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November 15, 2004
Tsukuba, JAPAN

CSNI Workshop on
"Seismic Input Motions,
Incorporating Recent Geological Studies"

Purpose and Target of Special Session

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Guest Research Fellow

Mt. Tsukuba

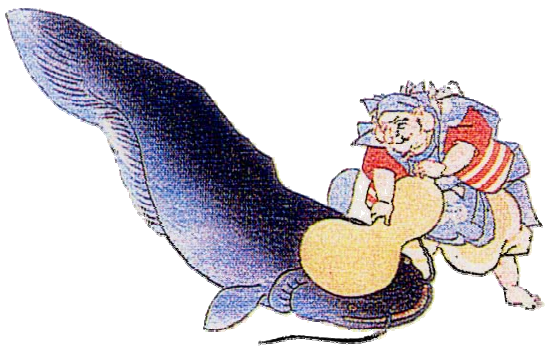
National Research Institute for
Earth Science and Disaster Prevention, NIED

Purpose of the Special Session

to establish the Practical Approach

to Design Basis Earthquake

for Nuclear Power Plant Design



USGS and NIED Workshop in NIED

in Feb 22~23, 2002

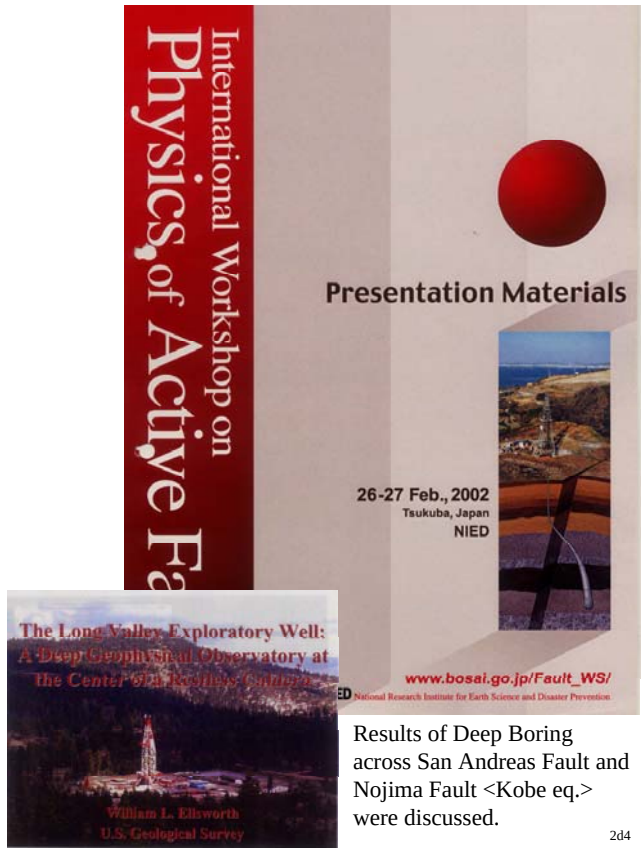
Int. WS on “Physics of Active Fault”

Deep Borehole and Faults

Sanandreas Fault

Nojima Fault

(Nozima)



Results of Deep Boring across San Andreas Fault and Nojima Fault <Kobe eq.> were discussed.

DBE in Japan

S_1: Maximum Earthquake

Historical Maximum

S_2: Upper Bound Earthquake

Omote Map

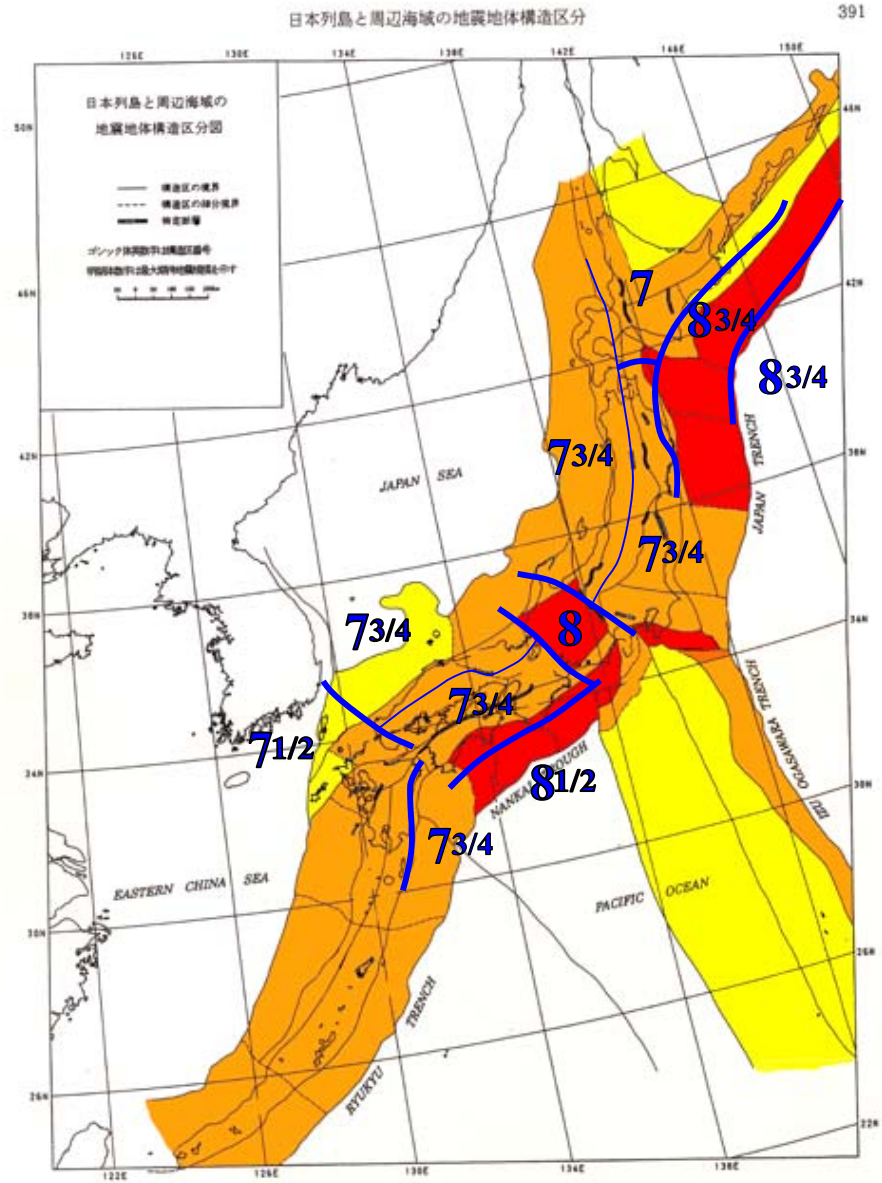
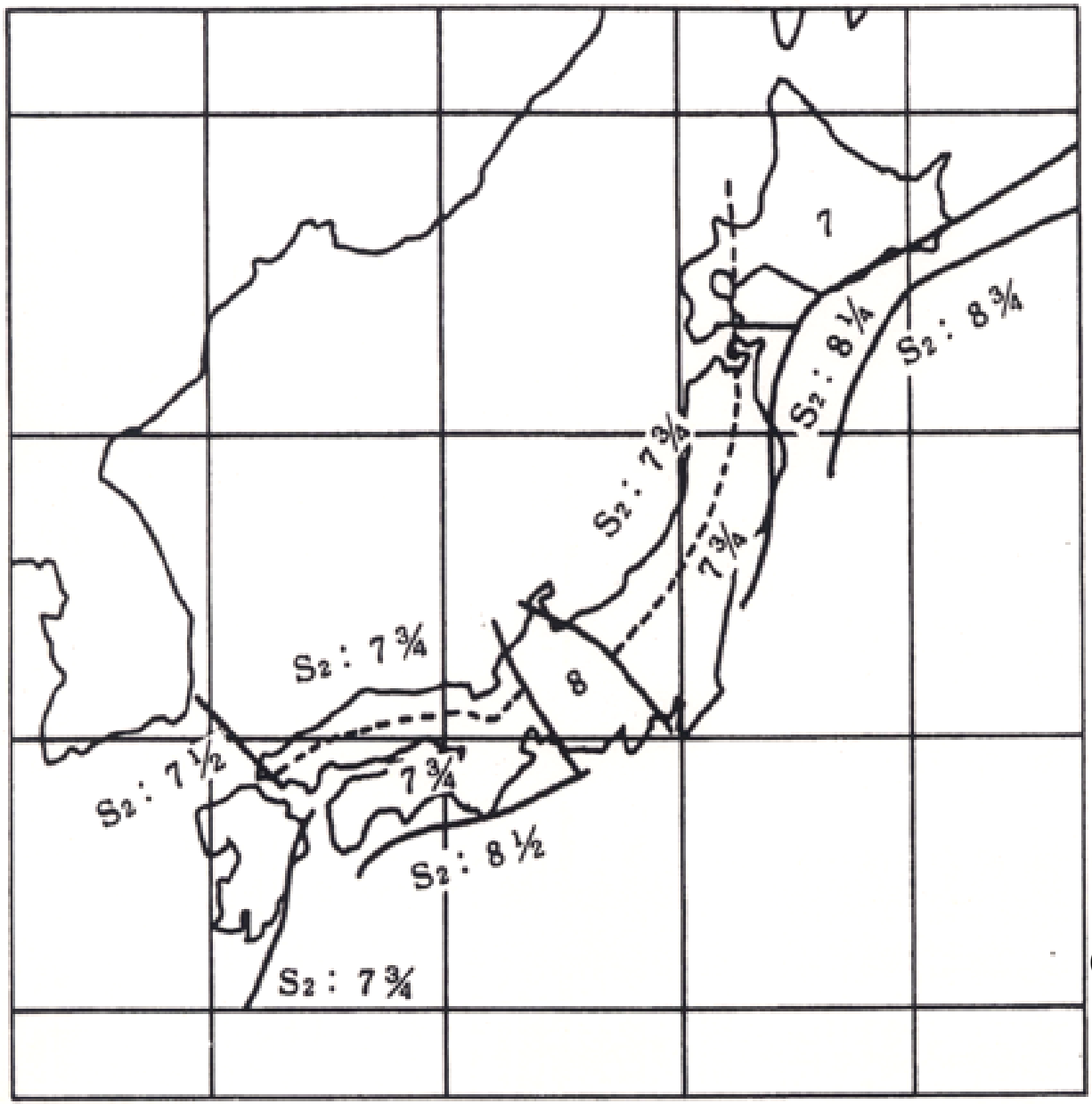


