



*Report for 15th PCGIAP Meeting
at 18th UNRCC-AP*
Working Group 1 Regional Geodesy

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Thailand**

Working Group 1: Regional Geodesy



- **Role of WG1:**

- Establishment of a regional vertical geodetic datum
- Enhancement of a regional geodetic infrastructure through annual cooperative campaigns
- Improvement to the regional geoid
- Implementation of an absolute gravity reference system
- Development of transformation parameters for spatial data
- Geodetic technology transfer to Pacific Islands nations

Resolutions endorsed at the 17th UNRCC-AP/ 12th PCGIAP meeting in Bangkok, September 2006

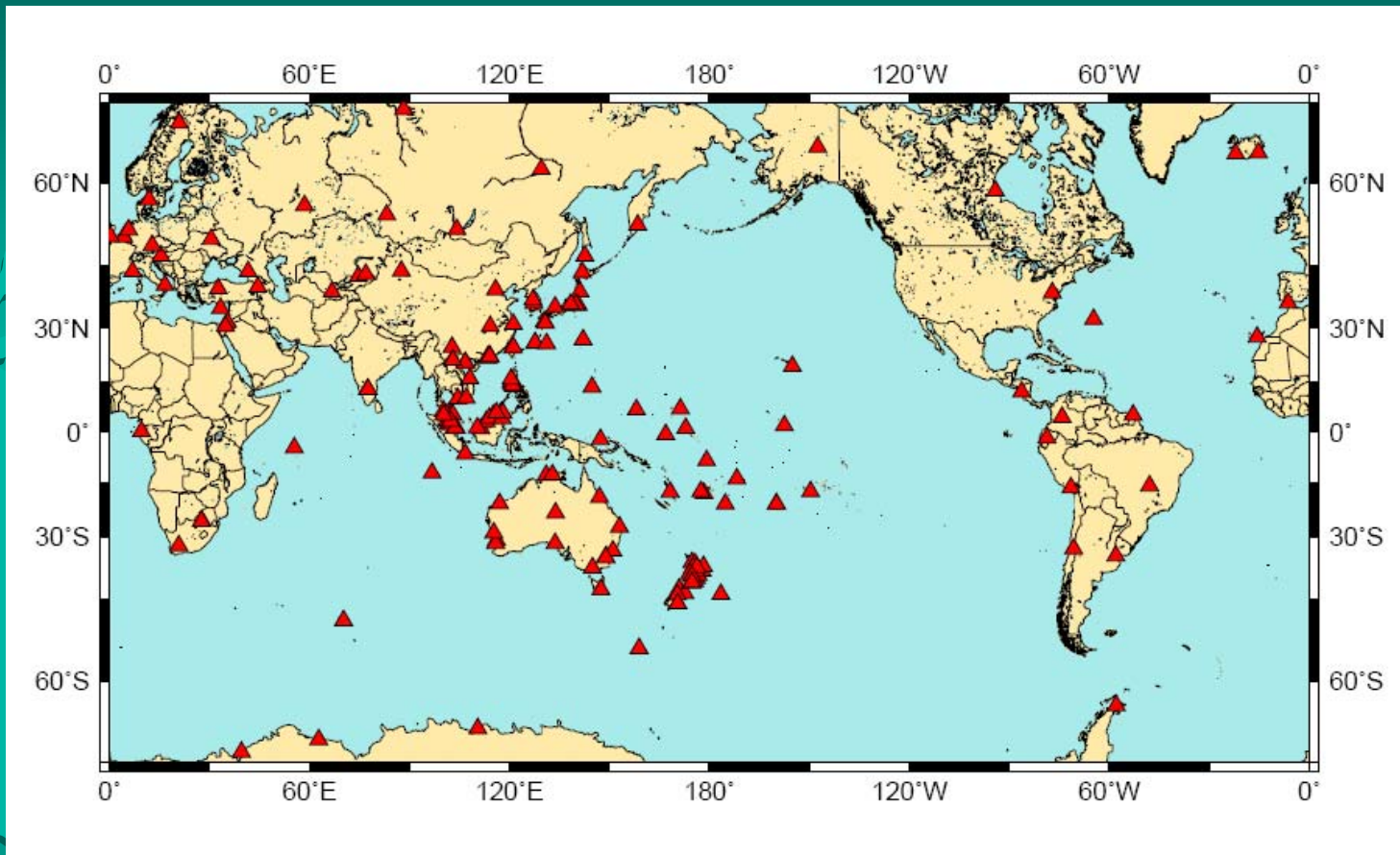
1. Enhance the regional geodetic infrastructure to contribute to monitoring, warning and post-event reconstructions through cooperative observations of crustal deformation and plate motion, and information exchange, including tide gauge networks and placement of new GPS key sites.
2. Encourage the transfer of GPS technology to nations in need through annual campaign observations, and the development and sharing of analysis techniques in the following geodesy workshop activities.
3. Promote the application of new geodetic adjustment techniques and datum change transformation parameters for regional spatial data integration and for geo-referencing cadastral and statistical information.

