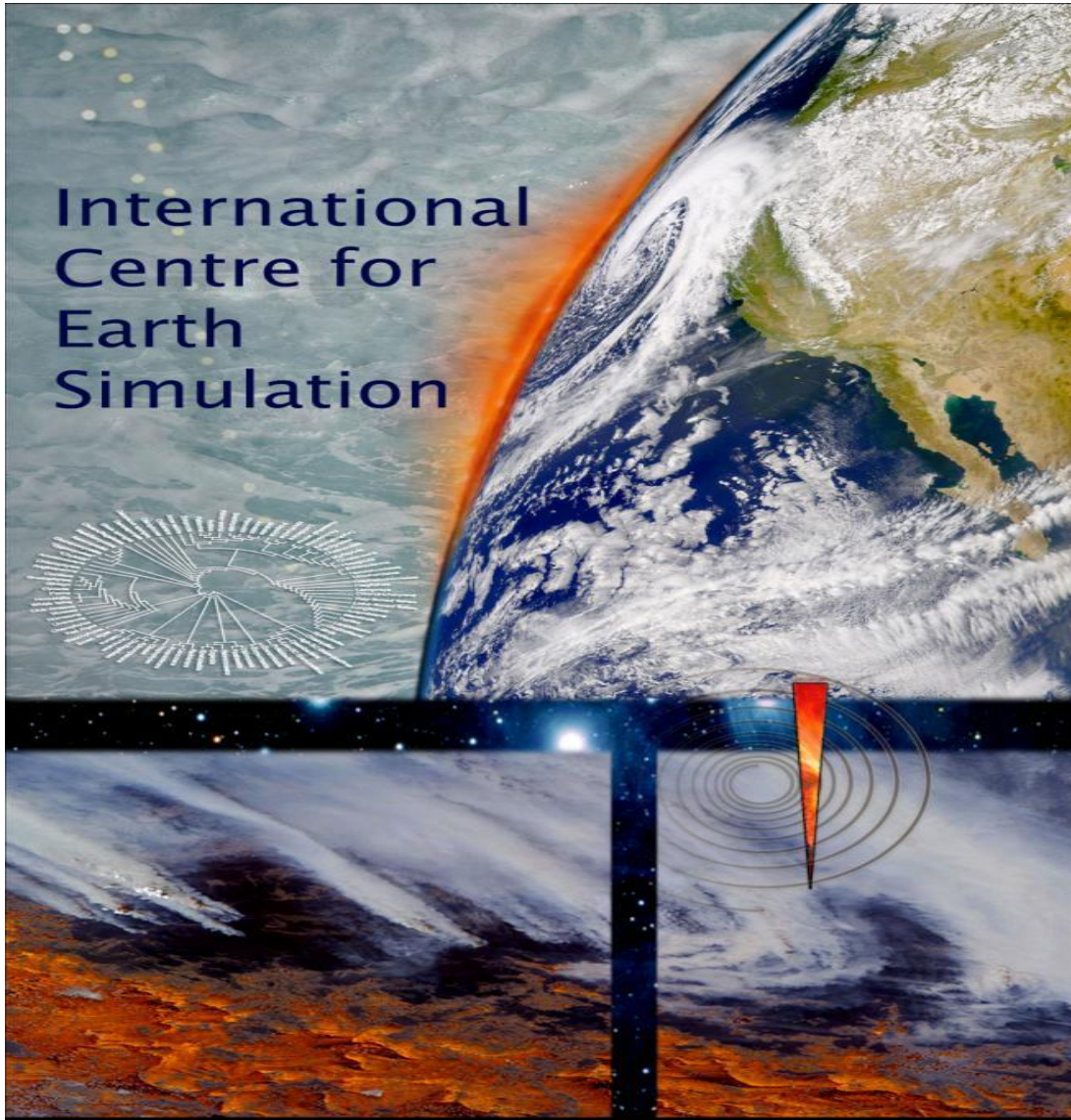


International
Centre for
Earth
Simulation



ICES Organization Philosophy

- Global
- Neutral
- Independent
- Not-for-profit
- Multi-disciplinary
- Integrated holistic modelling

Swiss based, Geneva HQ, Worldwide partnerships

ICES and TEST are collaborating on a global basis

- Global-Local concept
- Bottom-up/top-down
- All geographies: Asia/Europe/Africa/Americas

