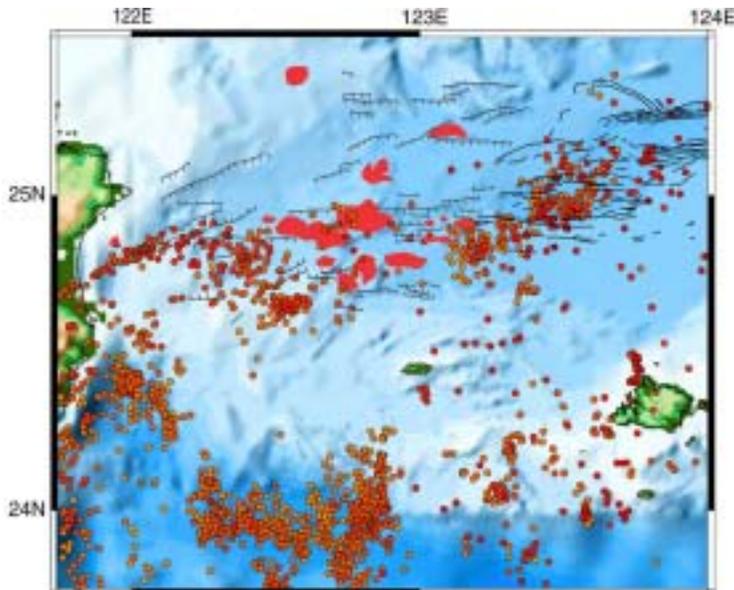
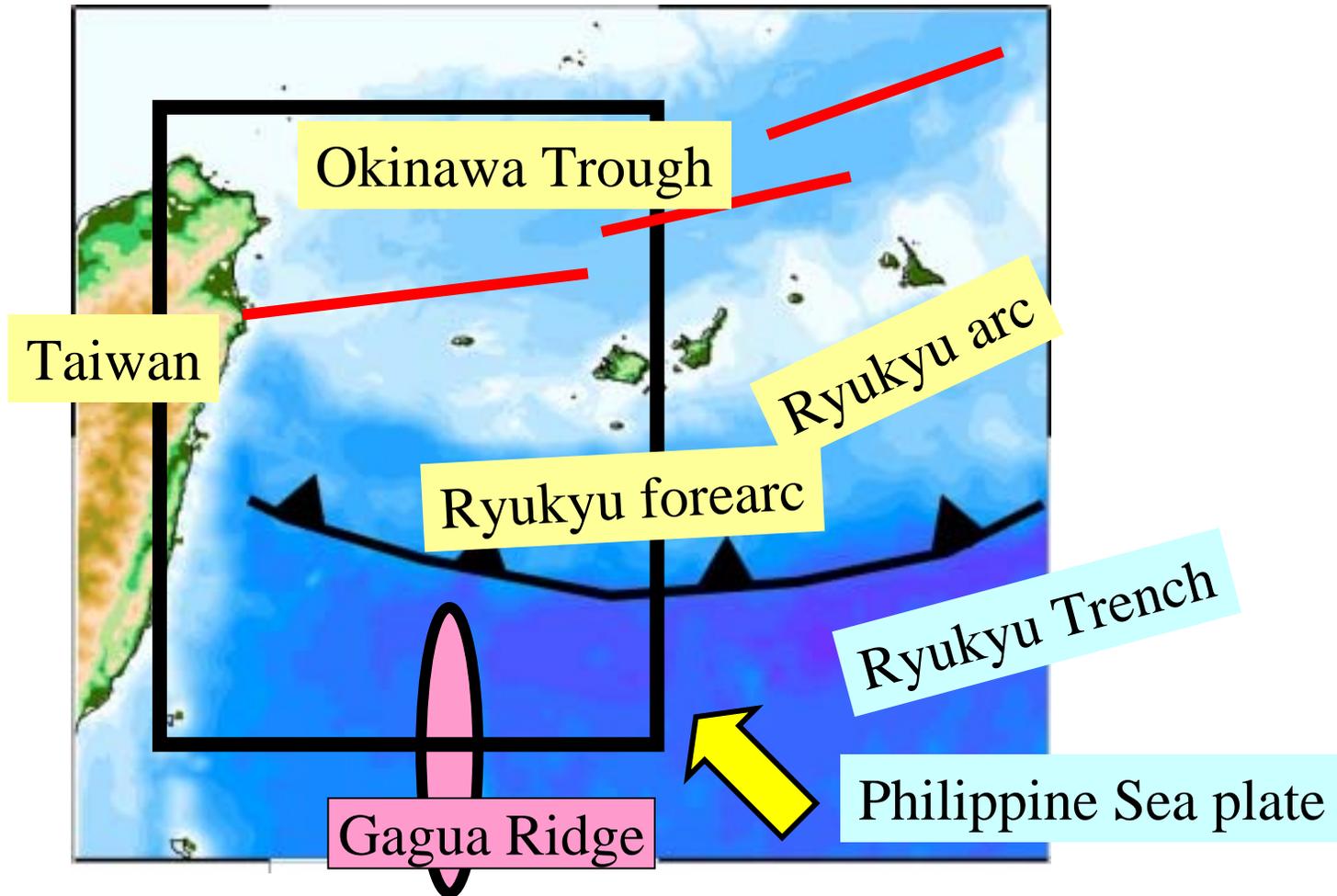


3-D Seismic Tomographic imaging in eastern Taiwan-southwestern Ryukyu regions

Mamoru Nakamura (*University of the Ryukyus*)
Cheng-Horng Lin (*Academia Sinica*)
Masataka Ando (*Nagoya University*)

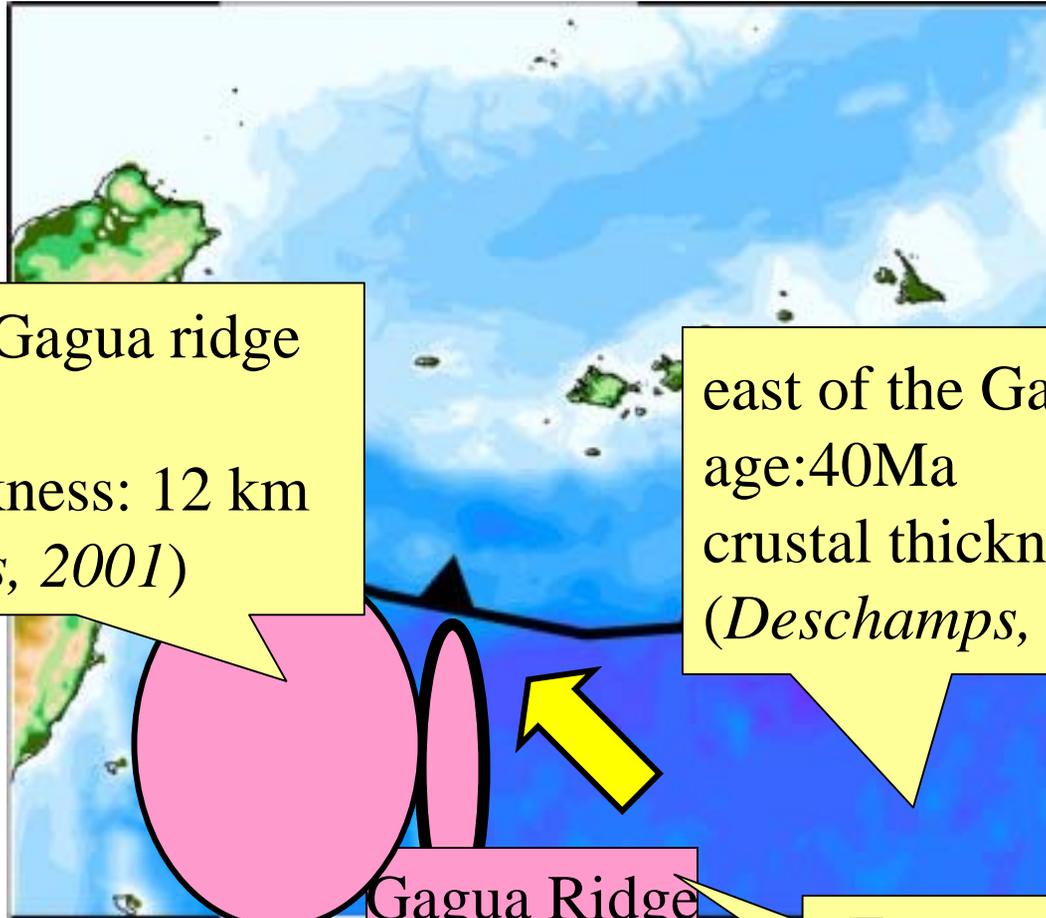


Tectonic background in the southwestern Ryukyu arc



Tectonic framework (1)

Subduction of Philippine Sea Plate



west of the Gagua ridge
age: 115 Ma
crustal thickness: 12 km
(Deschamps, 2001)