Resolutions (cont'd)

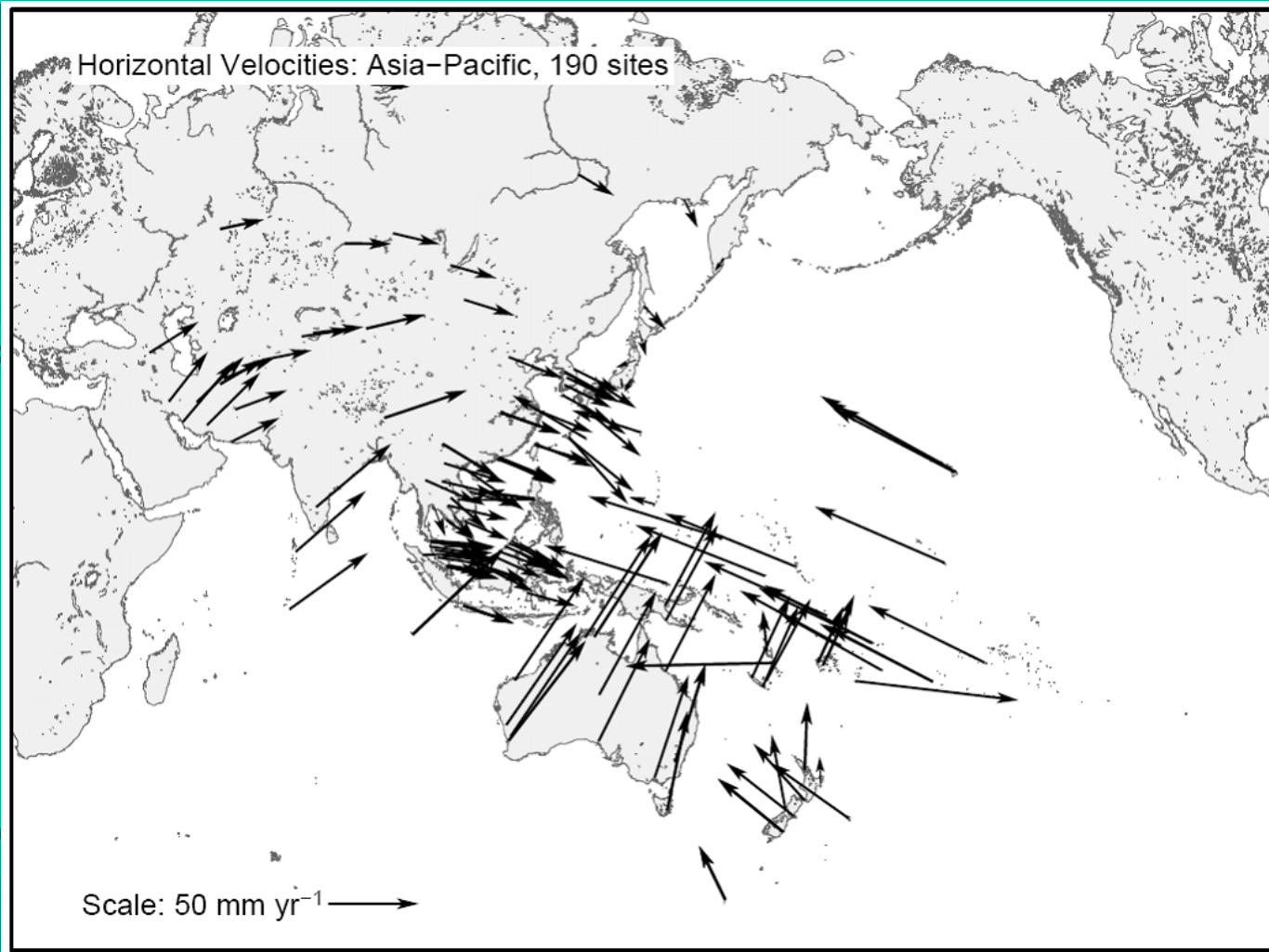
4. Interact with IAG commissions 1 and 2 on the status of the regional geodetic reference frames and geoid determination using absolute gravity, satellite, airborne and terrestrial gravity.
5. Review the status of geodetic networks in individual countries and upgrade PCGIAP web site information.
6. Support the expansion of continuous GPS installations in areas of earthquake and tsunami hazards and strongly encourages nations making such data readily available on a weekly basis for shared scientific study and warning systems in relation to tectonic events.

Topics in Working Group Activities (1/5)

- Asia Pacific Regional Geodetic Project :APRGP
 - Annual one-week GNSS/GPS campaign to connect national networks, obtain site velocities. Other space techniques - SLR & VLBI incorporated.
 - APRGP 2006 through 2009 conducted by the coordination of Geoscience Australia (GA).
 - GA analysis team has carried out preliminary re-processing of the APRGP data sets for 1997-2008. Coordinates and velocities available on request.