Peter Head and Bob Bishop serve on each other's Advisory Boards

ICES establishes collaboration with CAS/IAP/LASG in 2015

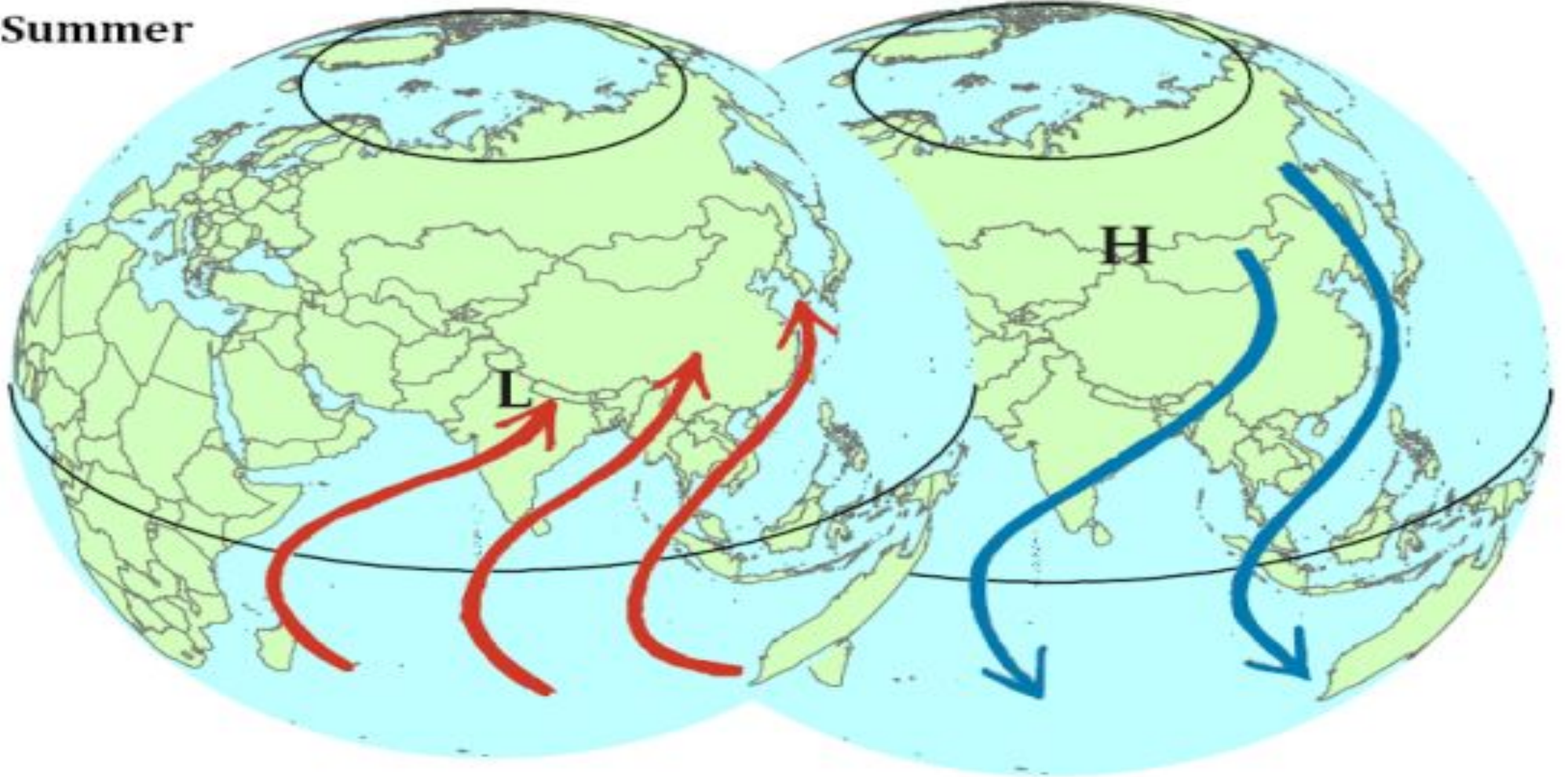
- Asian Centre for Earth System Simulation under formation (ACCESS)
- Implementation of the ICES Foundation's ***Himalaya Project***
- International Project Office at LASG
- First phase focus on Asian Monsoon – link to ENSO, IPO, PDO
- Earthquake Dynamics - Himalaya, Tibet Plateau, Greater China, Central Asia