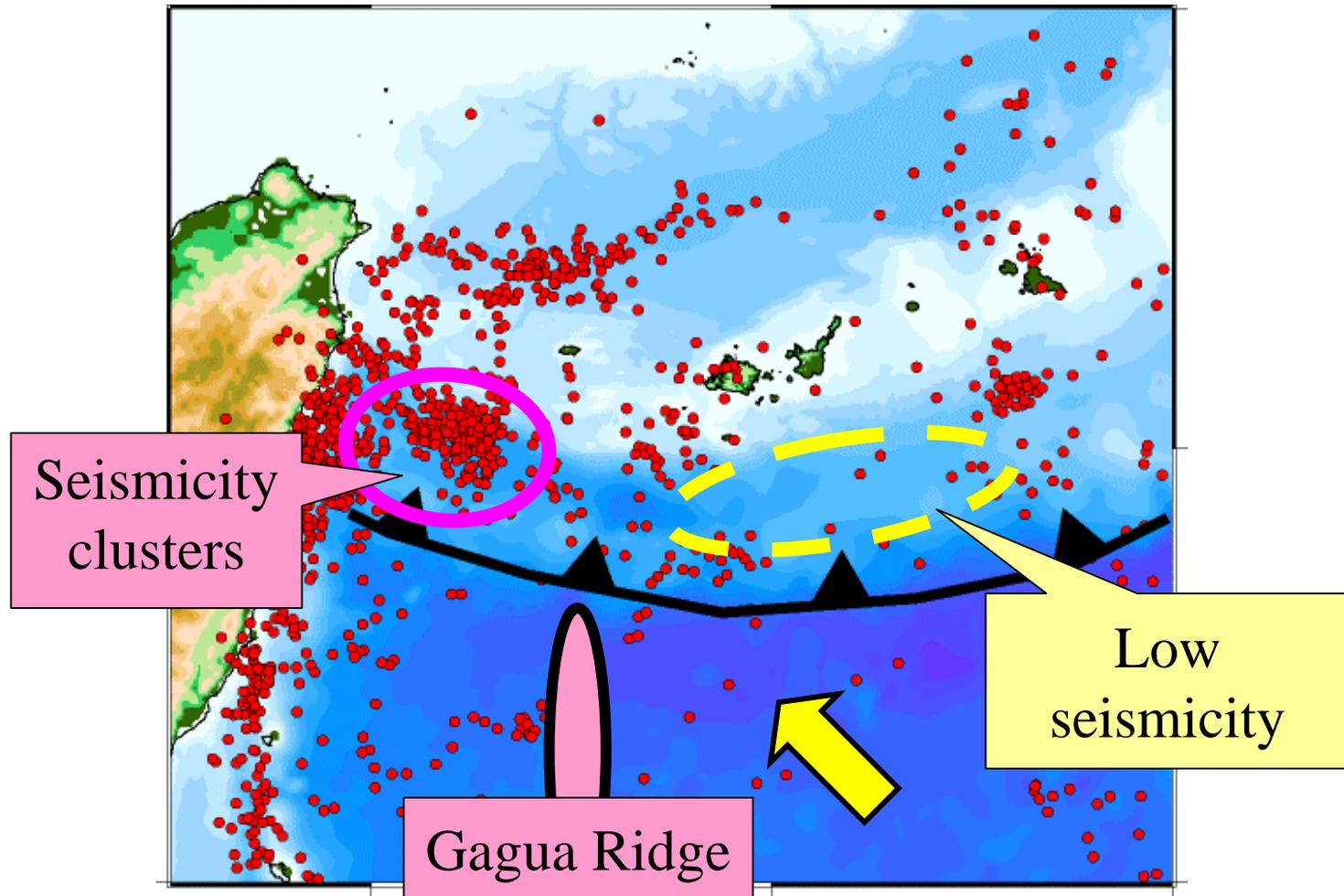
east of the Gagua ridge
age: 40 Ma
crustal thickness: 6 km
(Deschamps, 2001)

Gagua Ridge

Former fracture
zone

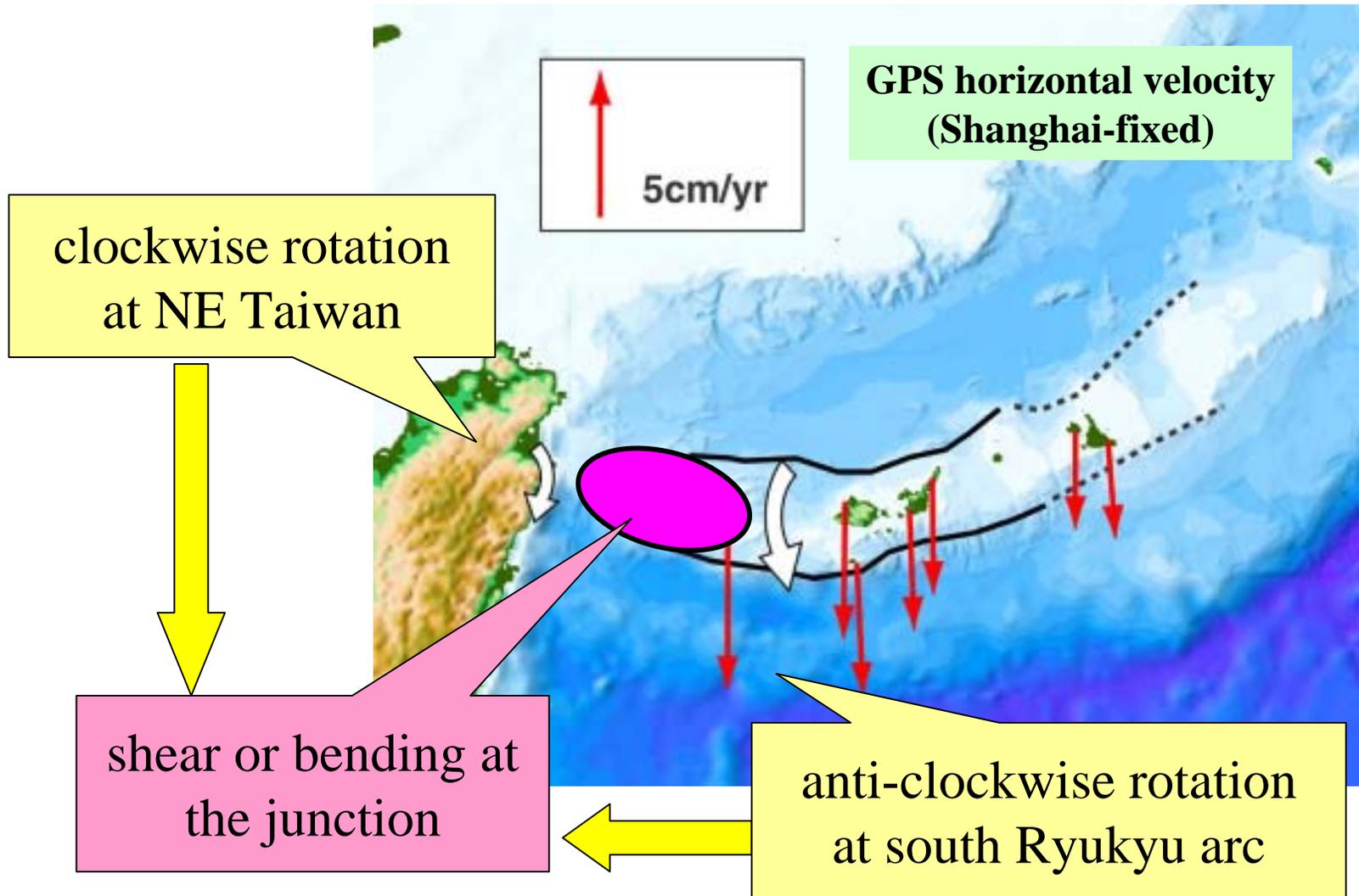
Tectonic framework (2)

Seismicity in the Ryukyu forearc



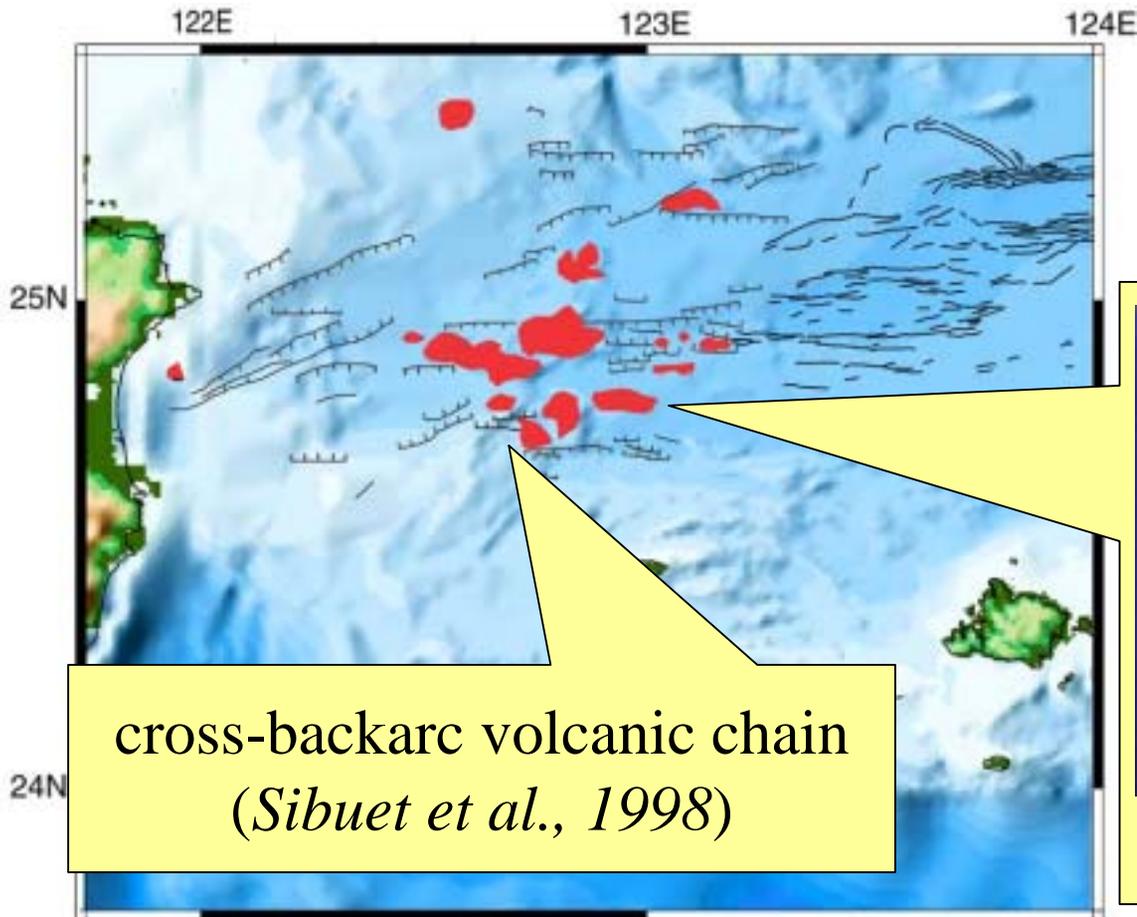
Tectonic framework (3)