**APRGP and IGS stations used in the 2008
campaign analysis**

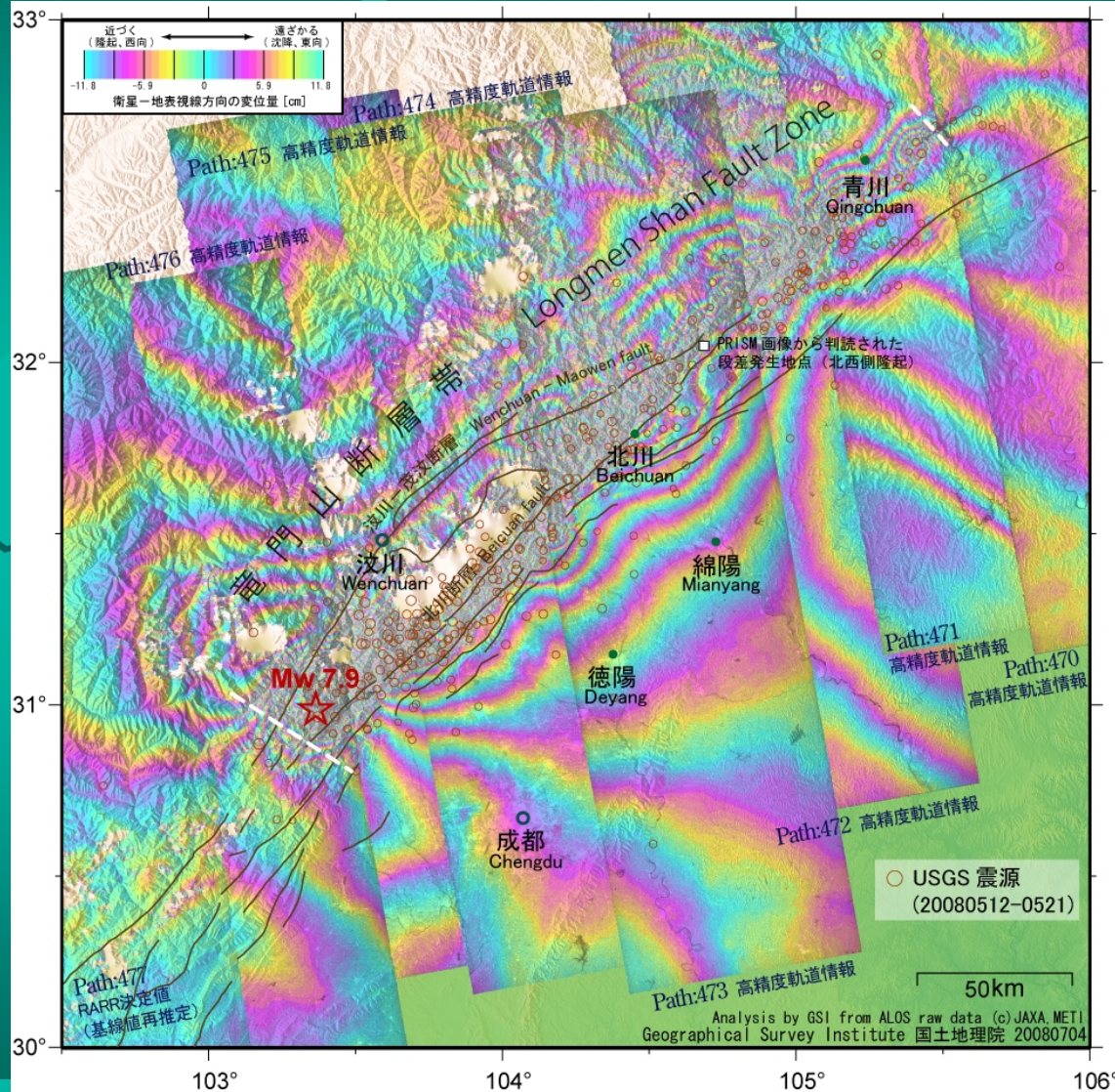


The estimated horizontal velocity field for the Asia-Pacific region

Appendix: Recent Earthquake Activities

- Significant earthquakes with fatalities in the region 2007-2009;
 - 2007 03 06 – Southern Sumatra, Indonesia – M6.4
 - 2007 04 01 – Solomon Islands – M 8.1
 - 2007 07 16 - Central Honshu, Japan –M 6.6
 - 2007 09 12 - Southern Sumatra, Indonesia - M 8.5
 - 2008 02 20 - Simeulue, Indonesia - M 7.4
 - 2008 05 12 - Eastern Sichuan, China - M 7.9 Fatalities 87,652 (InSAR image by GSI)
 - 2008 06 13 - Eastern Honshu, Japan - M 6.9
 - 2008 10 05 – Kyrgyzstan – M6.6
 - 2008 11 24 – Minahasa, Sulawesi, Indonesia – M 7.4
 - 2009 09 02 – Java, Indonesia – M 7.0
 - 2009 09 29 – Samoa Islands region - M 8.0 Fatalities > 100
 - 2009 09 30 – Southern Sumatra, Indonesia - M 7.6 Fatalities > 1,000
- Seismic gap near Padang along the Sunda trench.
- Sep. 2009 eq. does not fill the gap

Crustal Deformation and Source Fault of the Sichuan (Wenchuan) Earthquake, China, May 12, 2008, M7.9



- InSAR image disclosed the length and position of the source fault.

- Length was estimated as 285 ± 5 km.

- Large deformation is along the Longmen Shan fault zone.