Second phase focus on additional partnerships

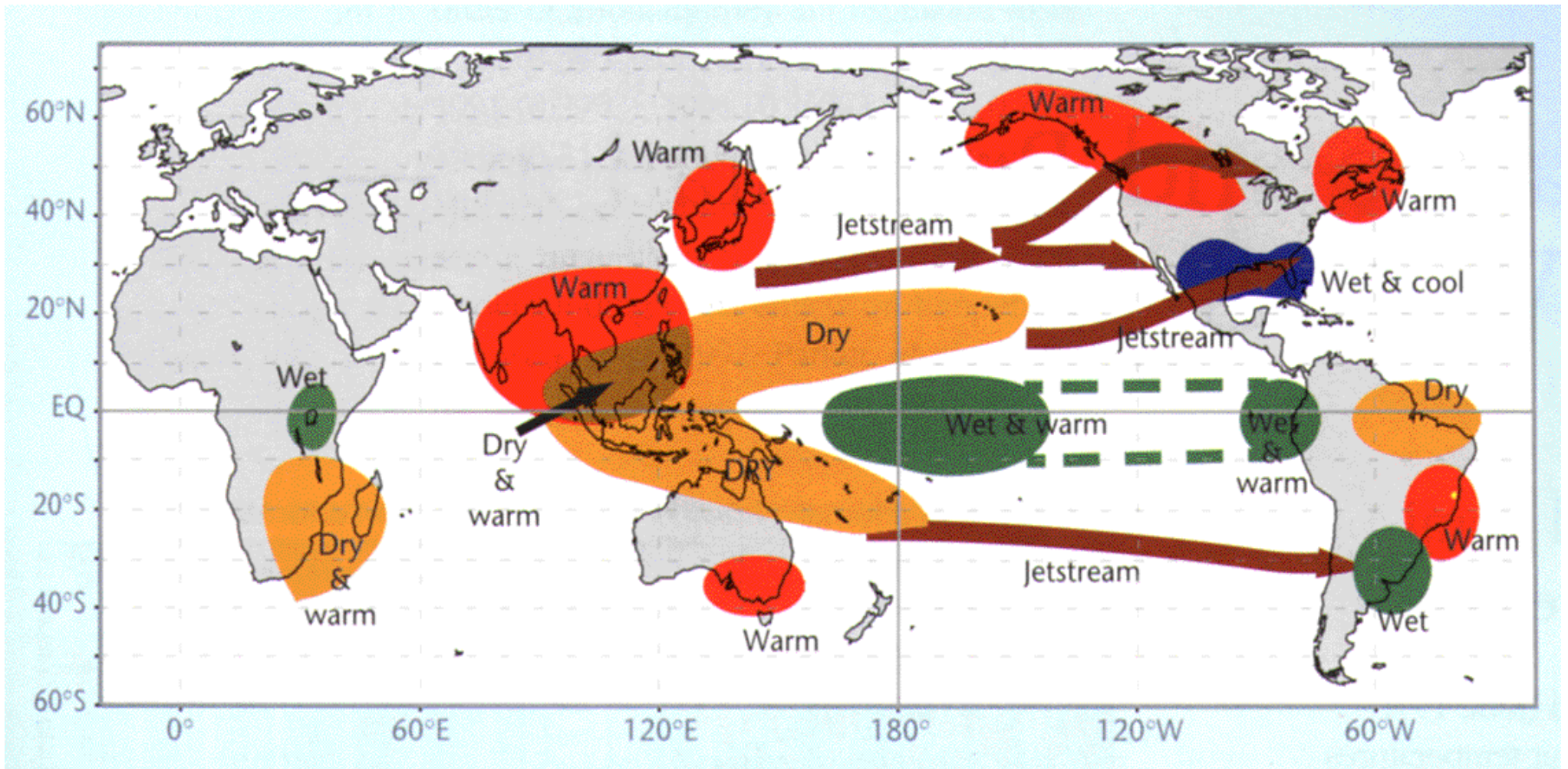
Monsun

Summer

Winter



Asian Monsoon & ENSO interconnections = floods, mudslides & droughts