Deformation of Ryukyu arc

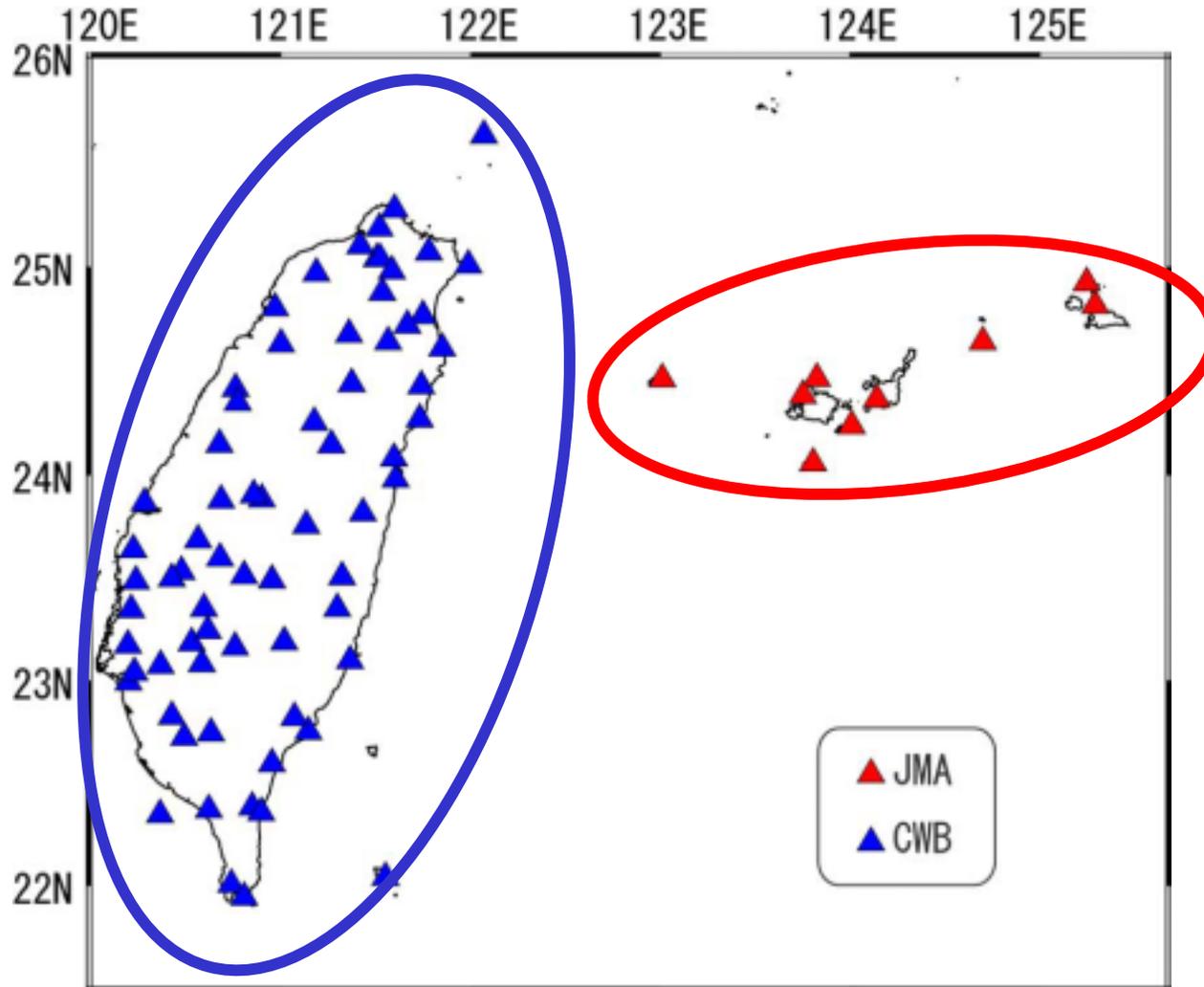


Tectonic framework (4)

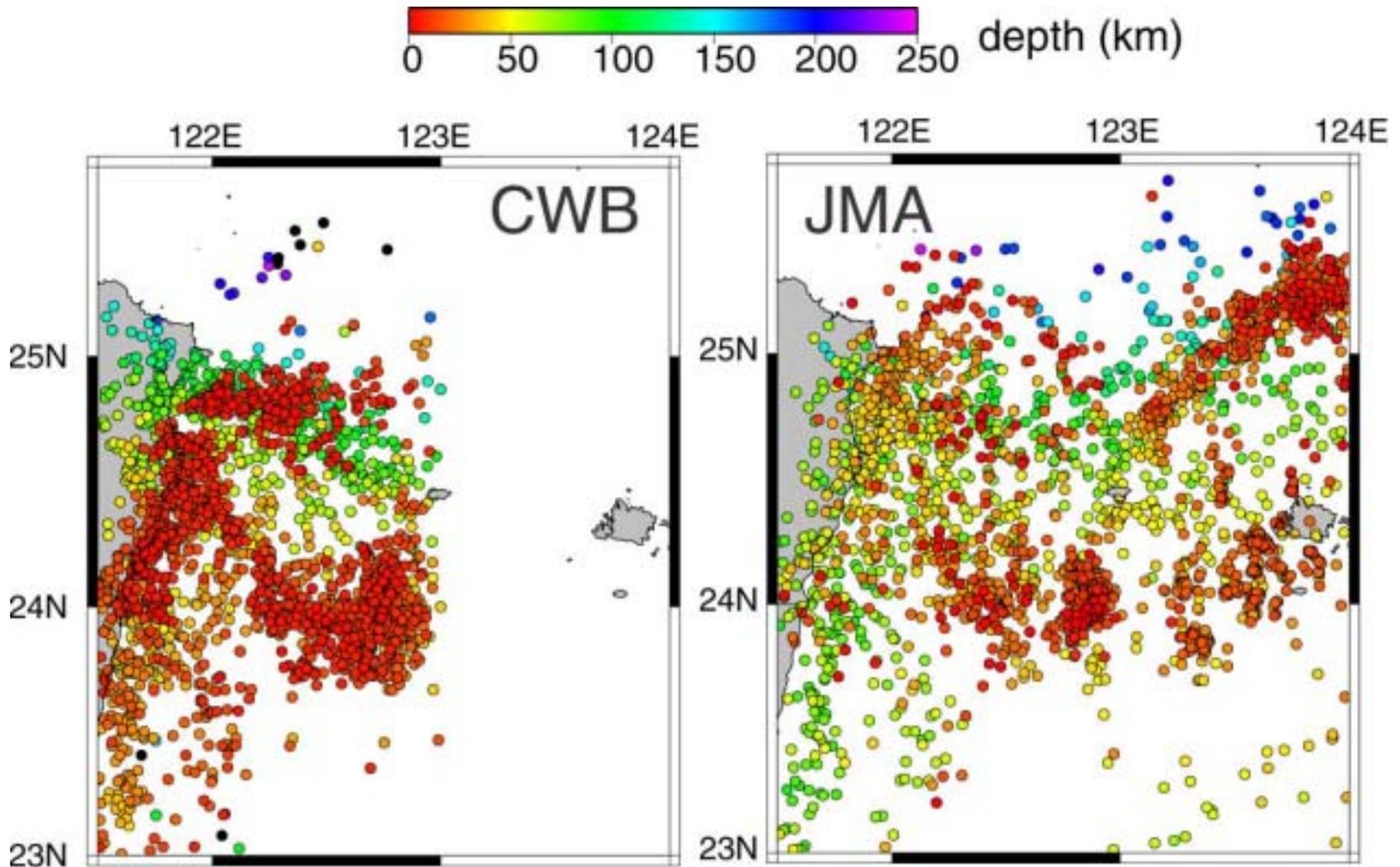
South Okinawa Trough



Seismic Stations



Hypocentral distributions for JMA and CWB catalogues

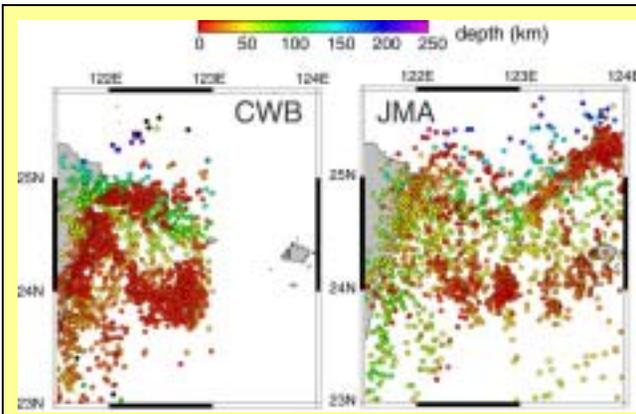


Ryukyu arc - Taiwan junction



- forearc seismicity clusters
- bending of the Ryukyu arc
- cross-backarc volcanic chain

Related to the subduction of thick oceanic crust ?



Relocated hypocenters distribution and seismic tomography would reveal the crustal and upper mantle heterogeneity between Taiwan and Ryukyu arc.

3-D seismic tomography and relocation of hypocenters using JMA and CWB data.