Fig. 1. Seismotectonic province map in and around the Japanese islands. Boldfaced sign is the symbol of province. Roman-type numeral represents the expected maximum earthquake magnitude (M_{max}) assigned to each province. Solid line: boundary between provinces. Broken line: boundary between subprovinces. Bar: the designated fault.



Original Omote Map

Two types of Earthquake 1) and 2);

1) Earthquake in Crust

2) Earthquake in Plate Boundary

3) Earthquake by Hidden Fault

4) Earthquake in Plate (Slab)

Licencing Criteria of

Seismic Design of NPPs, NSC,

1981 Version

Revising Work

It should been completed by Mar. 2005.

Empirical Method ⟹ Pseudo Green Function Method

Main Concept of 1981 Version

It hasn't been changed since 1960's for Fukushima #1 and Tsuruga #1.

Historical Records

Tectonic Regions; Upper Bound Earthquake

Hidden Fault $<M = 6.5, \triangle = 10\text{km}, h = 7\text{km}>$

⇓

Active Faults

98 Active Faults: mainly reverse fault listed by *HERP*

HERP: Headquarters for Earthquake Research and Promotion

"Seismo"

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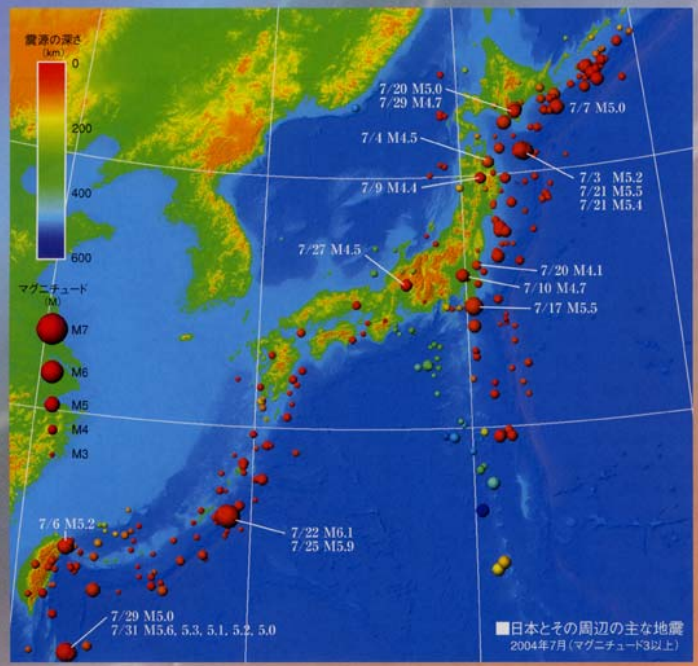
月刊地震レポート　サイスモ

SEISMO 9

地震調査研究推進本部ニュース　2004



Monthly Journal

for HERP's News

The 98 Faults.

Fault in Ocean Trench,

Ambiguous Fault,

undetermined.

Hidden Fault.

Active Faults in Japan, by *HERP*

Application of Deep Borehole Technique

- To Estimate Distribution of Asperity
- To Confirm No Hidden Fault in a Certain Area, that is, Volume, nearby NPP.

What should we study?

How should we work for?