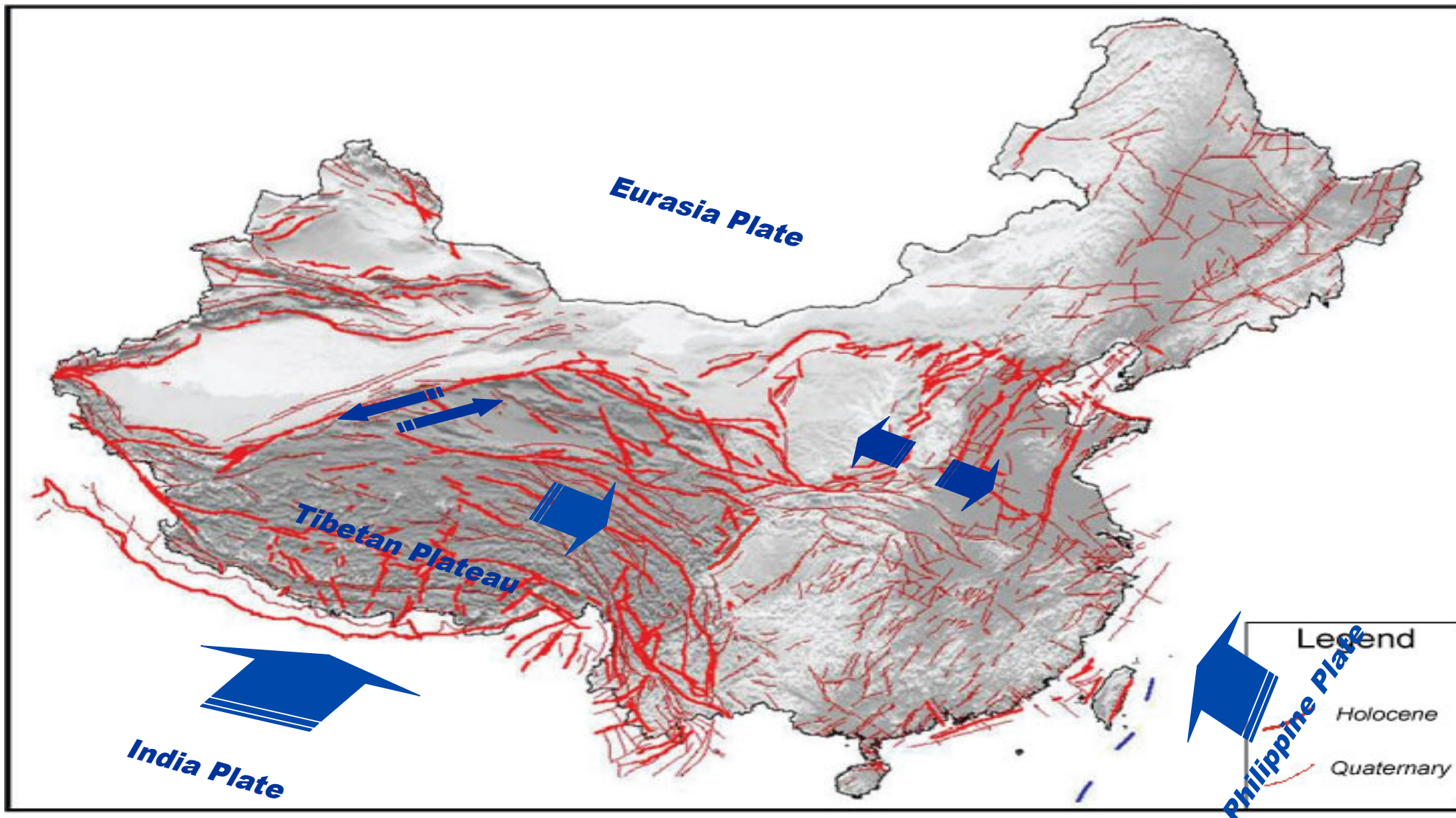


And at other times freezing weather, heat waves & dust-storms

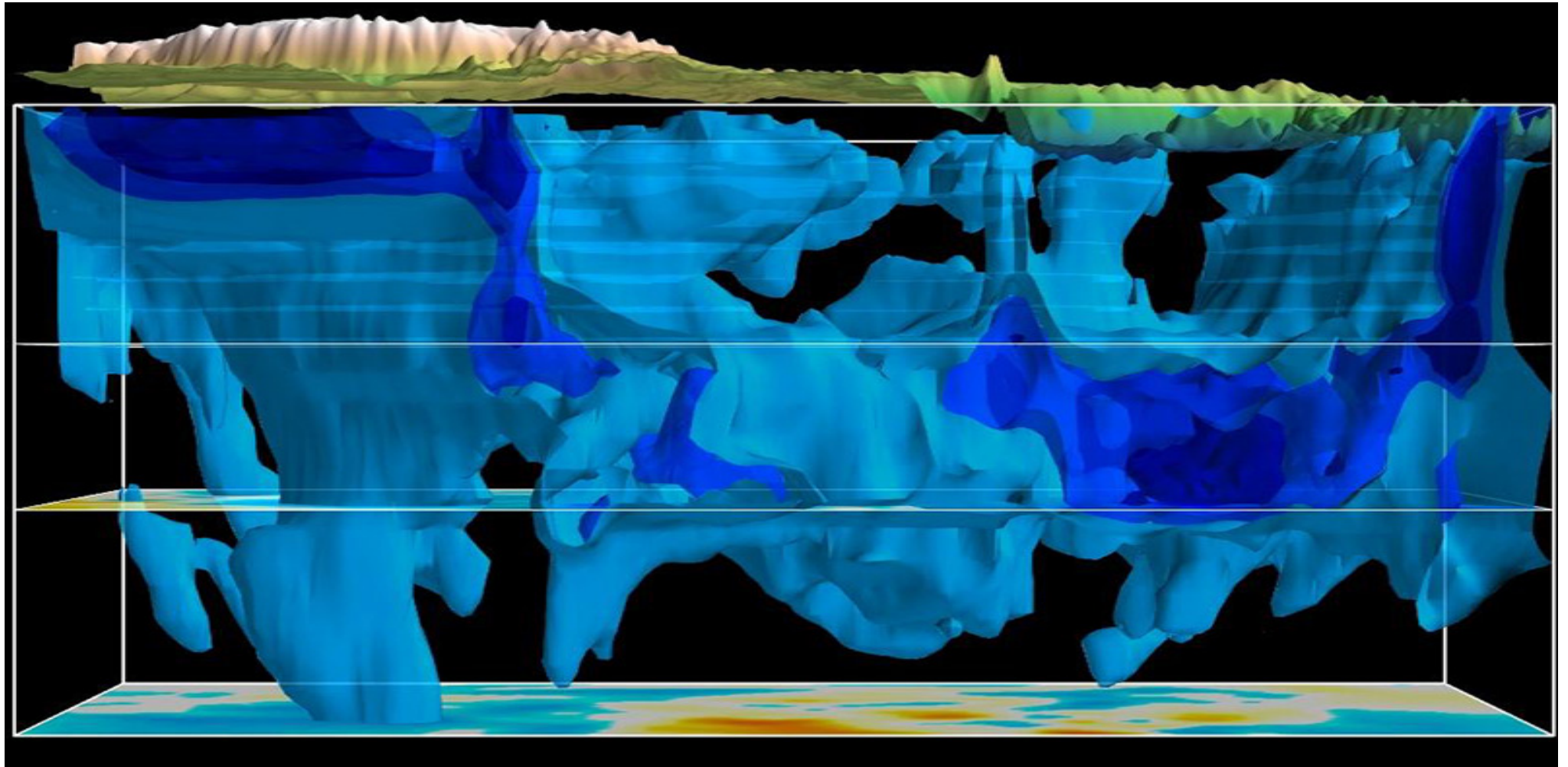