3-D seismic tomography

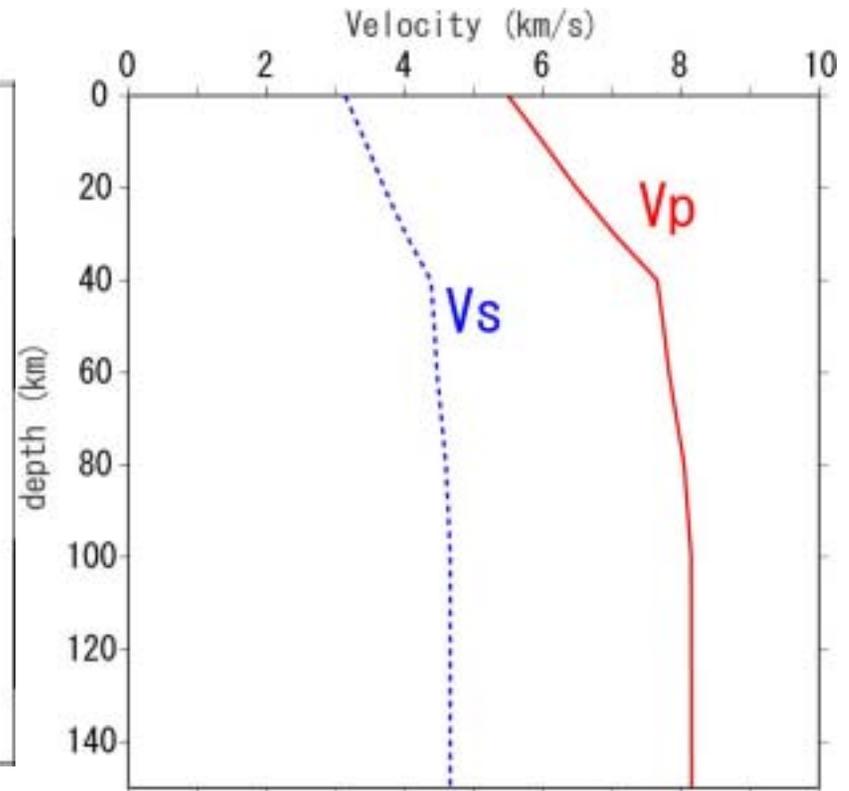
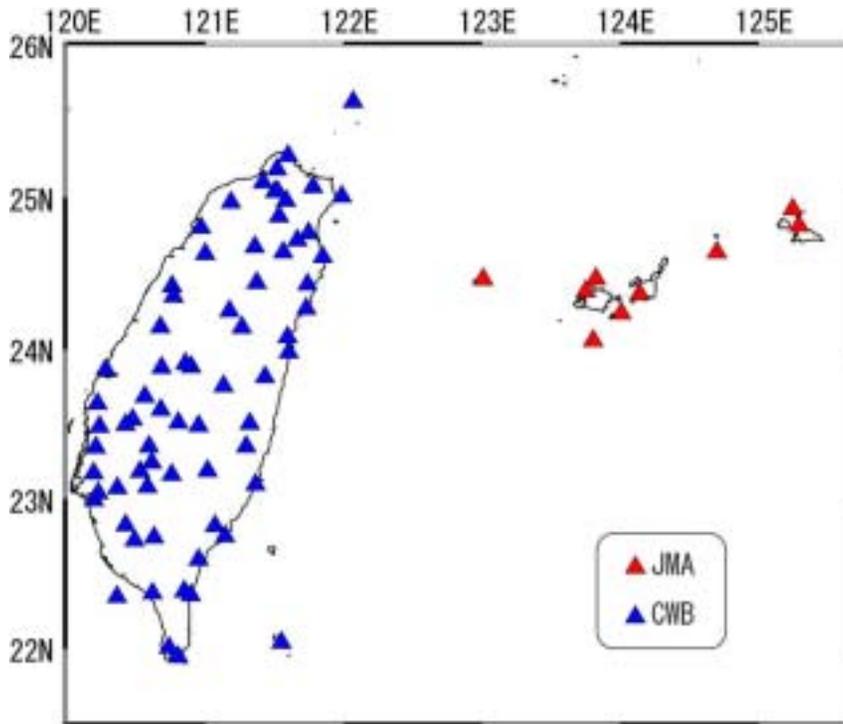
- Period: Jan. 1, 1996 – Mar. 31, 2002
- Used events: 2736 earthquakes (2489 common events recorded by both JMA and CWB), $M > 2.5$
- Stations: JMA (9 stations) and CWB networks
- Program code: simulps12
- Compute V_p and V_s

Previous 3-D tomography study in this region (*Hsu et al., 2001*)

Period: 1983-1994

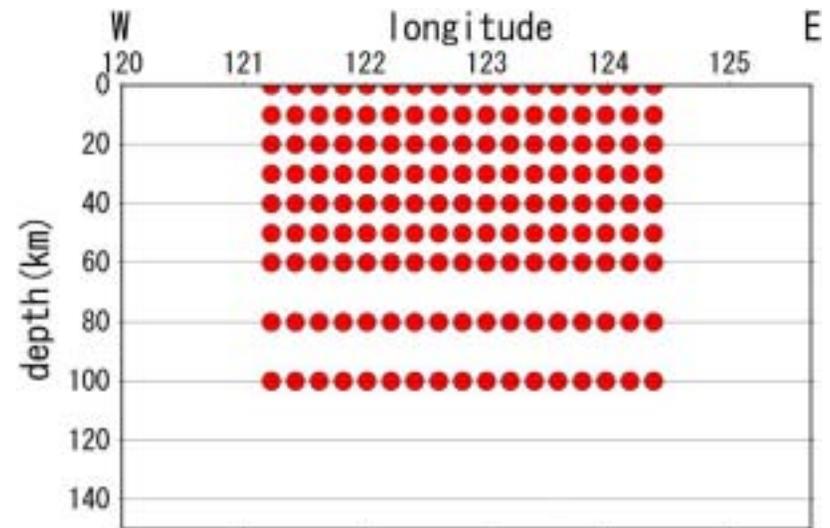
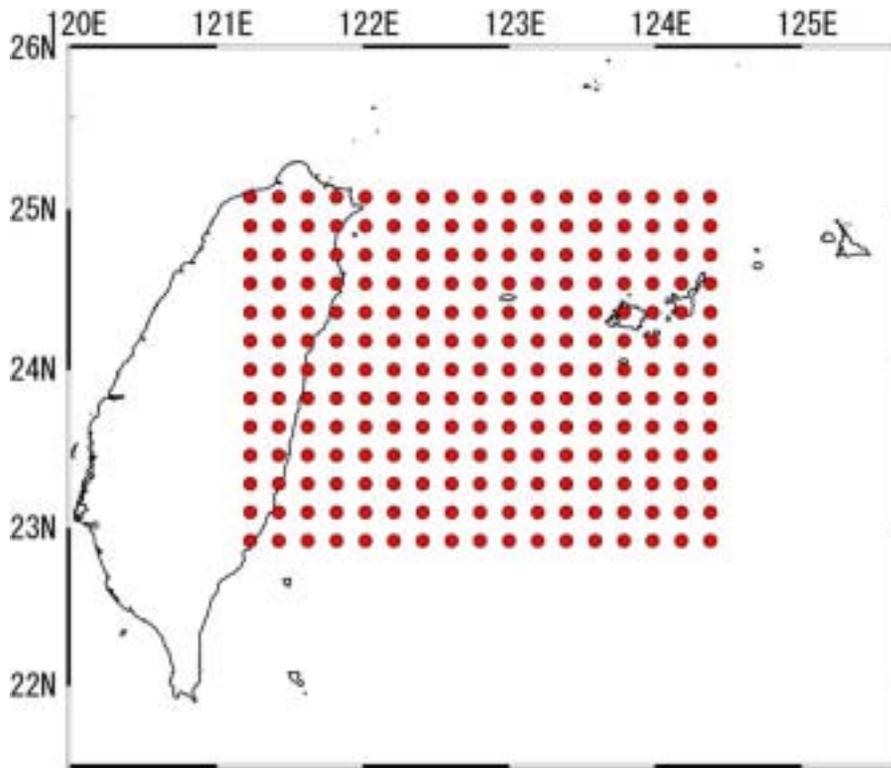
Used events: 162 common events recorded by both JMA (5 stations) and CWB

