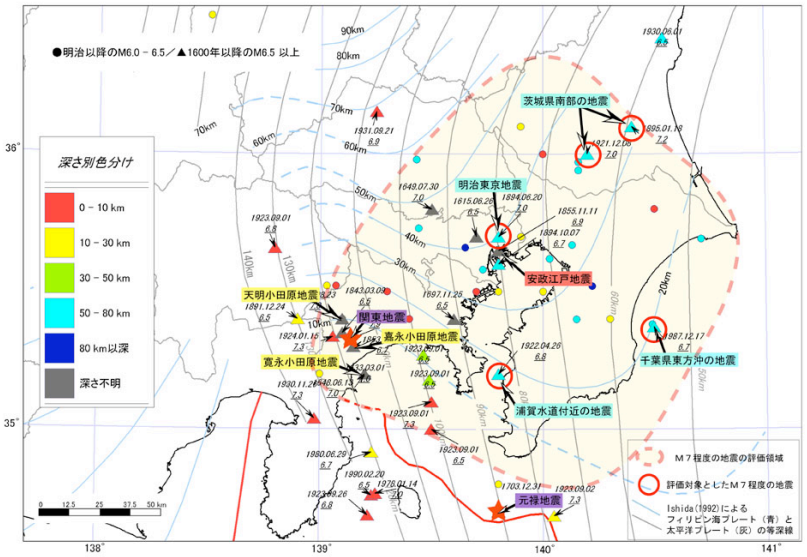
Probability of next Kanto Earthquake along the Sagami trough (The Headquarters for Earthquake Research Promotion,2004)



1923 ’Taisho type’ earthquake
recurrence interval 200-400 yrs
during next 10 years : almost 0 %
50 years: almost 0 to 5 %

1703 ‘Genroku type’ earthquake
recurrence interval 2300 yrs
during next 10 years : almost 0 %
50 years: almost 0 %

Probability of next M7 class earthquake in southern Kanto



average interval: 23.8 yrs
during next 10 years : 30 %
50 years: 90 %

Evaluated based on five earthquakes with M6.7-7.2 during the period from 1885 to 2004, assuming a Poisson process.

Possible location:

1) boundary between the continental and the Philippine Sea plate
2) within the Philippine Sea plate 3) around the boundary between the Philippine Sea plate and Pacific plate
4) within the Pacific plate

Parkfield December 30 1987

October 1987 – March 1988

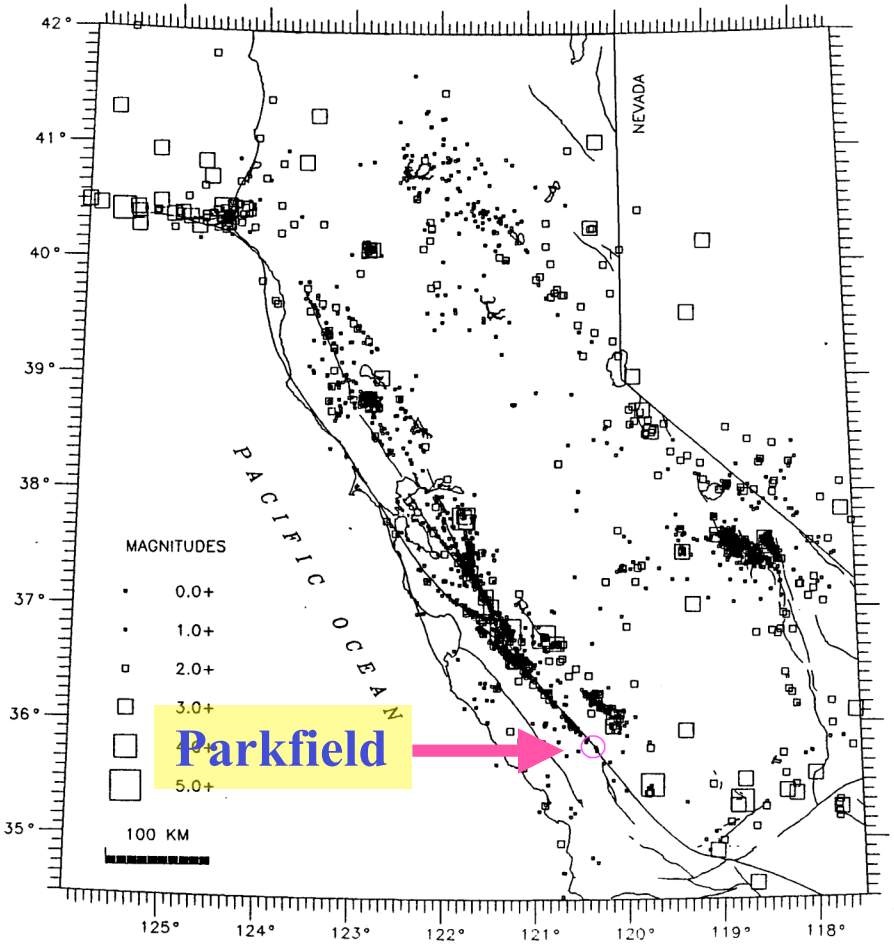
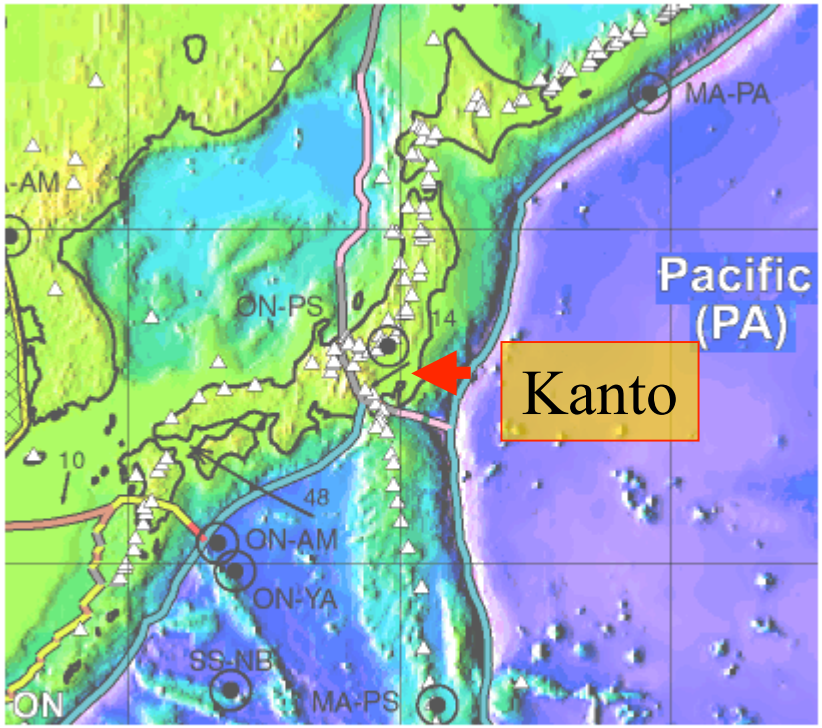