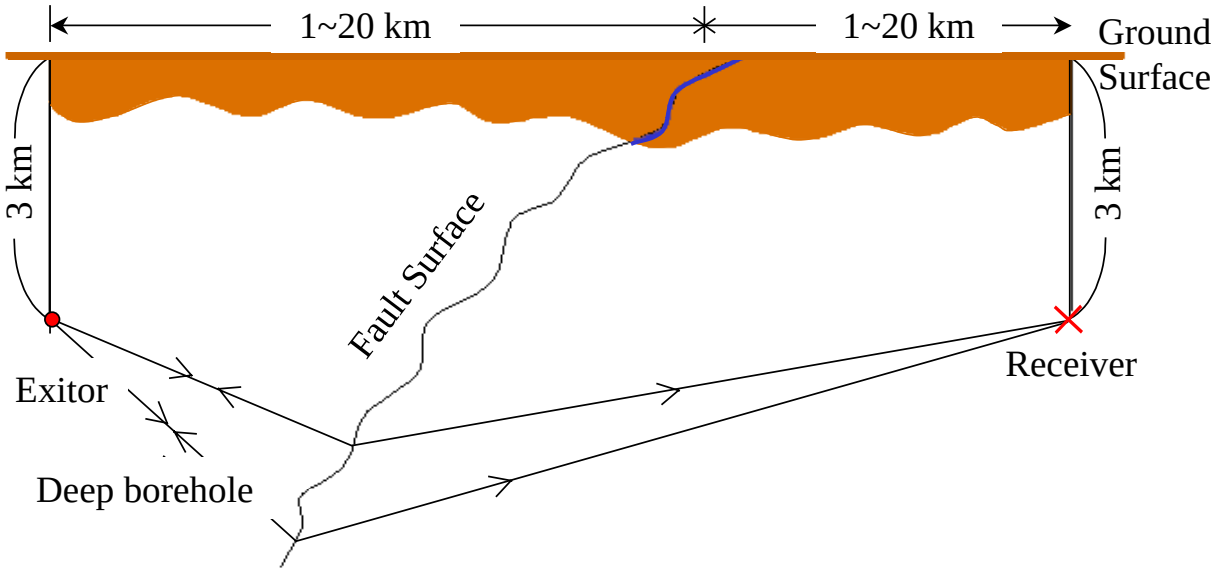
Who will work for this?

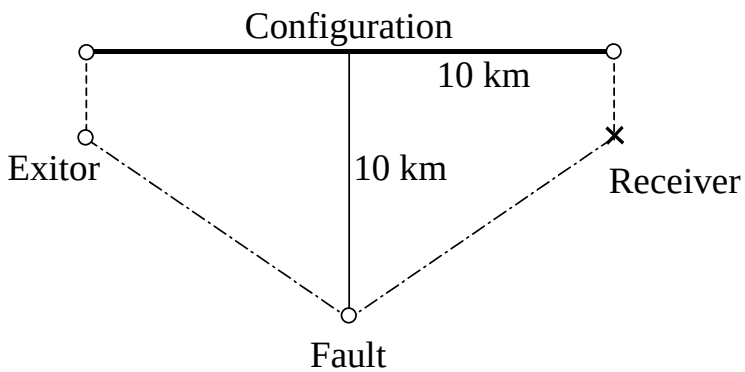
How many years should we expect to complete it?

How much does it cost for R&D?

How shall we expect the cost of one survey?

Use of Deep Borehole





Western Tottori-pref. earthquake

Oct. 6, 2000

$M = 7.3$, $h = 9$km

No Surface Fault or Rupture is found.

Less Damage of Local Houses,

However, Activity of Fault had been studied before the event by University Group.

Conjugate Distribution of Aftershocks.