陰影図はSRTM3-DEMを使用。

断層トレースの出典は以下のとおり

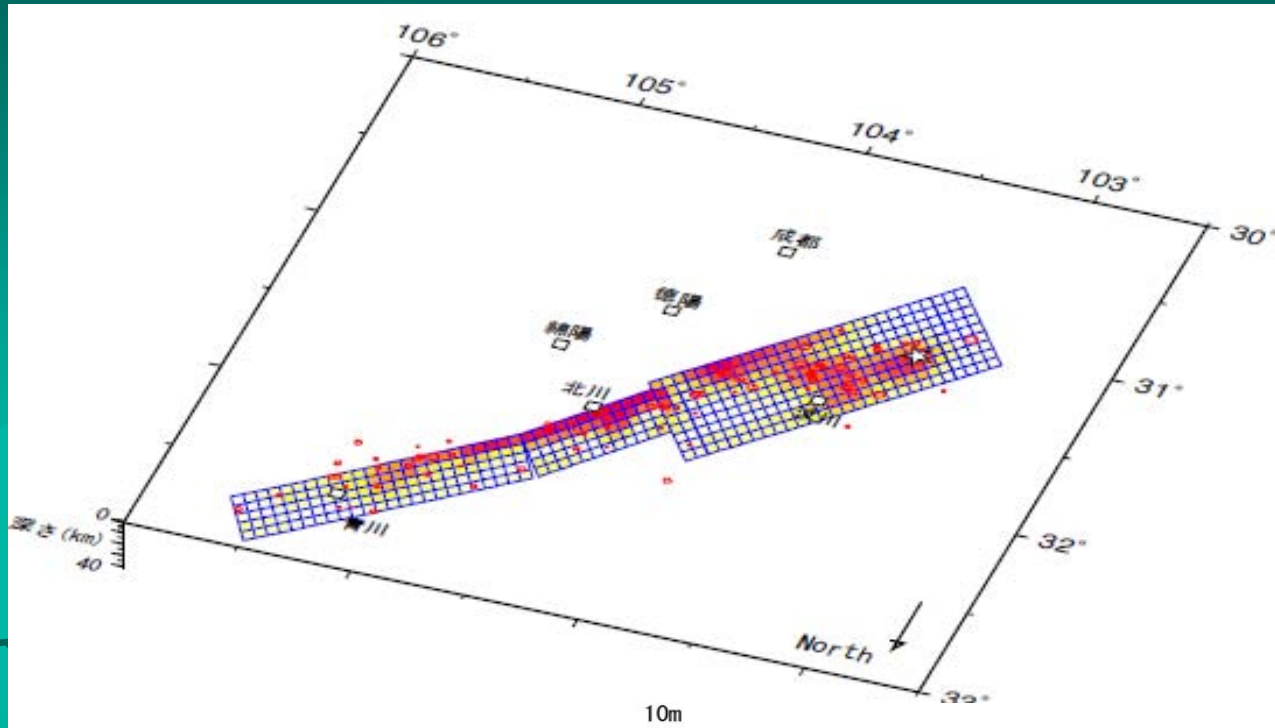
Densmore, A. L., M. A. Ellis, Y. Li, R. Zhou, G. S. Hancock, and N. Richardson (2007),

Active tectonics of the Beichuan and Pengguan faults at the eastern margin of the Tibetan Plateau, *Tectonics*, 26, TC4005, doi:10.1029/2006TC001987