Figure 1. Northern and central California seismicity
October 1987 - March 1988

Concluding remarks: subject to evaluate M7 class earthquake in Kanto

- Precise determination of hypocenters and focal mechanism solutions, together with information of waveforms, seismic tomography, reflection and refraction data, are important to define three plate boundaries more accurately.

- To examine asperity distribution, and aseismic or creeping portions along plate boundaries, systematic survey and monitoring of similarity earthquakes on the routine basis is necessary.



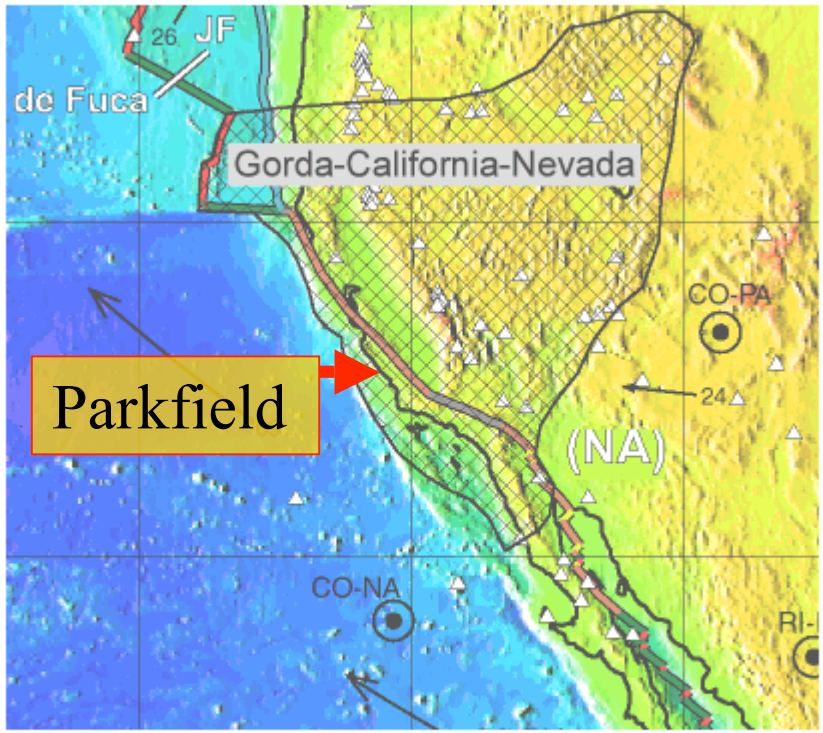


Plate Boundary Model PB2002

by Peter Bird, UCLA

Bird, P., An updated digital model of plate boundaries, *Geochemistry Geophysics Geosystems* (G^3), *4*(3), 1027, doi:10.1029/2001GC000252, 2003.