Miyagi-pref. earthquake

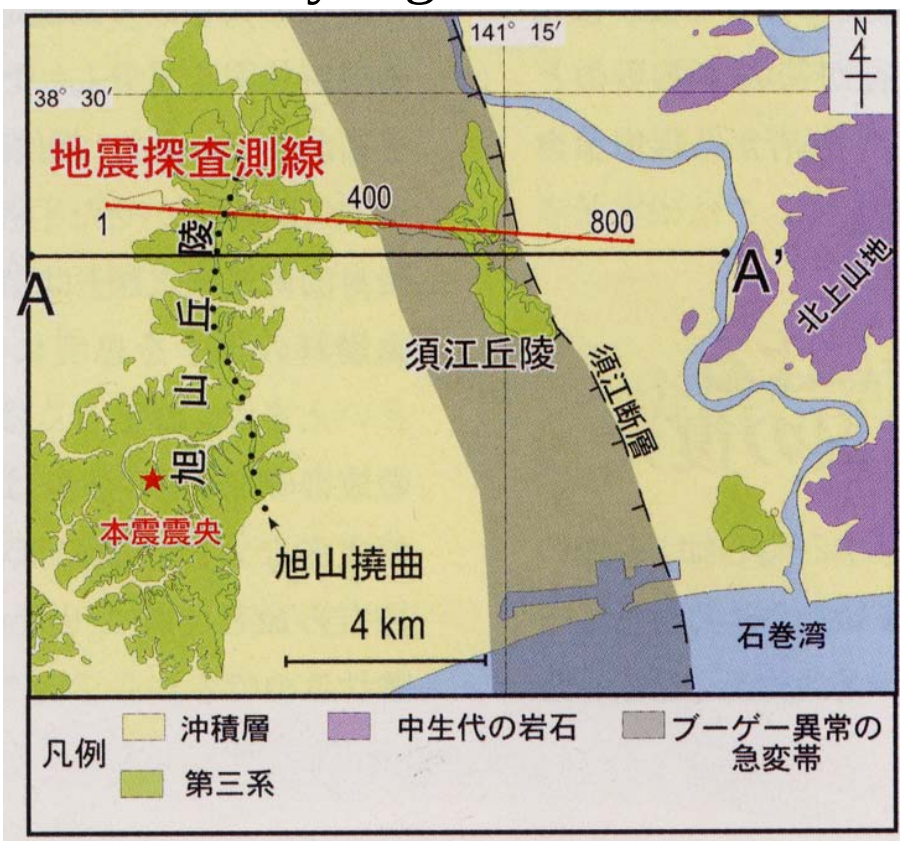
July 26, 2003

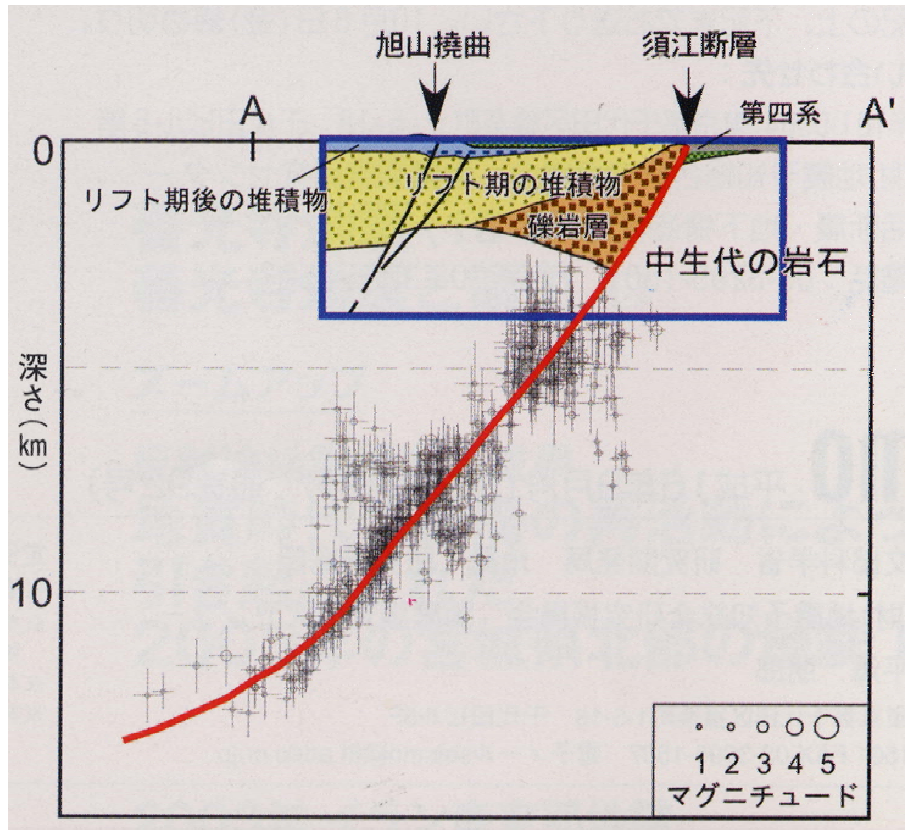
M = 5.6, 6.4 and 5.5 on the same day

Three shocks from an Old Fault (Tertiary or Older),

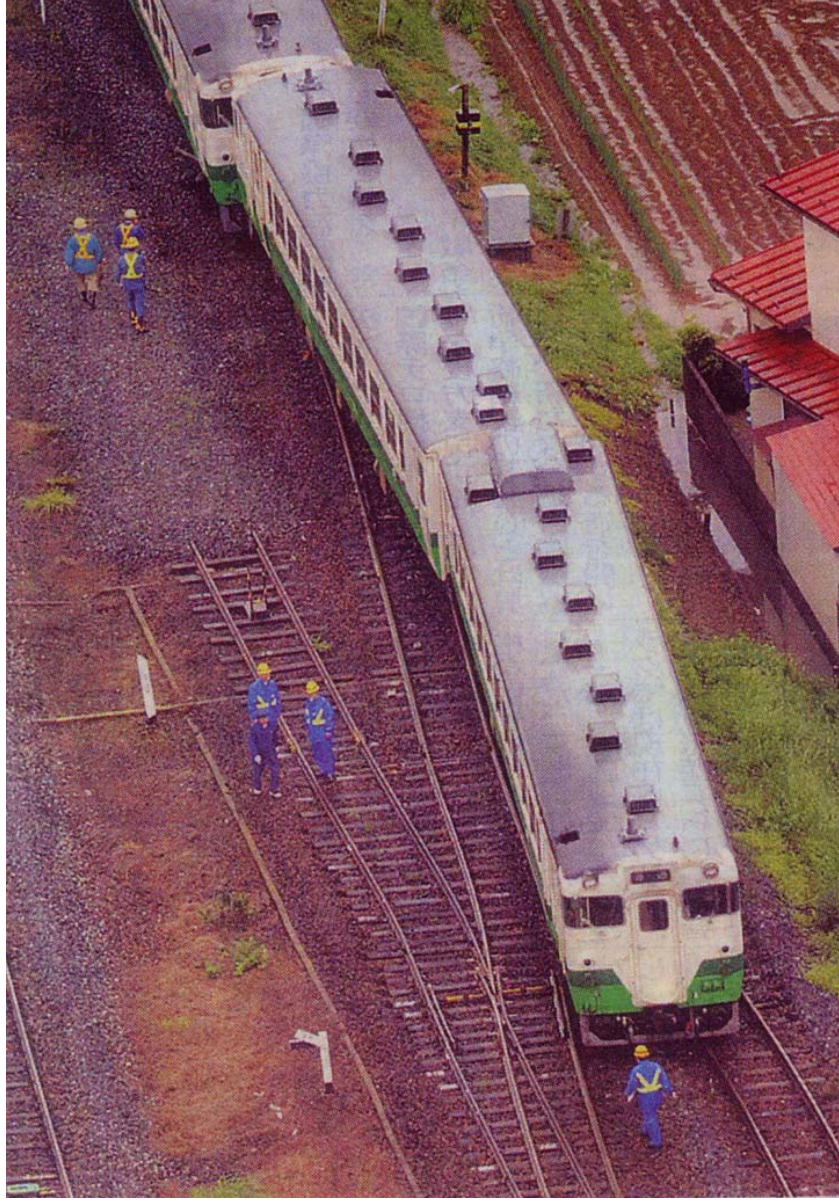
Very high accelerations

Mesozic Structure