Station distribution and initial velocity model



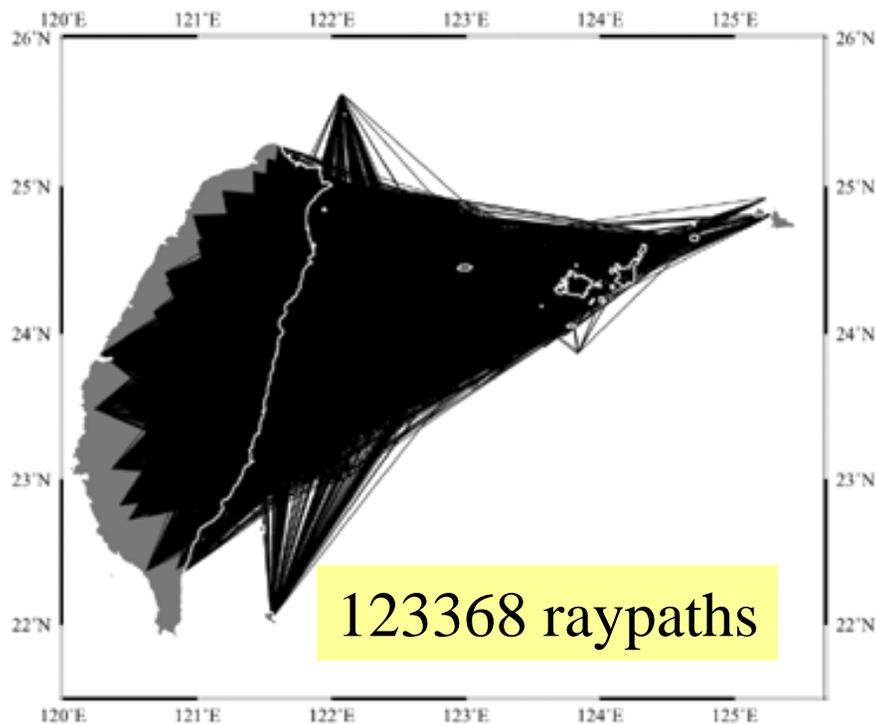
Grid Distribution

node interval
horizontal: 25km
Vertical: 10km

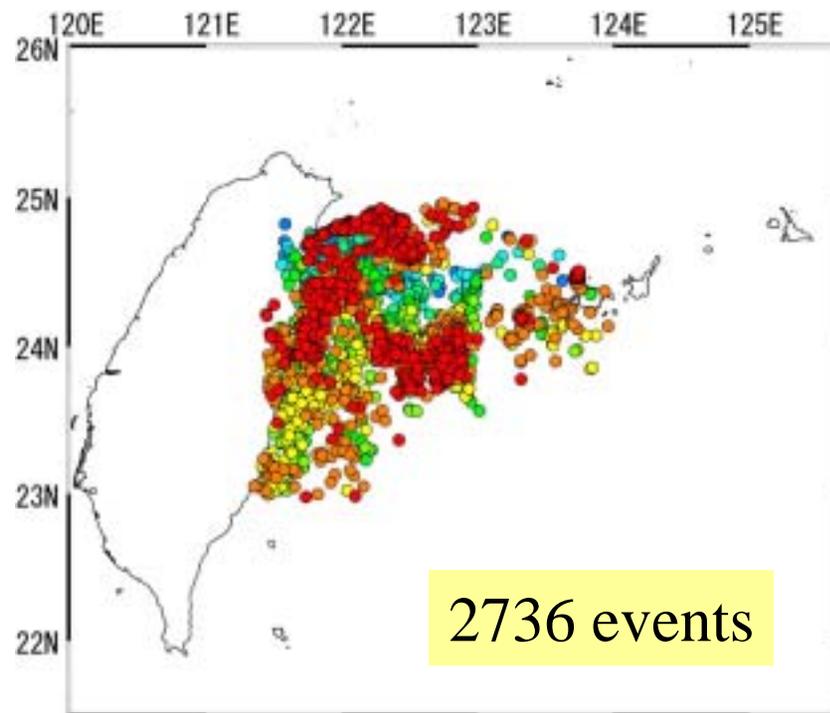


Ray-paths and used events

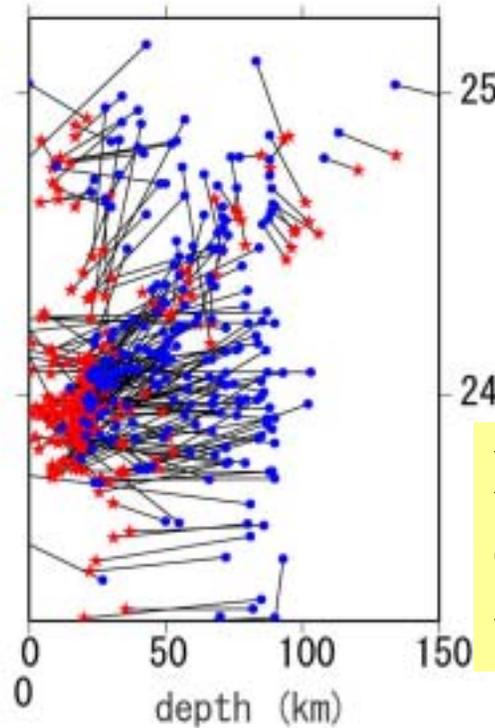
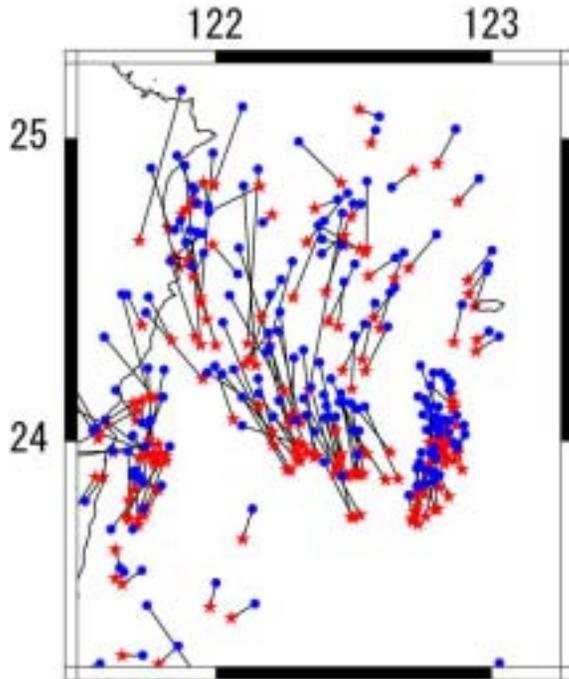
Raypath distribution



Used events

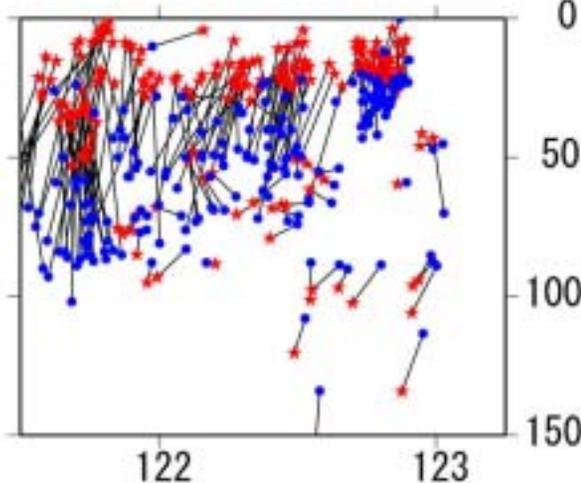


Hypocenters Distribution (JMA)



Depths of the JMA hypocenters are deeper than the relocated.

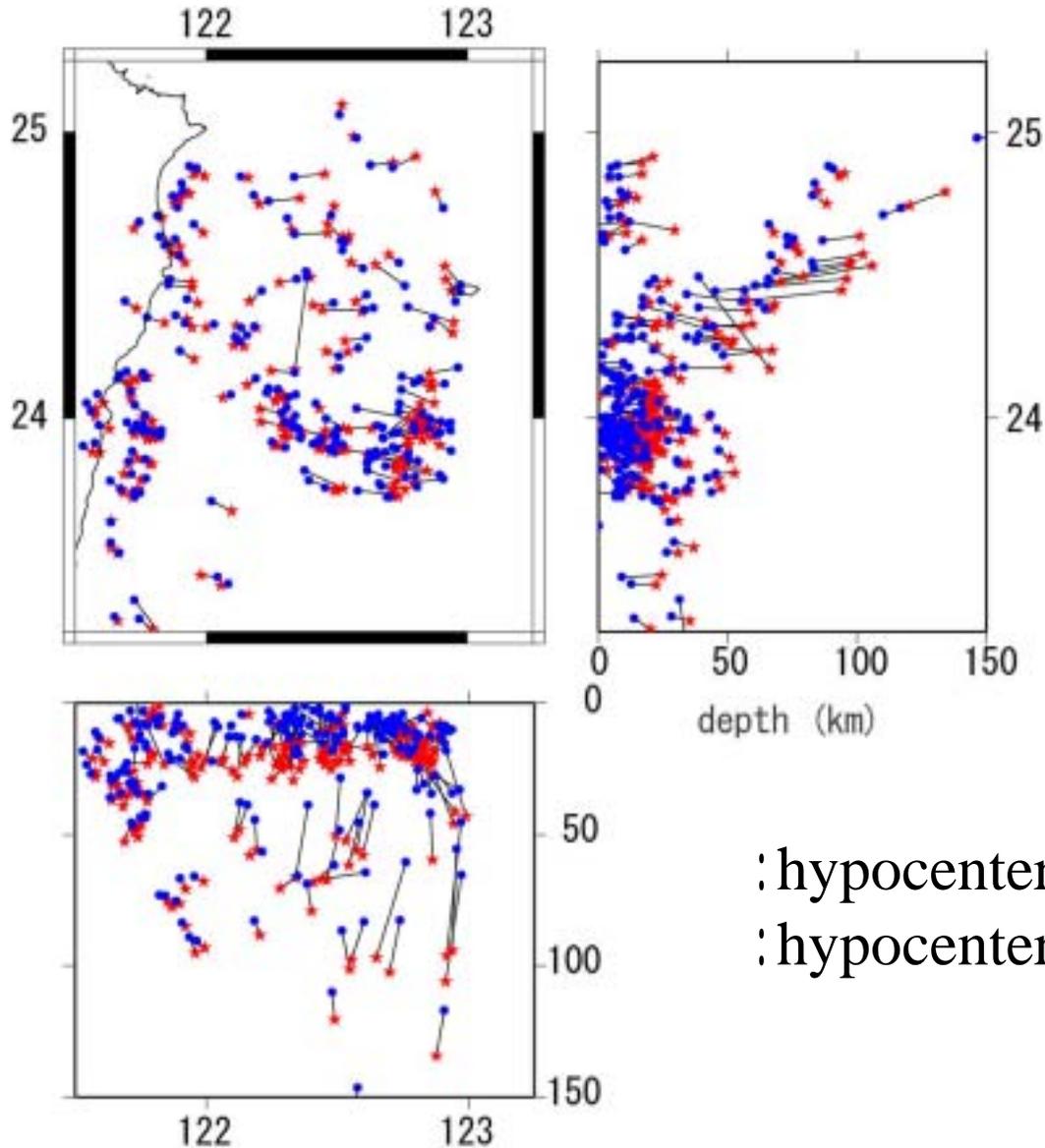
Epicenters of the JMA catalogue are distributed at the north of the relocated.