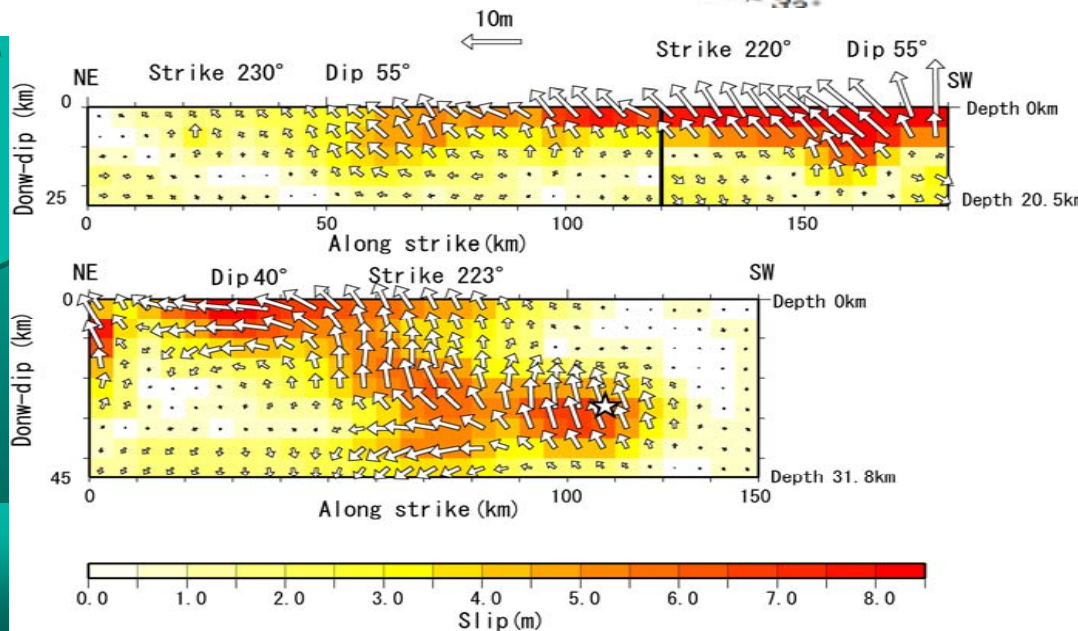
これらの干渉画像は、電波伝搬遅延が不均一である影響を受けています。

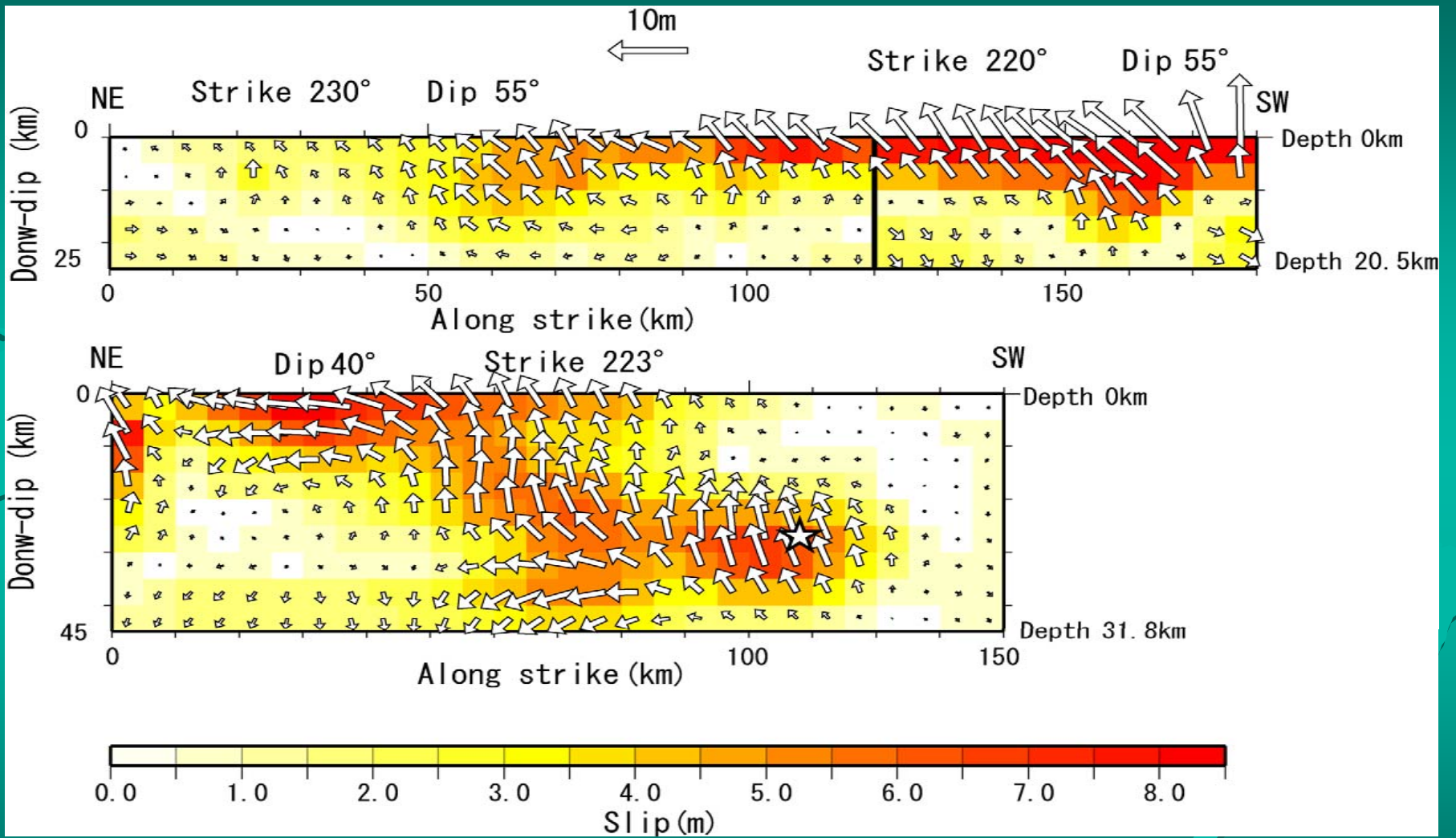
Analysis by GSI from ALOS raw data (c) JAXA, METI
Geographical Survey Institute 国土地理院 20080704

Fault model of the Sichuan (Wenchuan) Earthquake



The fault was reverse type with right lateral component. Max. slip was about 11m near Beichuan (北川).