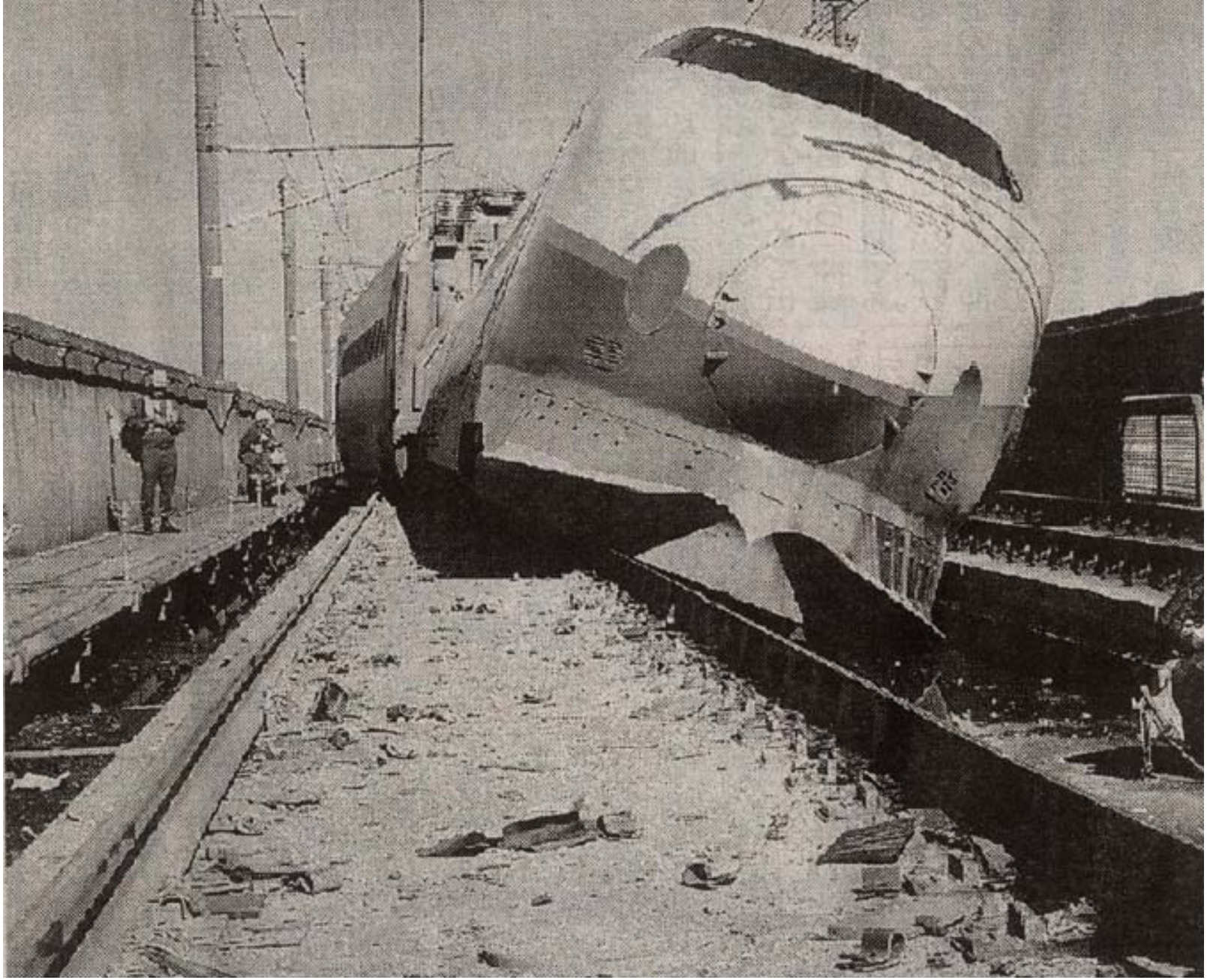




Structure of the Fault System by Prof. Sato [*Seismo*, Sept. '04]



Miyagi-pref. Earthquake-2003 from Newspaper



Derailed Train by Chuetsu earthquake-2004, the Last Coach, from Newspaper

Niigata-pref. Chuetsu earthquake, 2004

~~(Ojiya earthquake)~~

Oct. 23, 2004, 17:56.