: hypocenter (relocated)

: hypocenter (JMA)

Hypocenters Distribution (CWB)

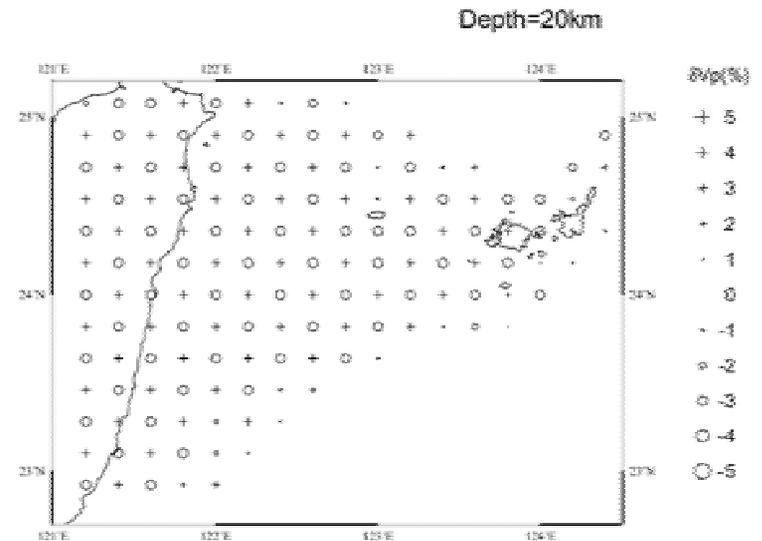
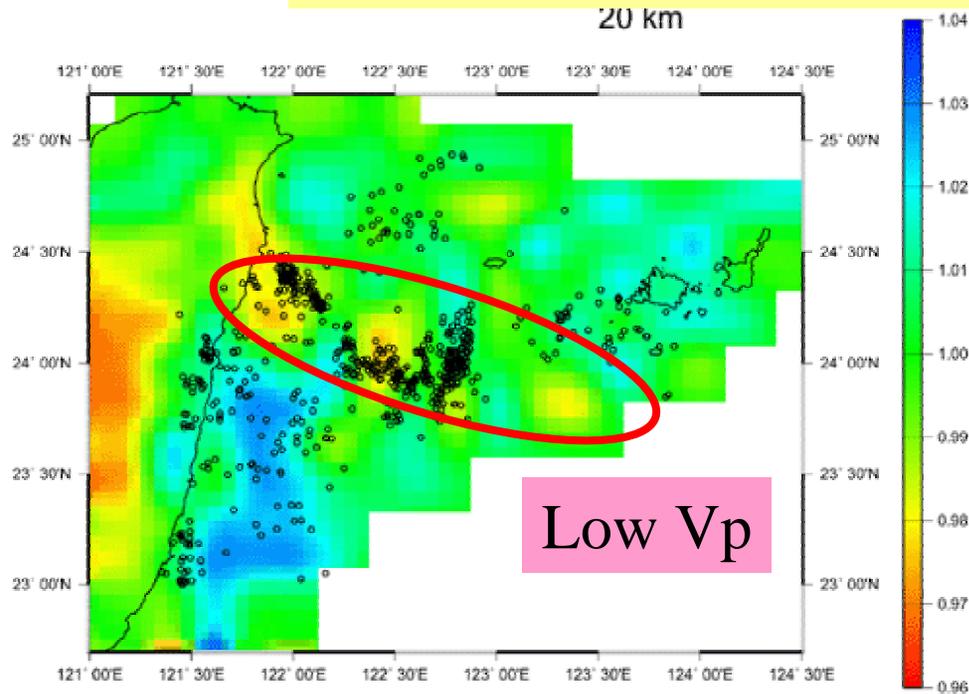


Depths of the CWB hypocenters at the east of Taiwan are shallower than the relocated.

: hypocenter (relocated)
: hypocenter (CWB)

Vp at the depth of 20 km

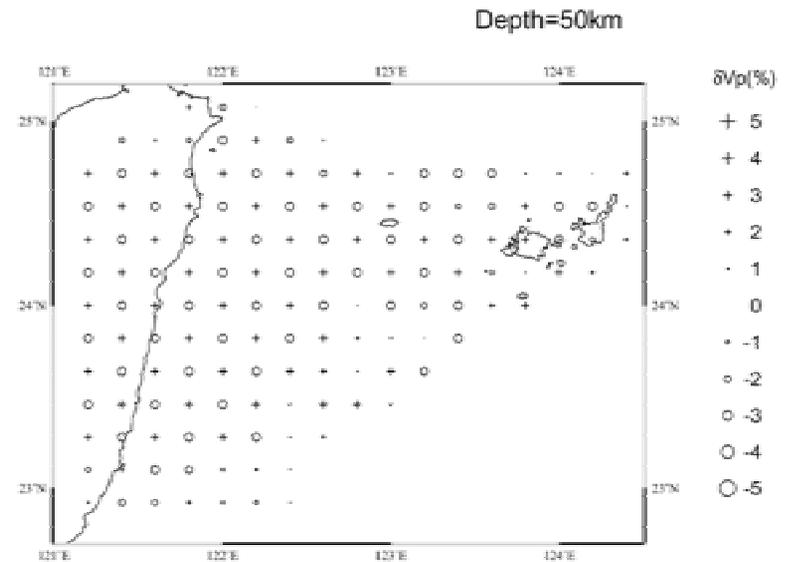
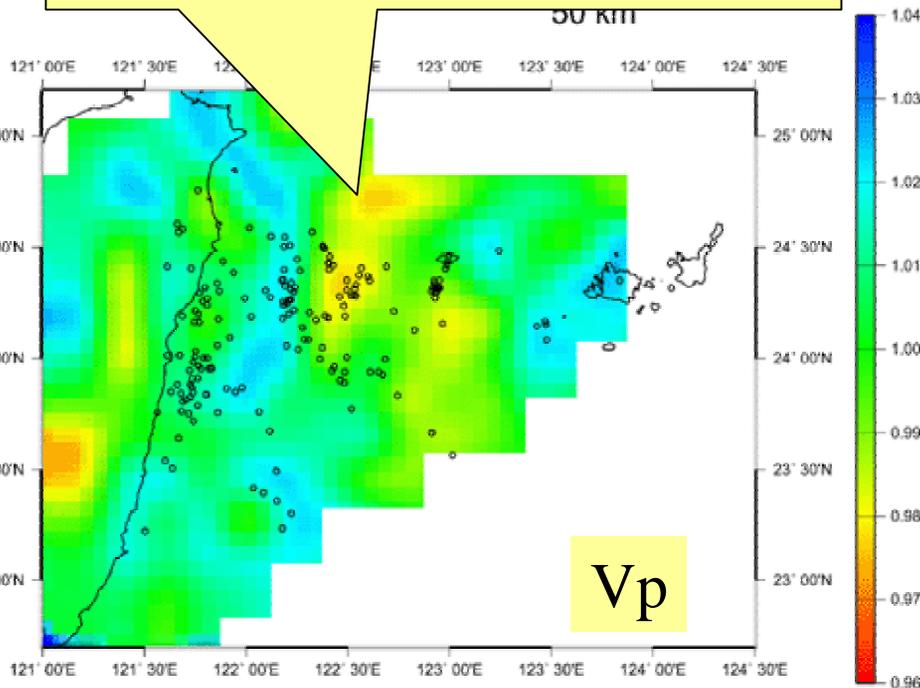
Distribution of low-Vp along the Ryukyu forearc:
basement of the Ryukyu forearc is imaged as low velocity area.