Asia is tectonically very active

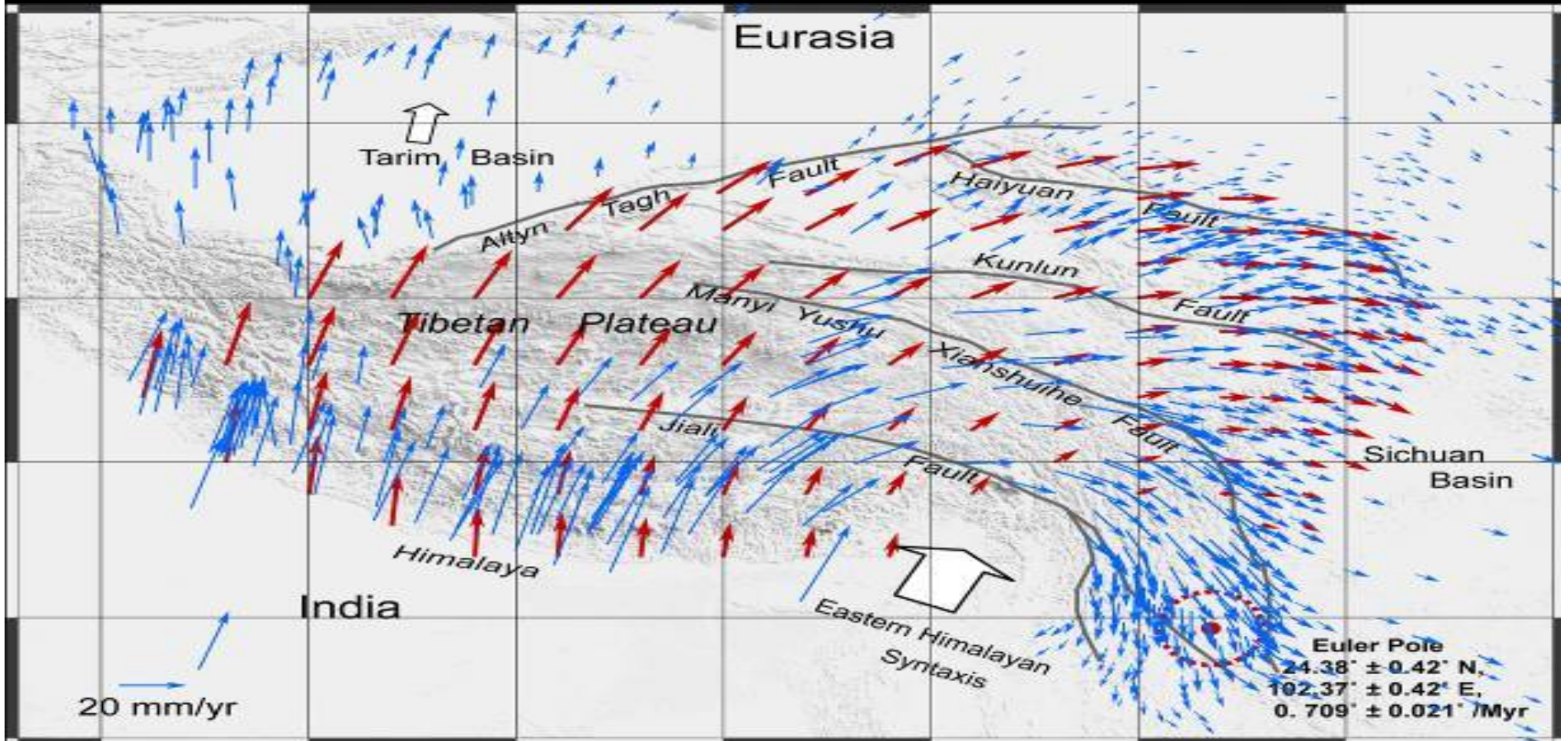




Earth's crust below the Tibetan Plateau



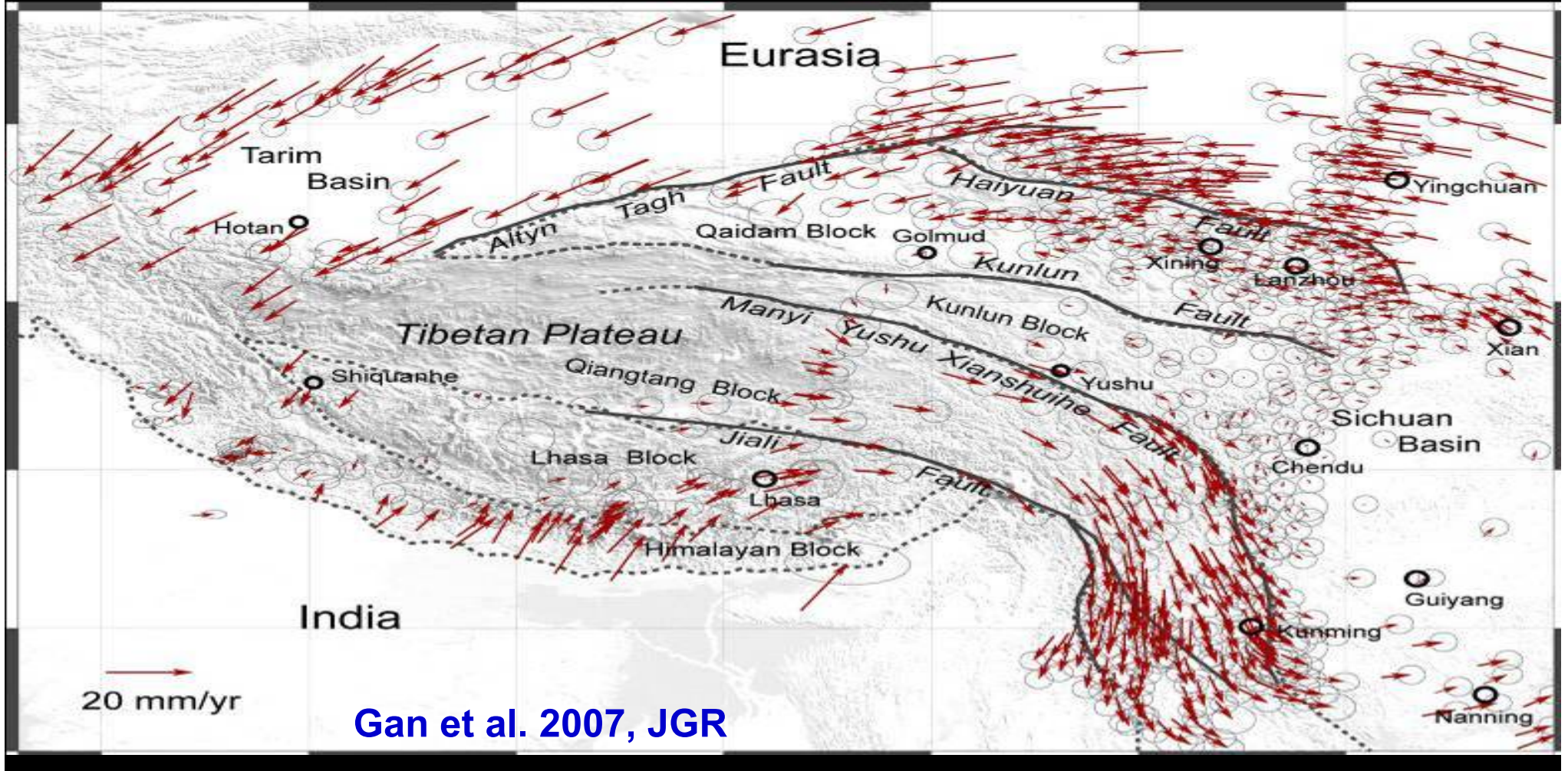