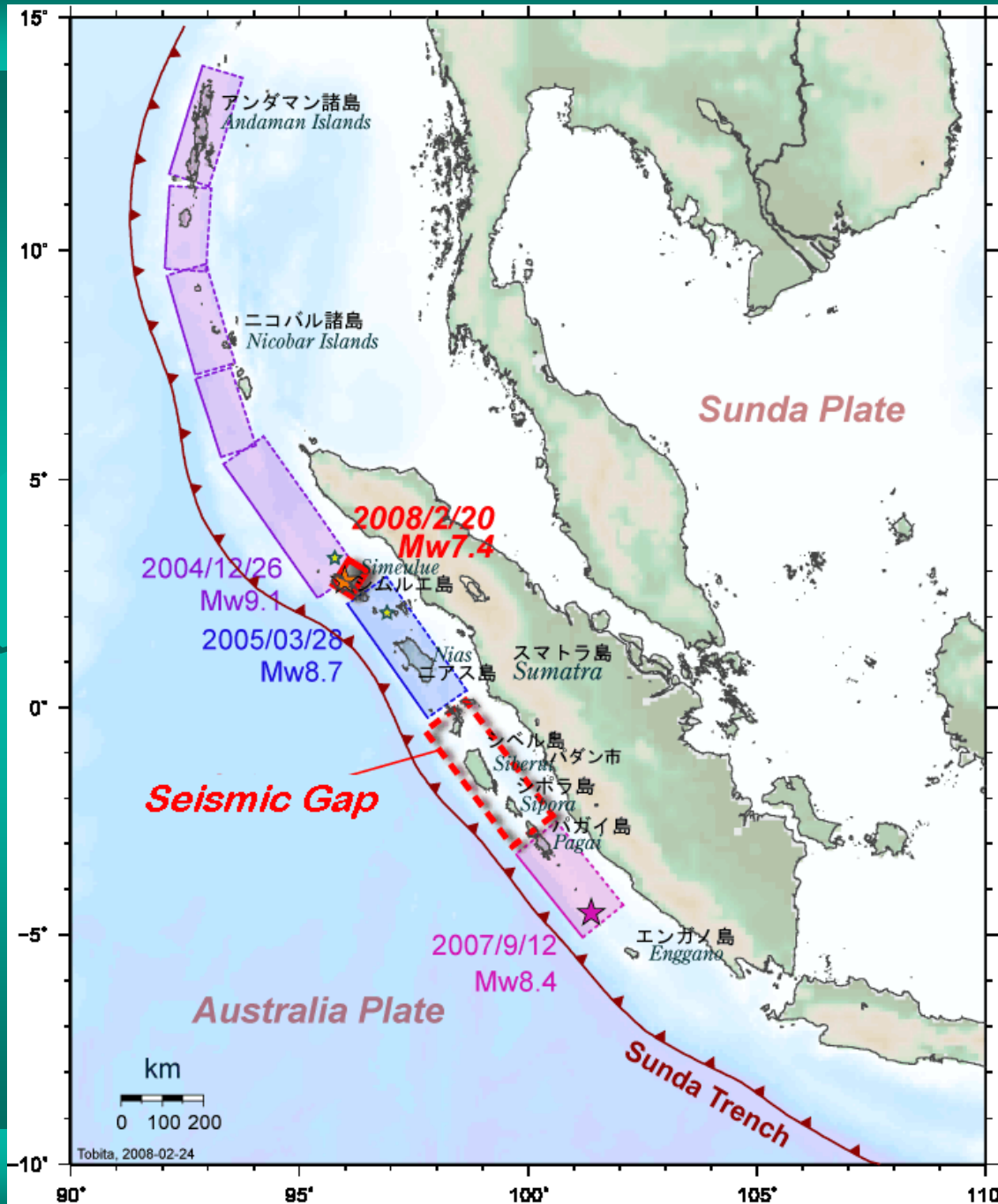




Earthquakes along Sunda Trench

Mega and large earthquakes occurred in 2004 - 2008 covering most of the area (~2,300 km) along the Sunda trench.

There still exists a seismic gap about 370 km in length off Padang. An earthquake with magnitude over 8.5 occurred in this area in 1797.



Topic in Working Group Activities (2/5)

- International cooperation
 - Australia: GA as coordinator for IAG regional dense velocity solution. Contribution of PCGIAP solution to ITRF.
 - Korea: Korean geoid development project. Cooperation with NGS, USA.

Topics in Working Group Activities (3/5)



- Geodetic network & reference system
 - China: national geodetic reference has become geocentric in 2008 (CGCS2000)
 - Korea: 44 CGPS stations operated by National Geographic Information Institute (NGII) with network-based RTK service as of 2008

Topics in Working Group Activities (4/5)

- Expansion of continuous GPS (CGPS)
 - Steady progress across the region
 - China, Japan, Korea, Singapore, Malaysia, Australia, New Zealand, Turkey, etc.
 - New projects starting

Topics in Working Group Activities (5/5)

- On going projects in the region
 - Australia: AuScope
 - Indonesia: IndCORS
 - Japan: Asia-Pacific crustal monitoring project
 - Korea: a new geodetic VLBI (2008-2011)
 - New Zealand: a new geodetic VLBI (2008)
 - South Pacific Sea level monitoring project. 12 CGPS collocated with tide gauges.