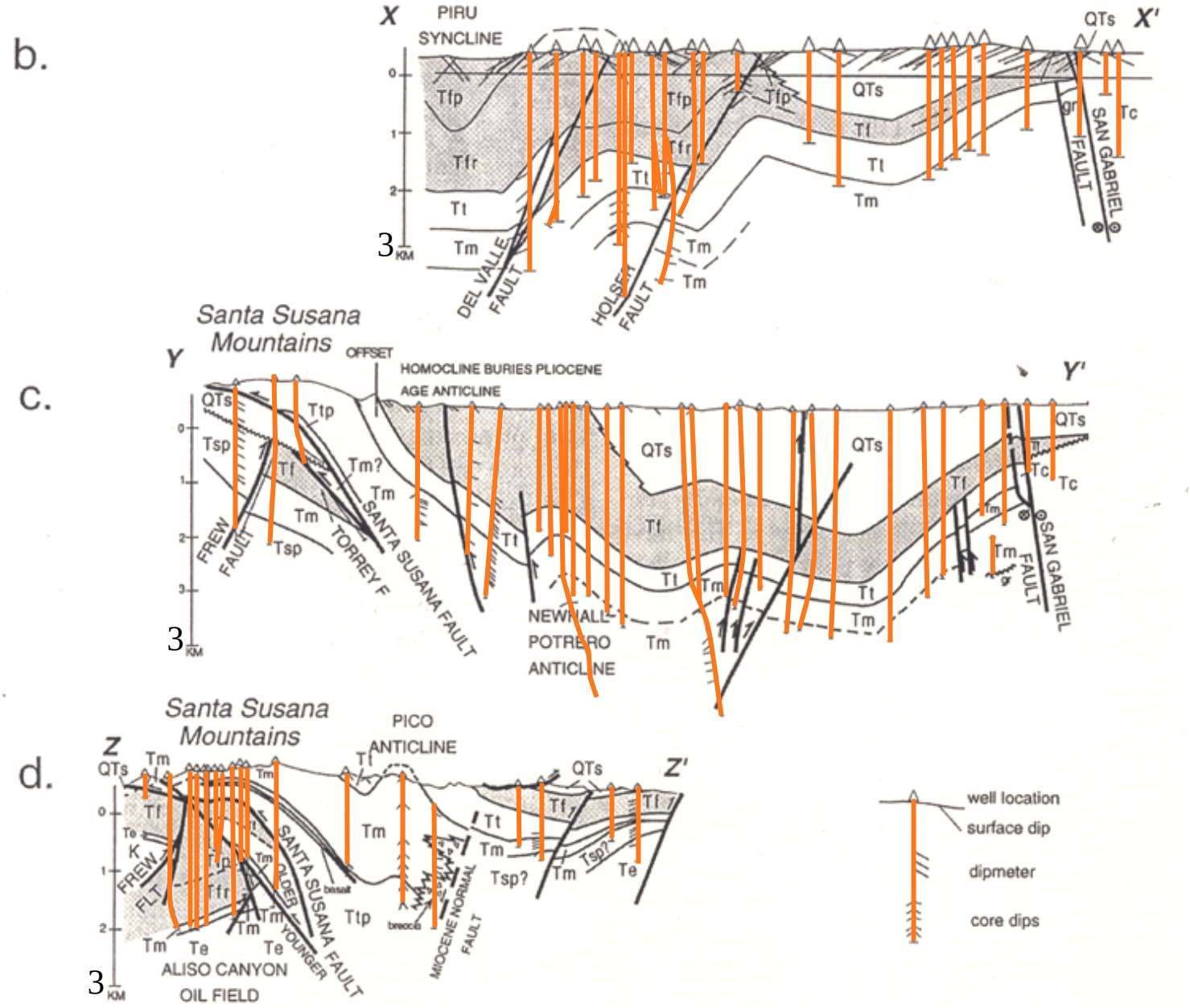
M = 6.7, h = 7km,

High Acceleration,

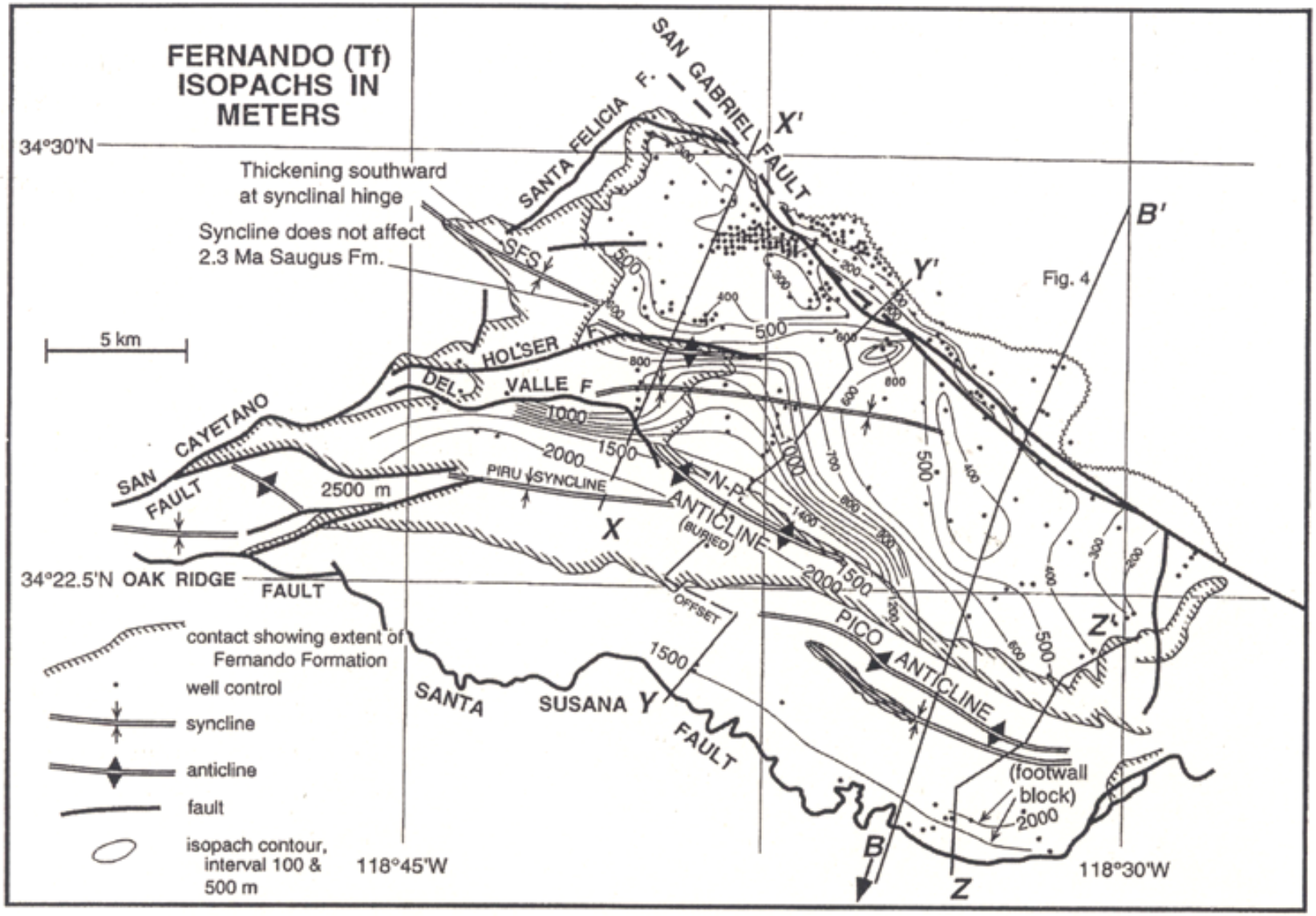
Many After Shocks,

2 Parallel Faults and One Conjugate Fault; by *HERP*

Dr. Y. Okada, NIED will report the details on Tuesday.



Bore Holes for Oil-wells and Structures [Ref. (4), BSSA]



Map of Northridge Eq.-1994, Source Area and Faults [Ref. (4), BSSA]

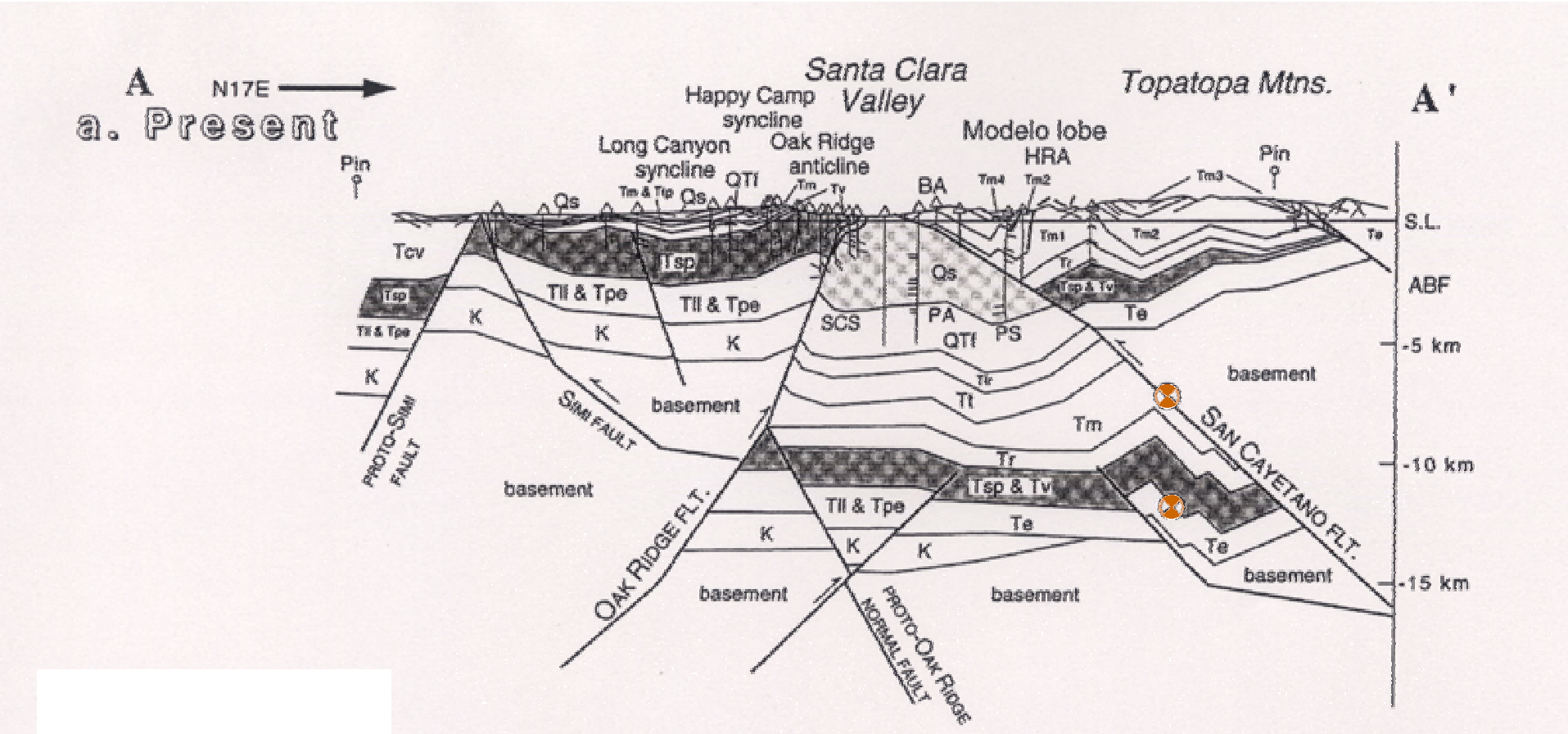


Fig. 2 Geological Cross-section of Santa Clara Valley, CA [Ref. (4)]