Overall Rigid Rotation of Tibet Plateau



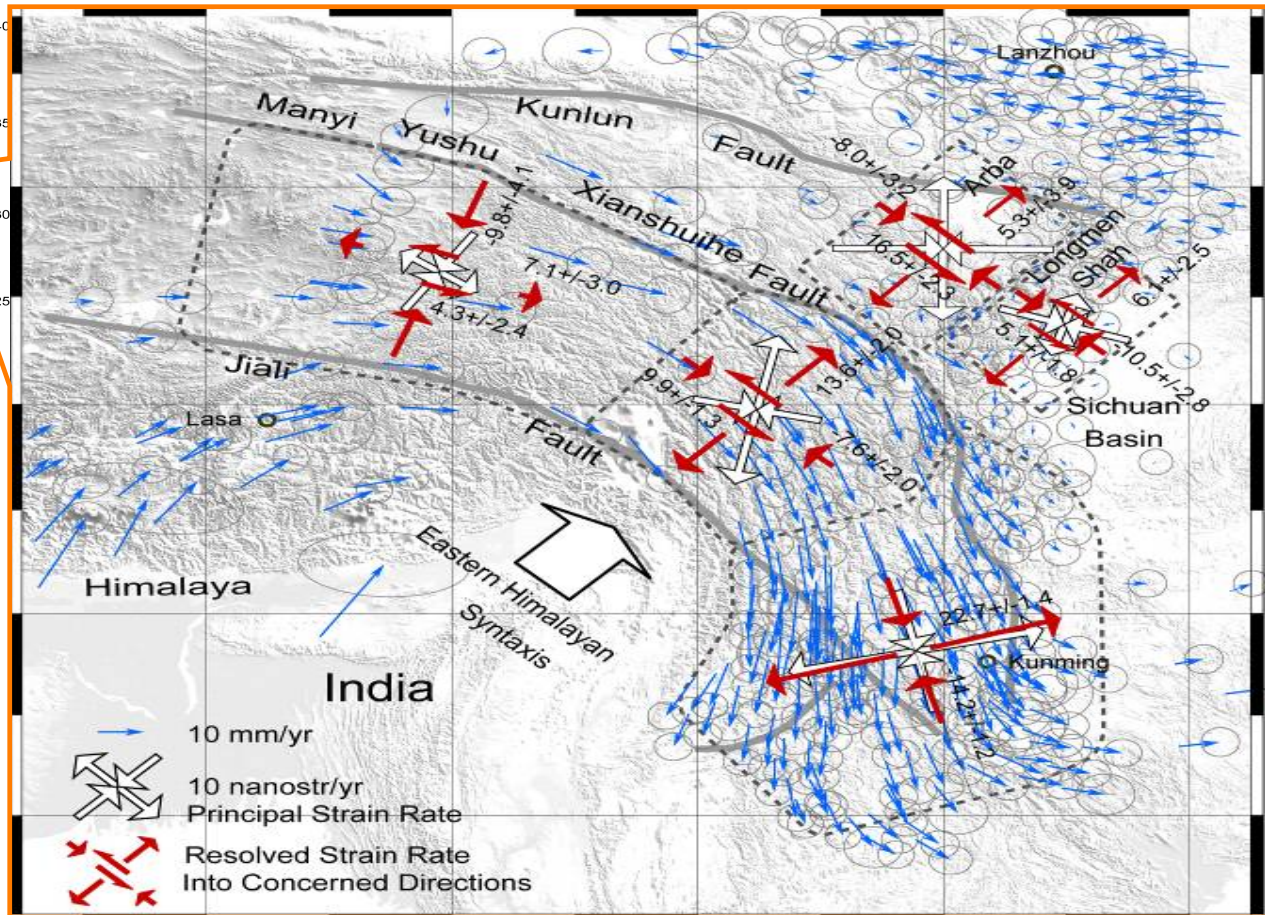
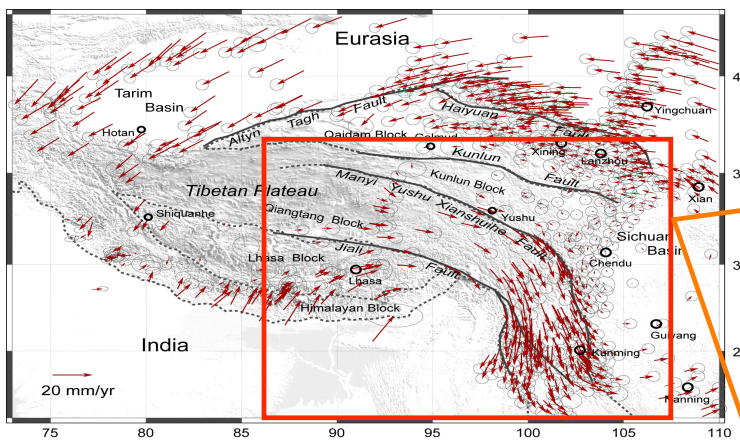
Gan et al. 2007, JGR