Future activities



- Need to invigorate the regional geodesy WG to respond to the expected roles and activities
- Acknowledging
 - Substantial number of GPS/GNSS networks in the region
 - Inhomogeneous infrastructure and poor data sharing
- Propose a new project for regional geodesy

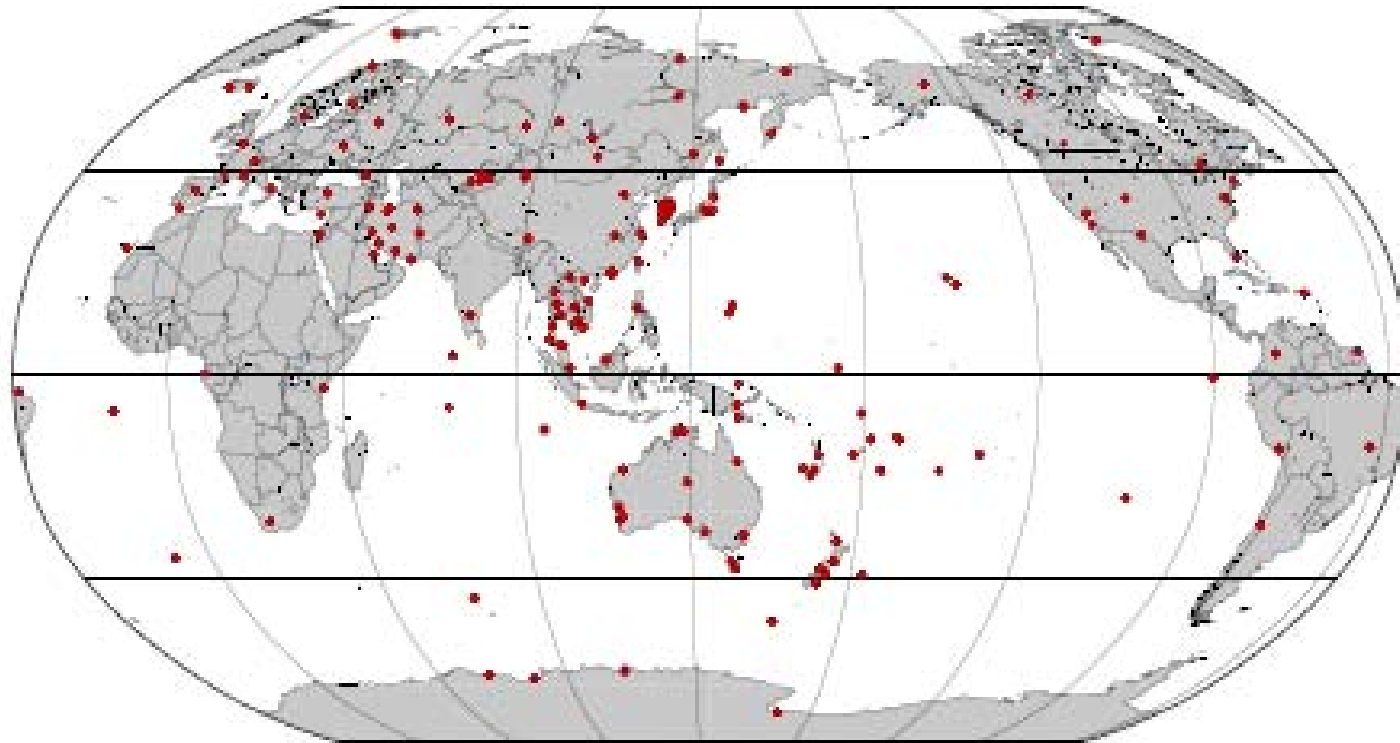
Future activities (cont'd)

The Asia-Pacific Reference Frame (APREF) Project

- Coordinated geodetic activity of the region
- Regional densification of the terrestrial reference frame based on continuous GPS tracking stations
- Crustal deformation monitoring possible
- EUREF Network as a model
- Development and evolution of the APRGP activity into the future

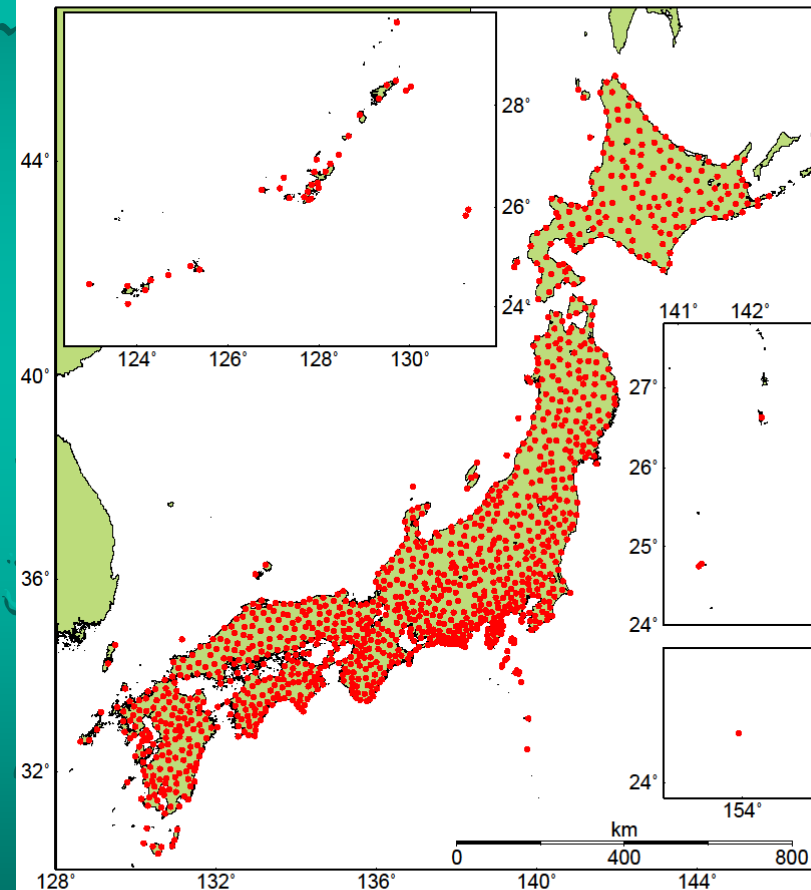
APRGP Observations (1997~)