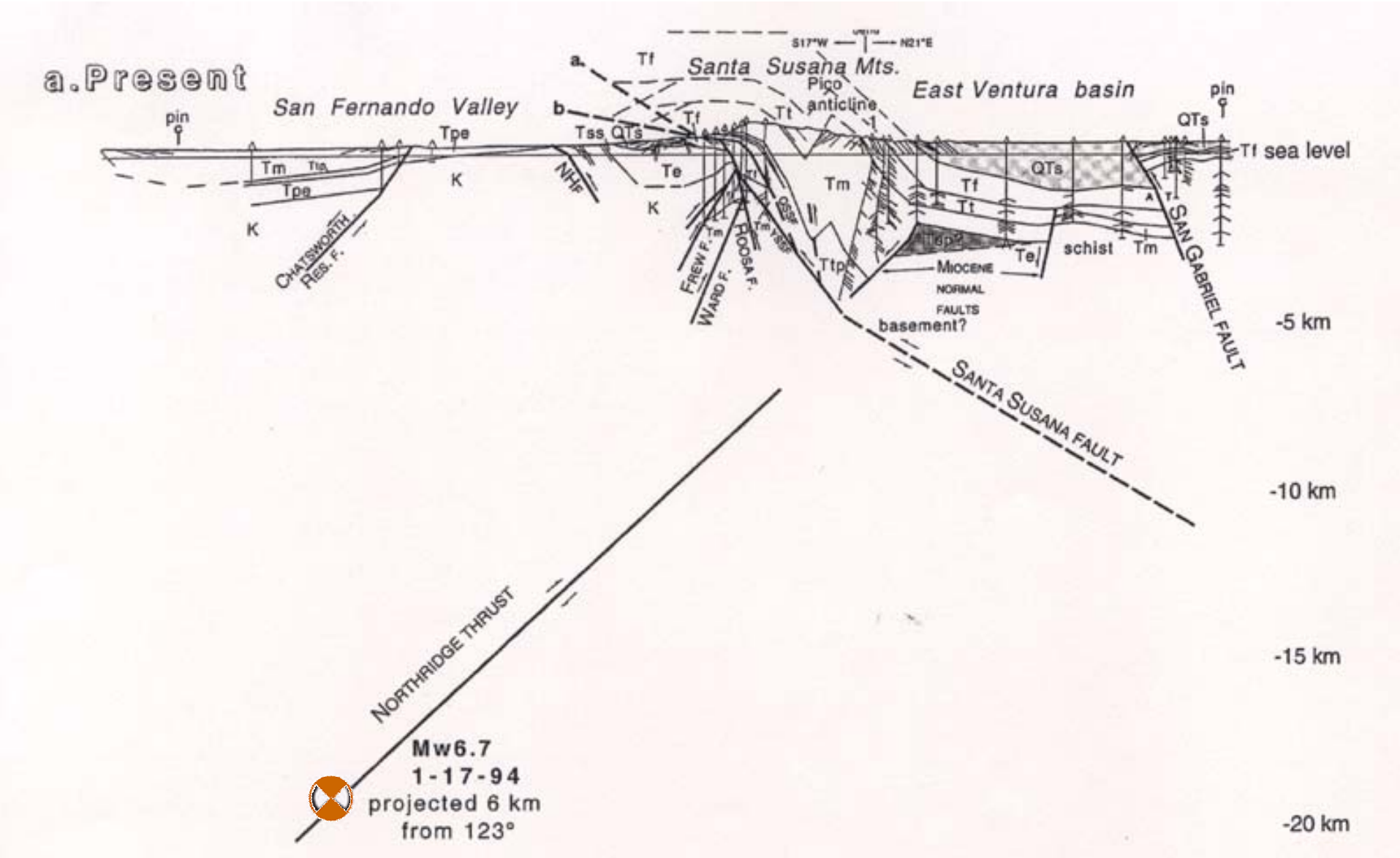
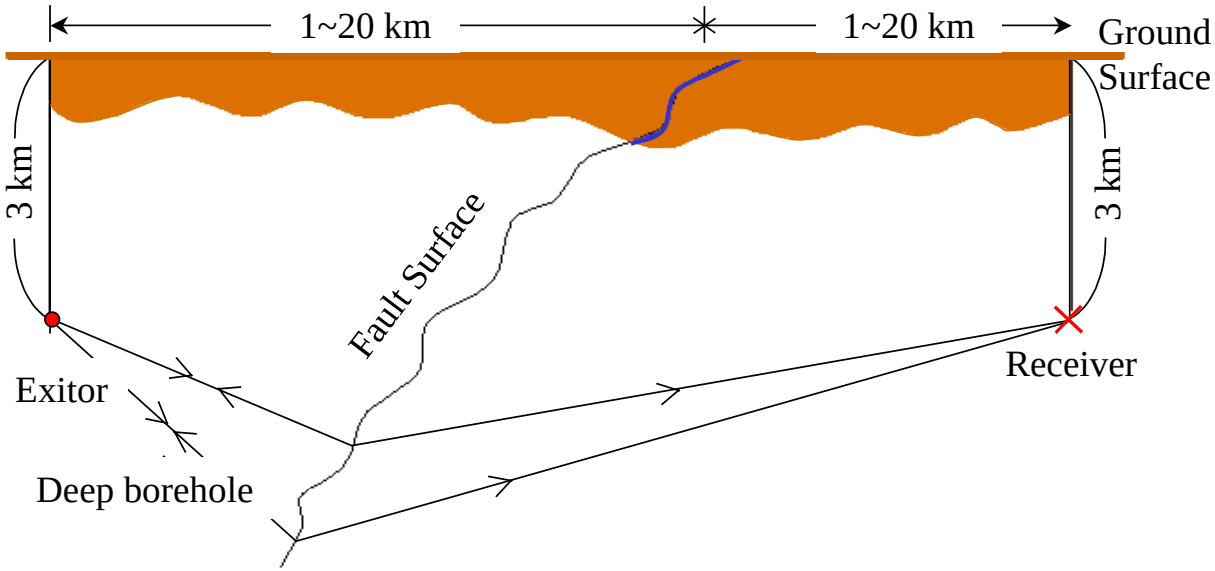
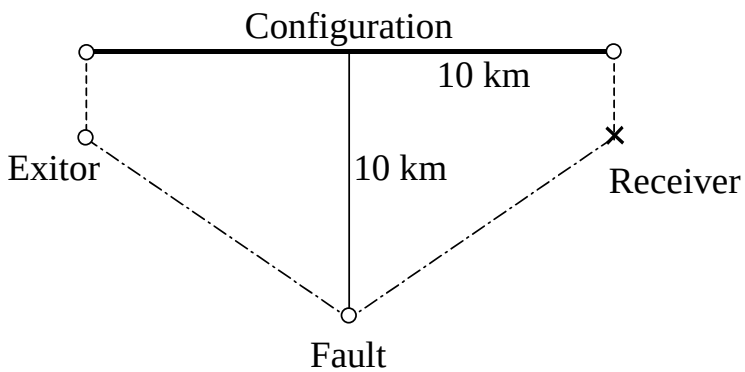


Fig. 3 Schematic Cross-sections of the Focus and Fault of Northridge earthquake-1994 [Ref. (4)]