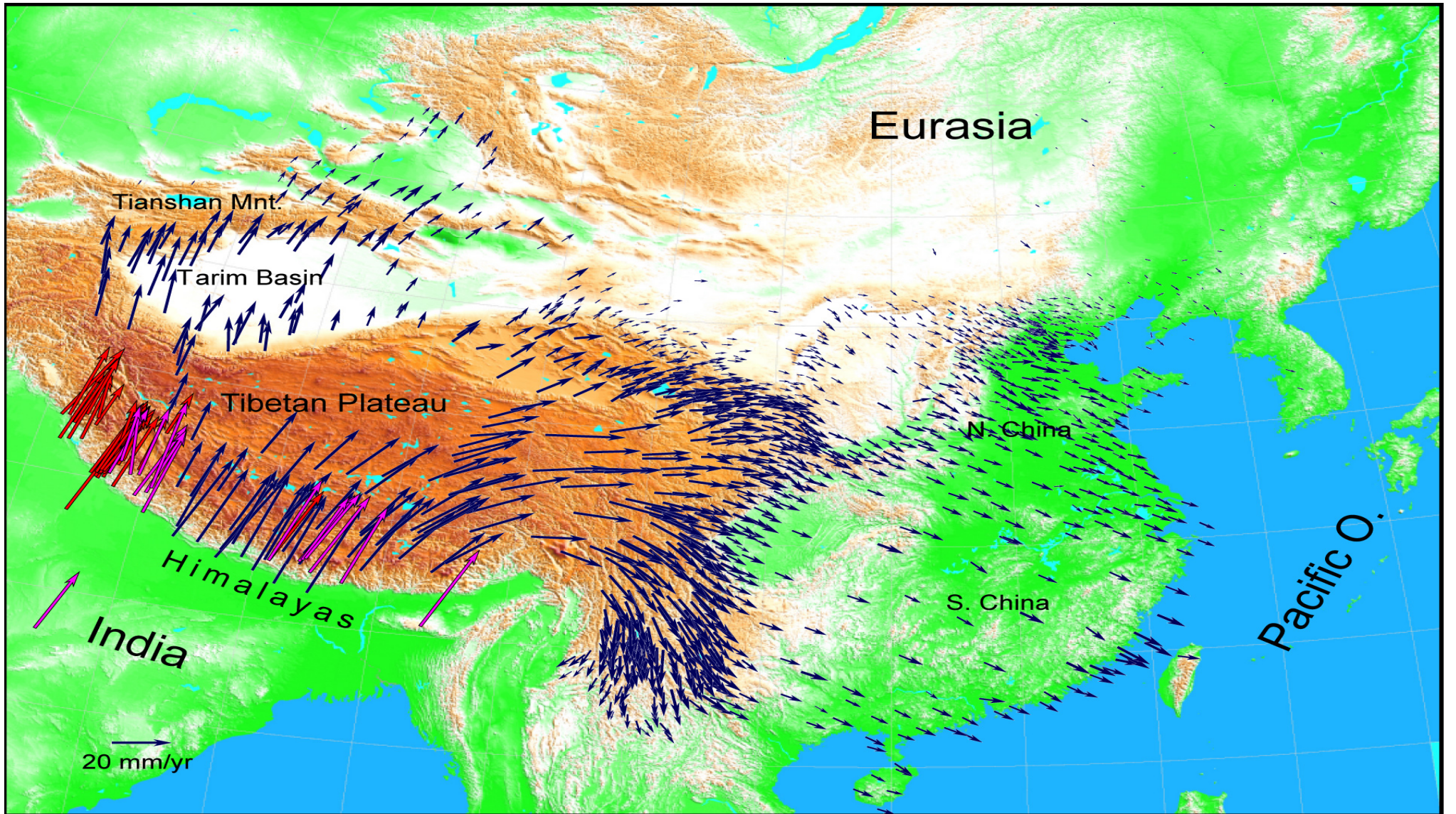
Interior Deformation within Tibet Plateau

(Highlighted after Removing the Overall Rigid Rotation)