GPS



Japan's GEONET (GPS Earth Observation Network, 1996~)

- >1200 permanent GPS stations (average spacing: 20km)
- Real-time data service
- Positional reference in Japan as well as monitoring of deformations



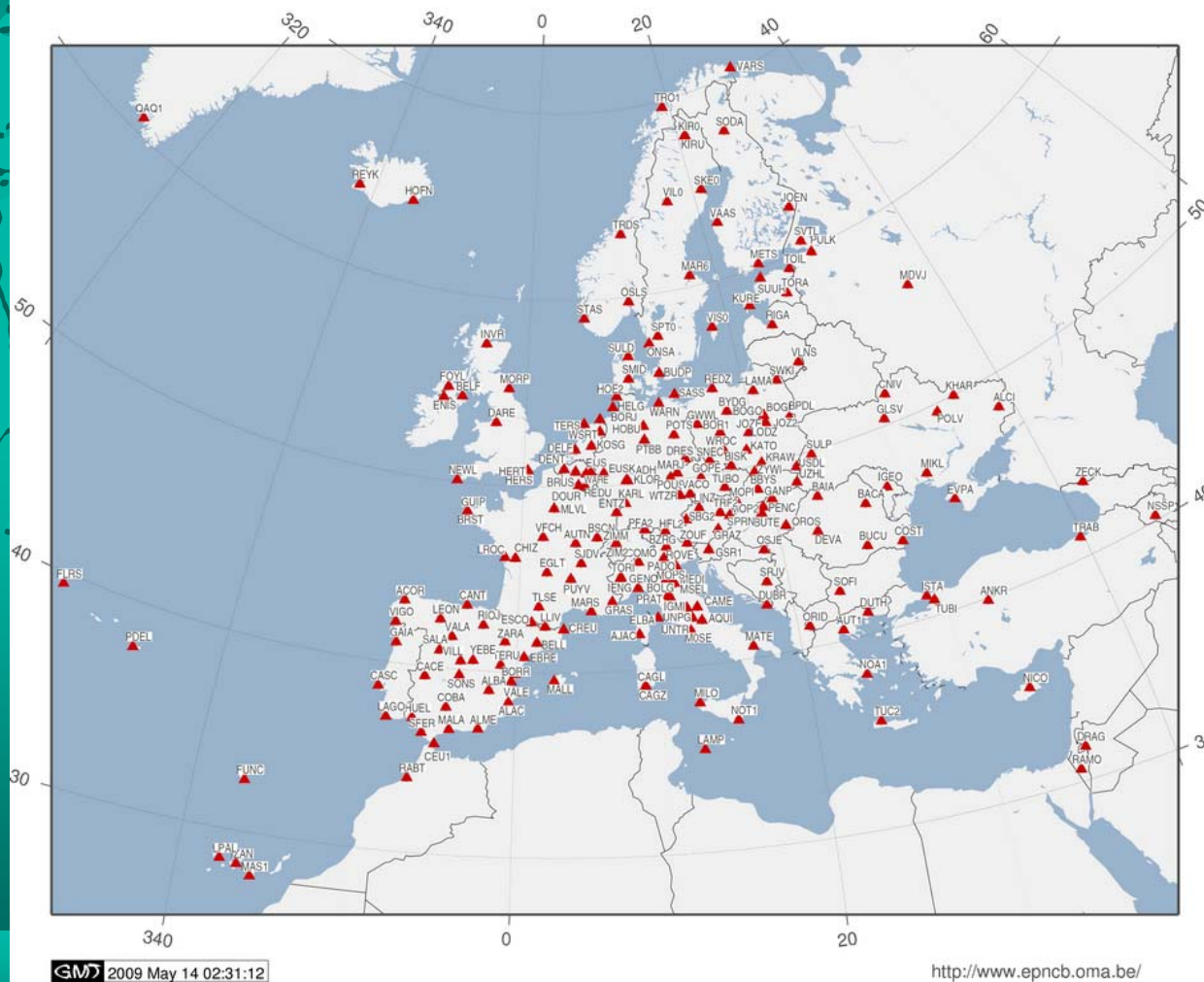
AuScope Geodetic Network (2009~)



New network of VLBI, SLR and 100+GPS

EUREF Permanent Network

EUREF Permanent Tracking Network



Proposed Structure of APREF