checkerboard resolution test

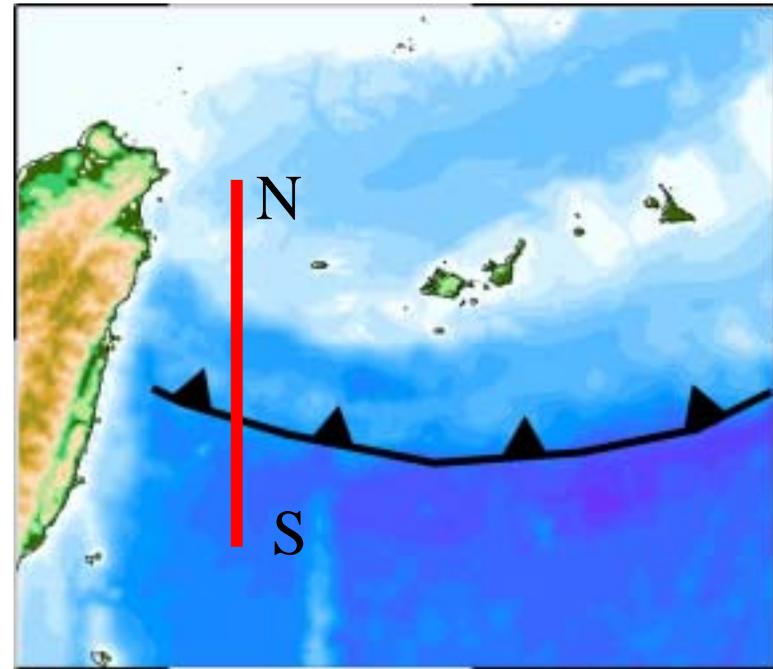
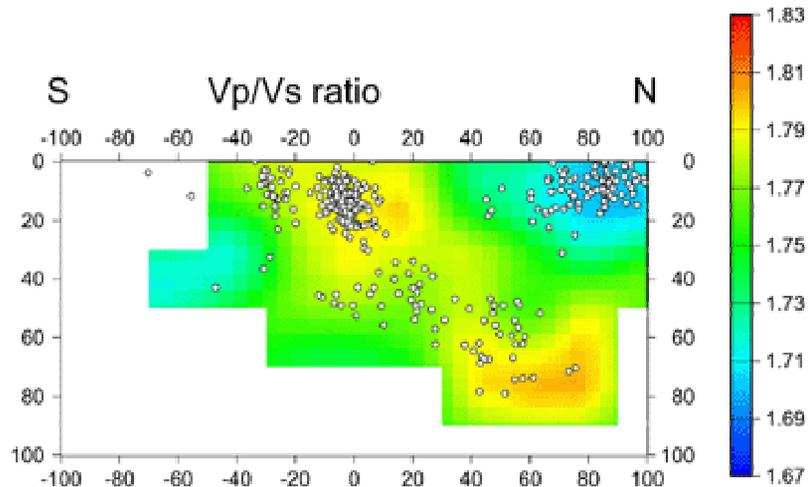
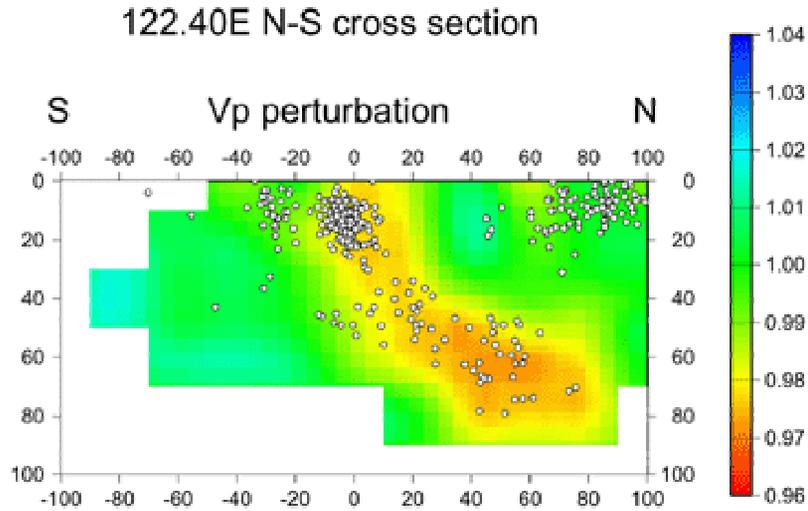
Vp at the depth of 50 km

Low Vp beneath the
Okinawa Trough



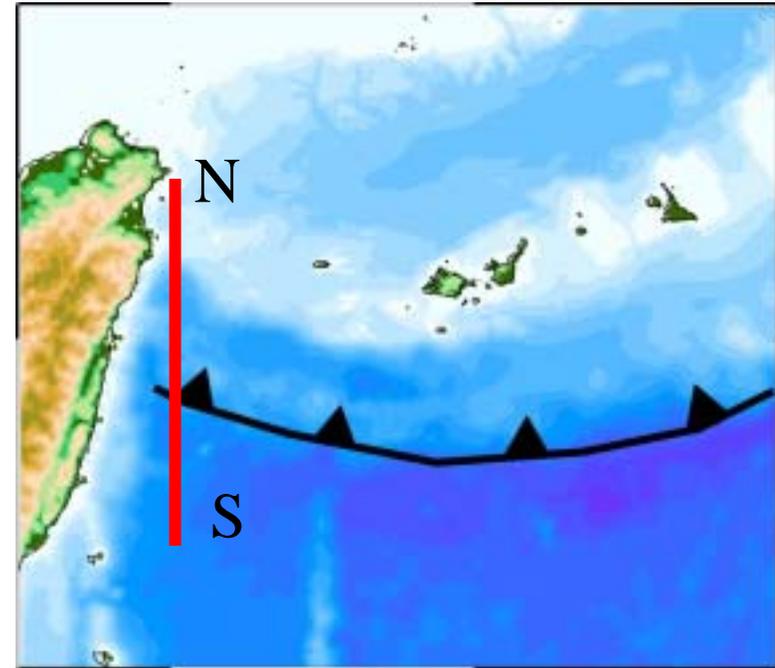
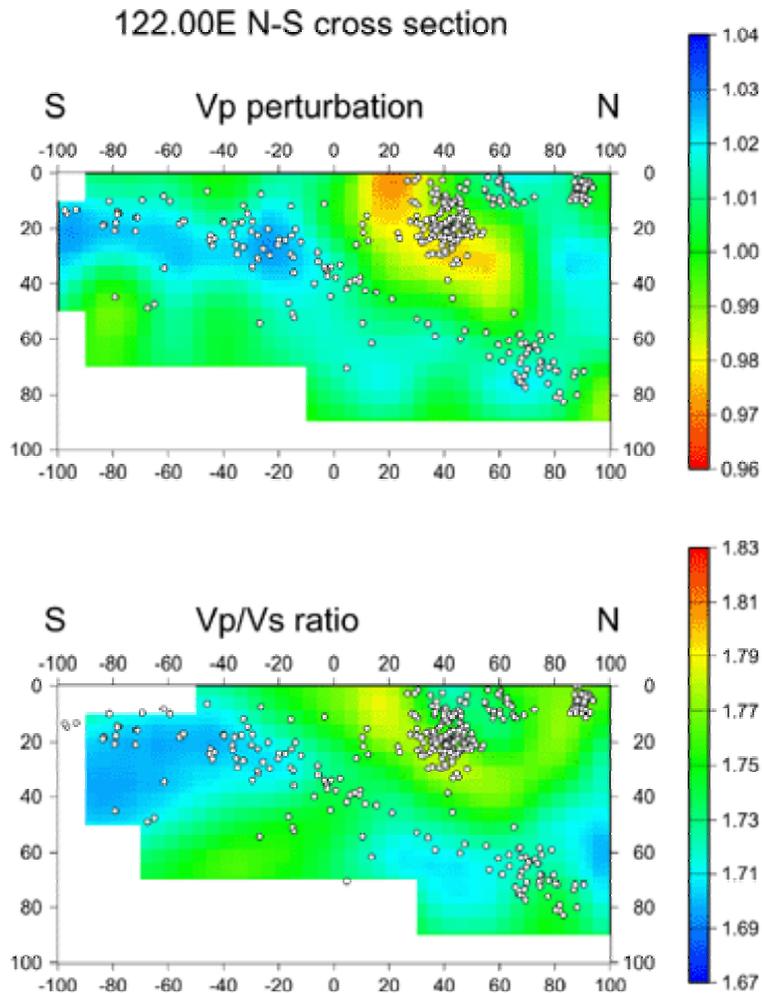
checkerboard resolution test

Low- V_p along the Wadati-Benioff zone



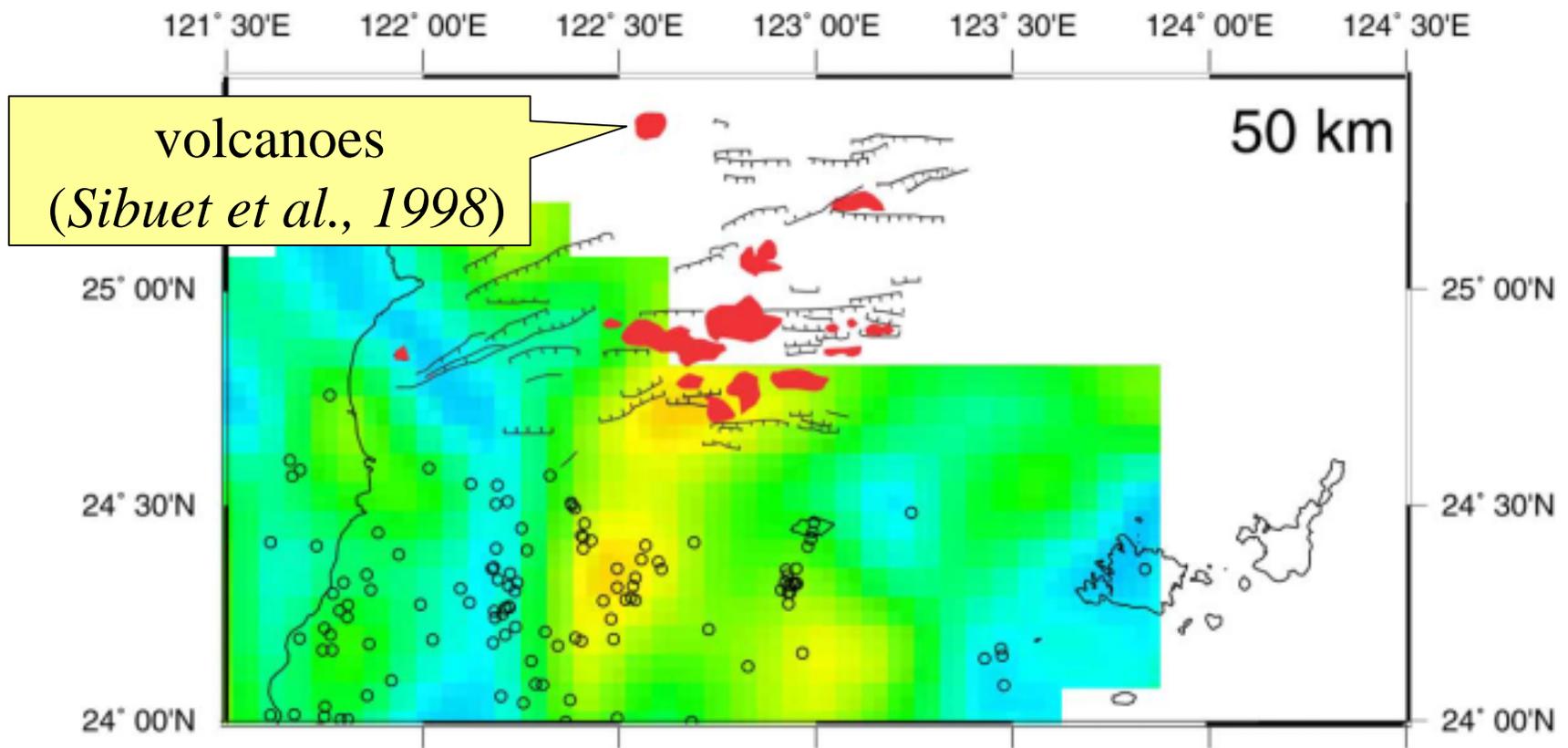
- Low- V_p and high- V_p/V_s along the Wadati-Benioff zone beneath the Okinawa Trough *dehydration from the subducted oceanic crust ?*