Use of Deep Borehole





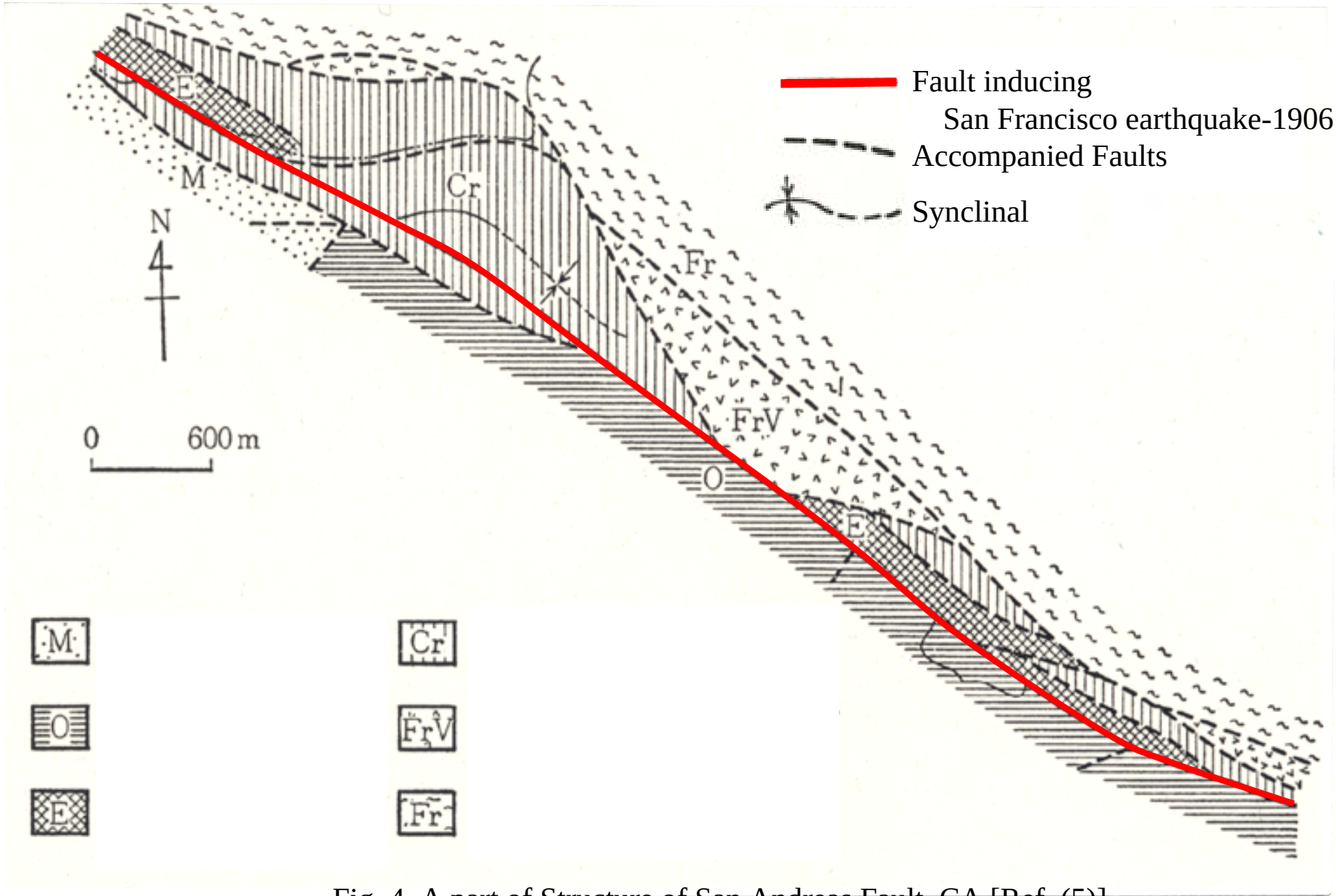
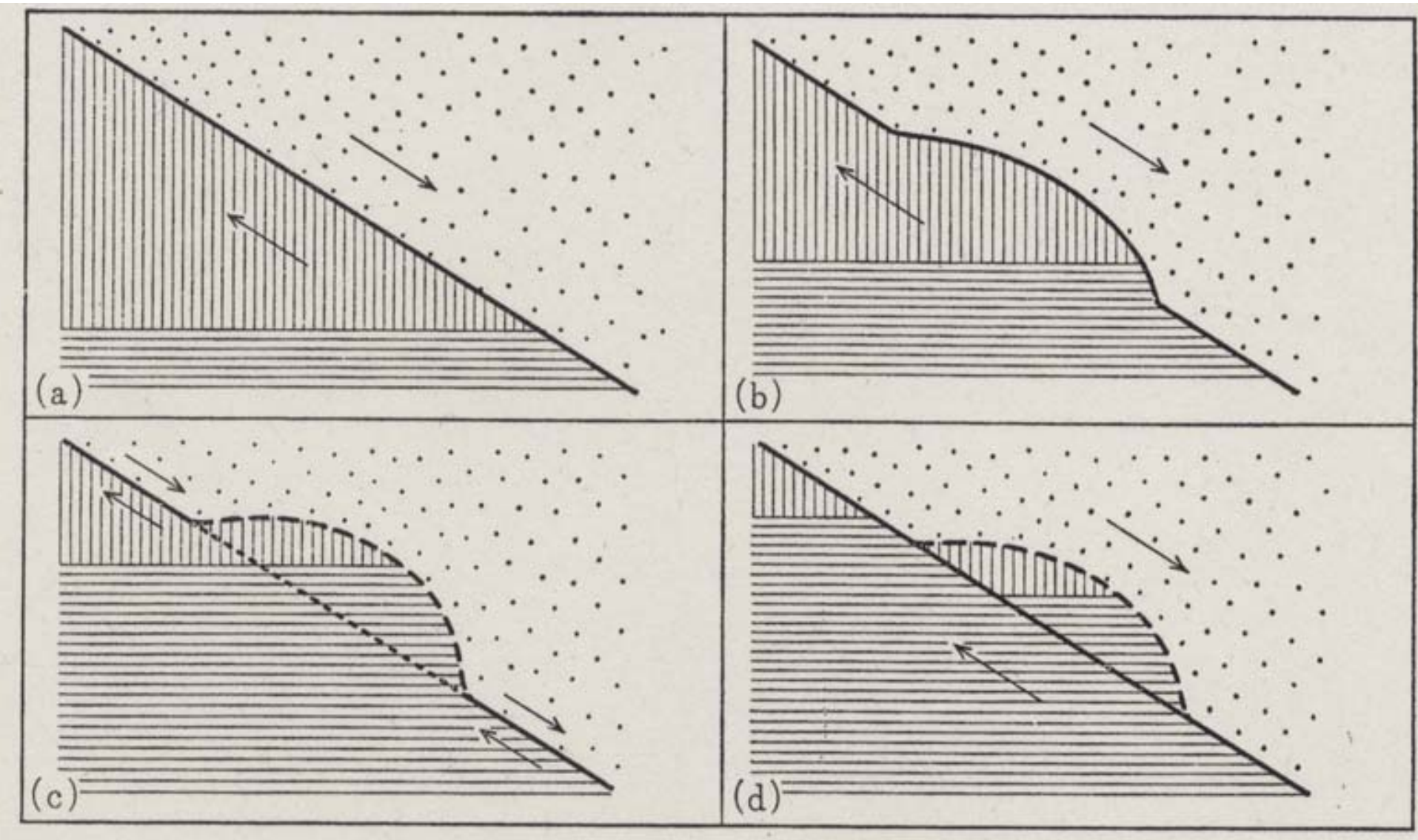


Fig. 4 A part of Structure of San Andreas Fault, CA [Ref. (5)]



Model of Replacing Fault---time [Ref. (5)]

Cost per One NPP unit, (1300 MW/unit).

US$ 4B ~ 5B / One NPP.

1 Plant consists of 5 ~ 10 units.

Fukushima #1: 6 units
Fukushima #2: 4 units
Kashiwazaki: 7 units
-Kariha

} TEPCO.

Tsuruga-District: 2+(2)+3+2+4 units

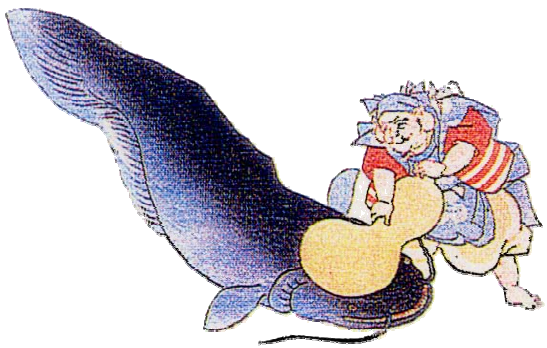
JAPCO. + Kansai P.C.

Target of the Special Session

To clarify the followings:

- Cost
- Duration
- Technique
- Tools
- Researchers

***We** expect a certain Positive Conclusion in the three days!*



ICOSSAR ’05 in Roma

9th International Conference on
Structural Safety and Reliability

Rome Italy
19-22 June, 2005

Special Session: organized by *Shibata*
Stochastic Model of
Eigen-periods of Destructive Earthquake

http://www.icossar2005.com/
Special session organizer:
iitsuka@bosai.go.jp