Spreading ridge boundaries by Paleo-Oceanographic Mapping Project [Mueller et al., 1997, *J. Geophys. Res.*]

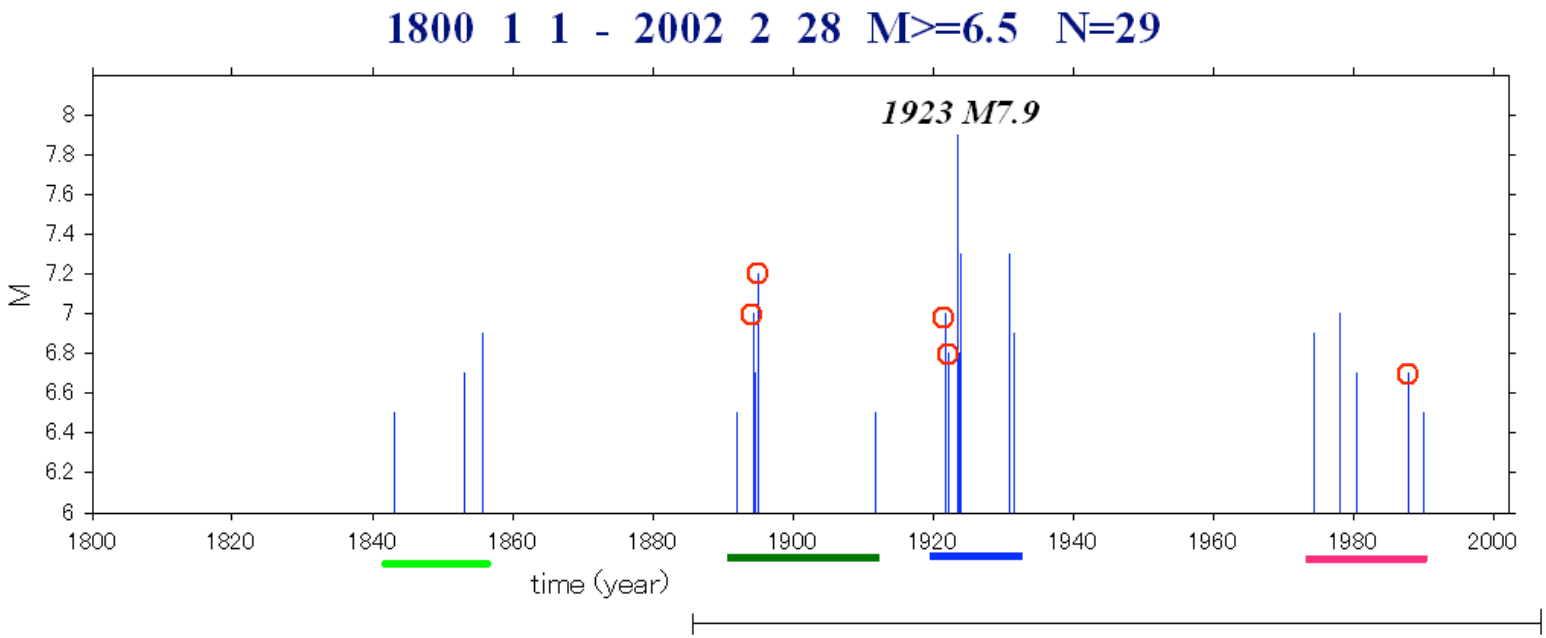
Euler poles for major plates from NUVEL-1A [DeMets et al., 1994, *Geophys. Res. Lett.*].

Topography from ETOPO5 data set by National Geophysical Data Center, NOAA.

Volcanoes from T. Simkin & L. Siebert [1995] *Volcanoes of the World*, Smithsonian I.

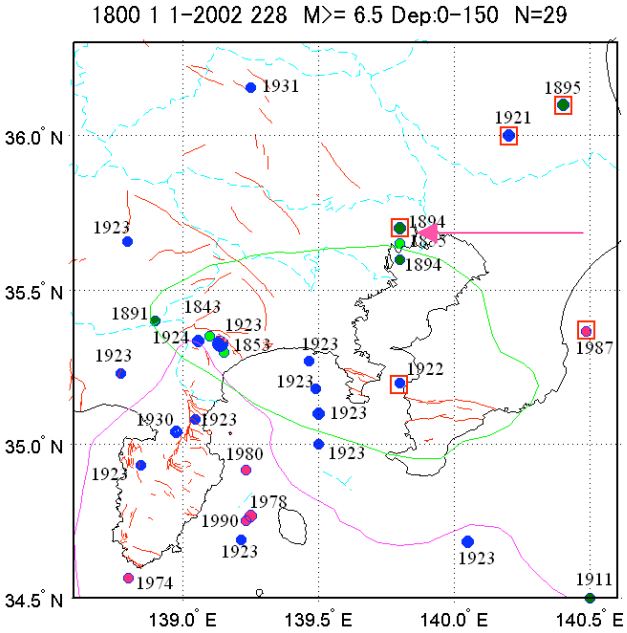
Coastlines from *World Coastlines and Lakes*, NGDC, NOAA.

Mercator projection, plotted with *FiniteMap* by P. Bird.



evaluated period

Catalogues by Utsu (1999) and JMA



1855 Ansei-Edo M6.9