High- V_p along the Wadati-Benioff zone

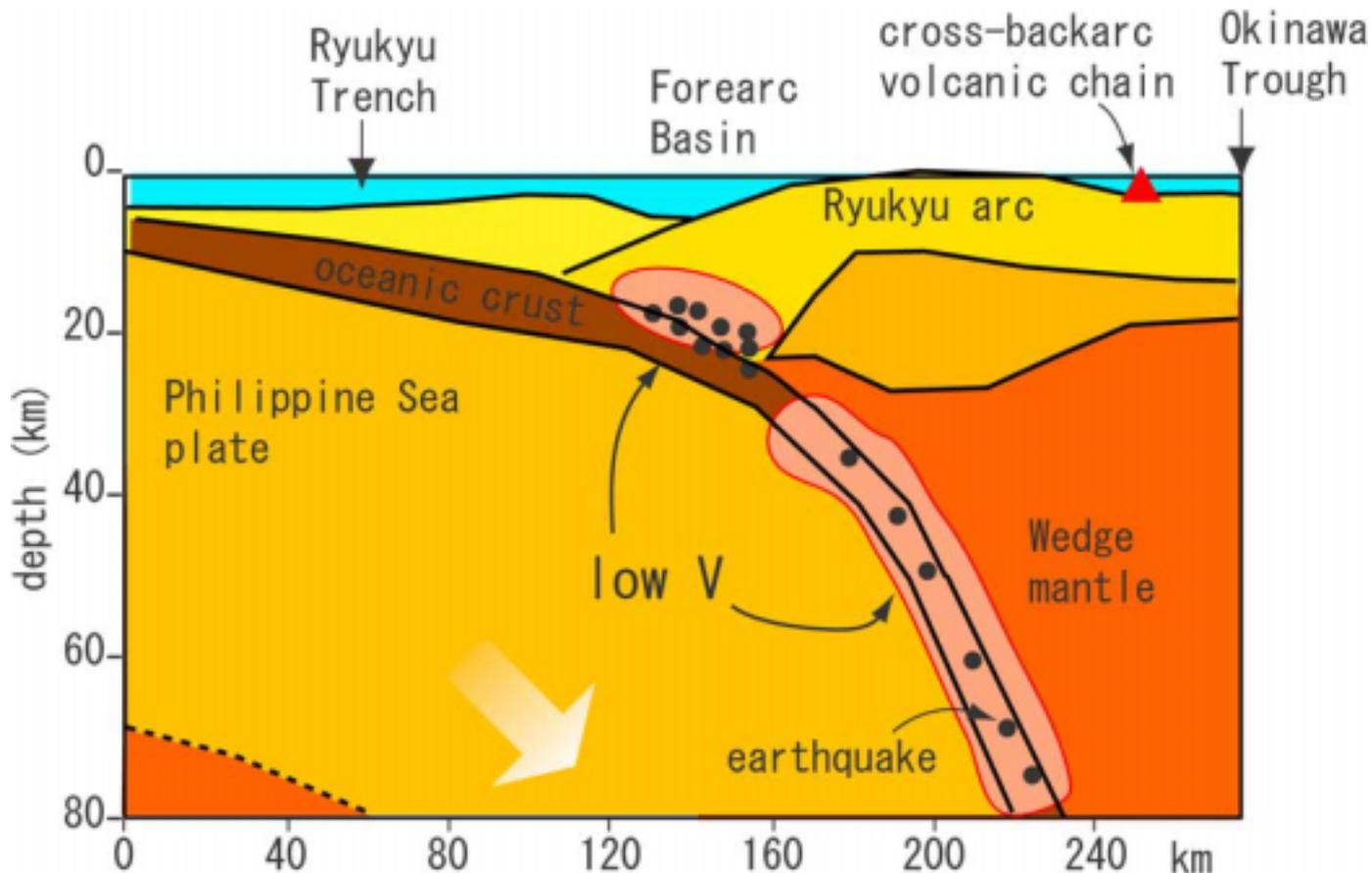


High- V_p along the Wadati-Benioff zone

Vp at the depth of 50 km and backarc volcanism



Schematic model

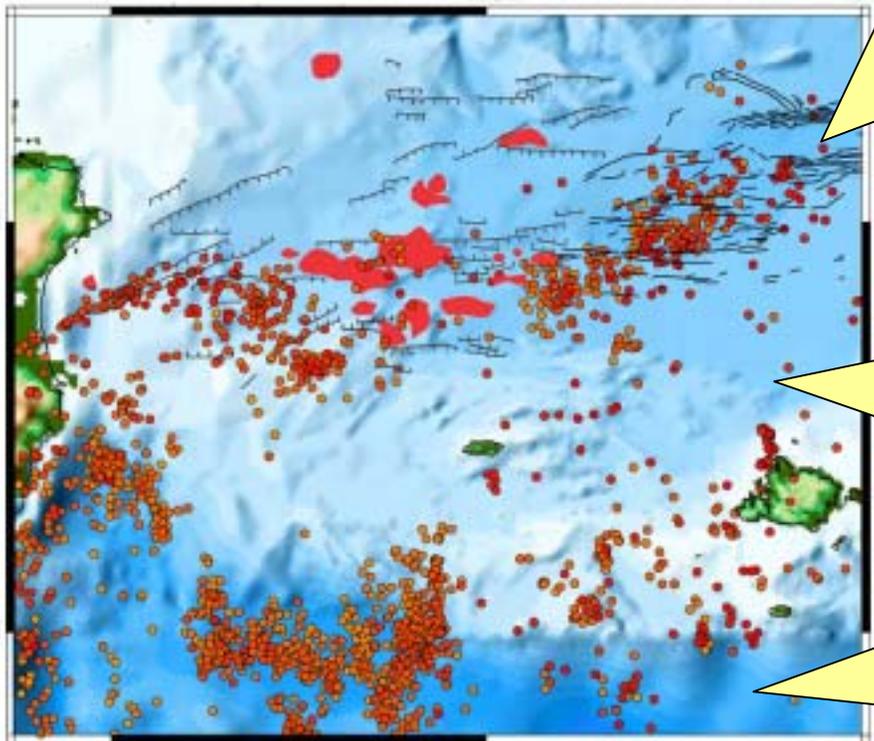


Schematic illustration along 122.5E.
(Simplified seismic refraction model:
from *McIntosh and Nakamura 1999*)

Shallow seismicity between E. Taiwan and S. Ryukyu arc

Relocated
($M > 2.5$)

JMA catalogue
($M > 2.5$)



- seismicity clusters along the Trough axis
- inactive at the volcanic area.
thinning of seismogenic layer ?

Ryukyu arc:

- inactive at the western area.
- clusters at the eastern area.

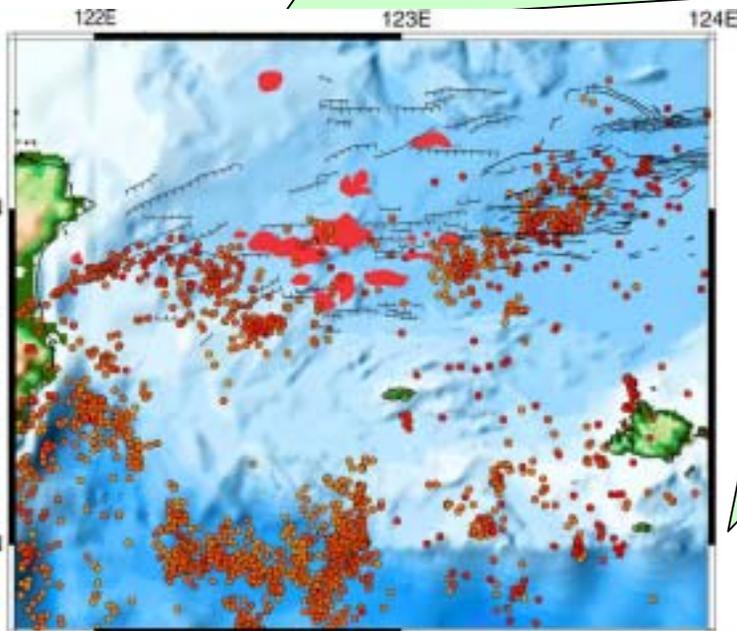
Ryukyu forearc:

- low V in the seismicity clusters

Conclusions

Okinawa Trough:

- Low velocity anomaly in the upper plate interface.
*Related to the dehydration from subducted thick oceanic crust ?
Related to the cross backarc volcanic chain?*
- Low seismicity at cross backarc volcanic chain.
It would be caused by the thinning of seismogenic layer.



Ryukyu forearc:

- Seismicity clusters at the low velocity area along the forearc.
basement of the Ryukyu forearc would be imaged.