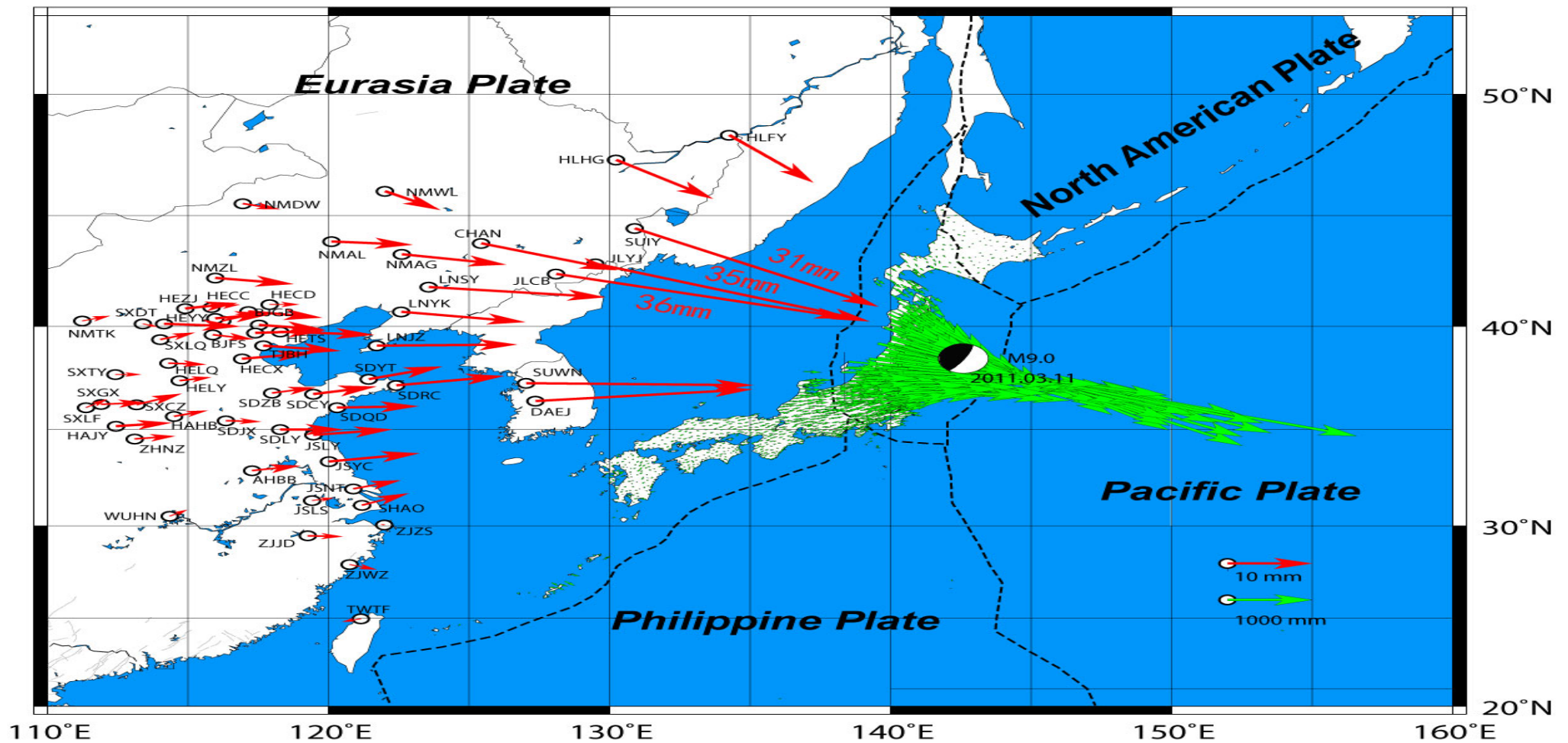


Strain Rates in Different Sections of the Flow Zone





The M9.0 Great East Japan Earthquake 11 March 2011



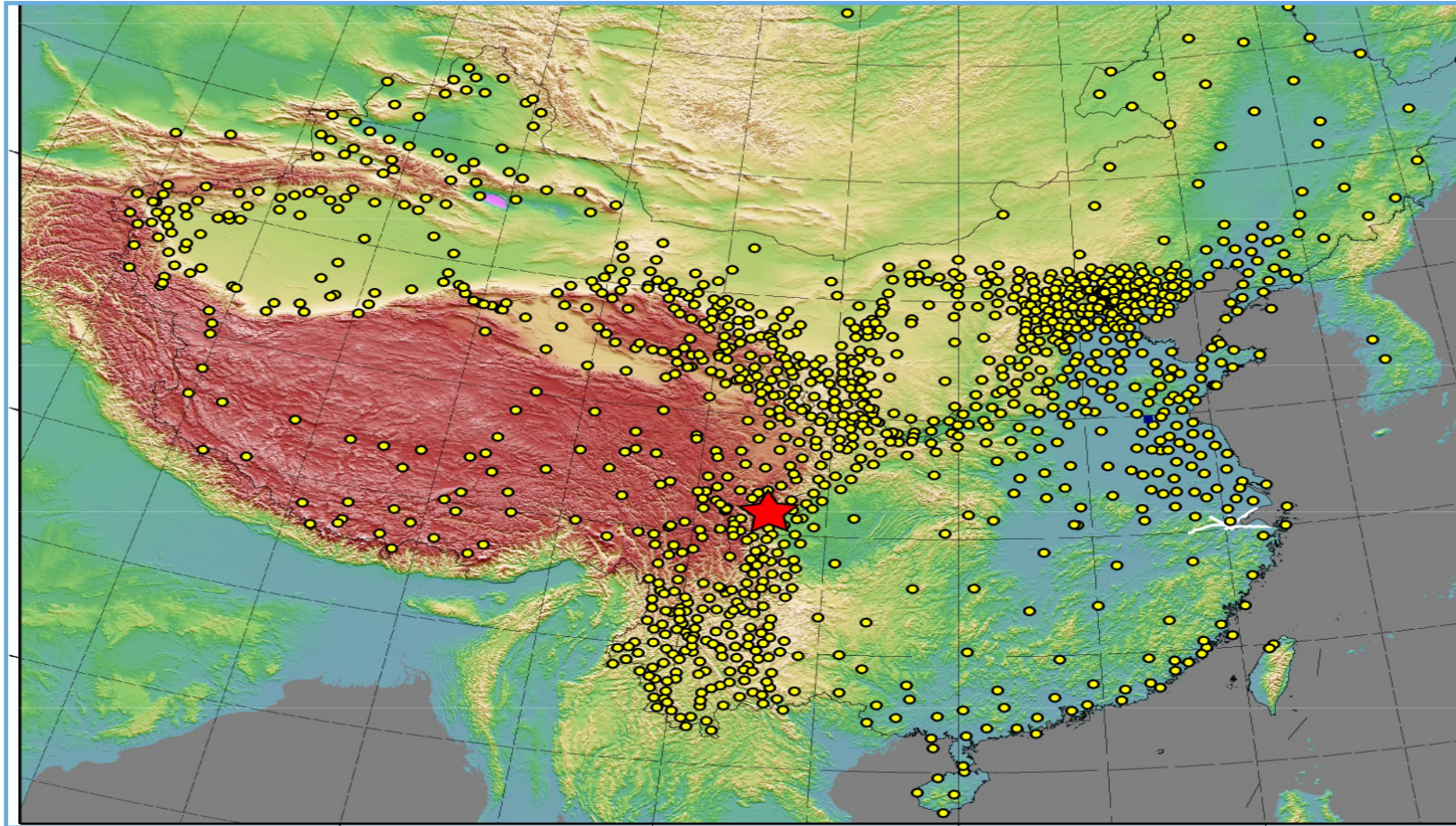
Nepal M7.8 earthquake 25 April 2015



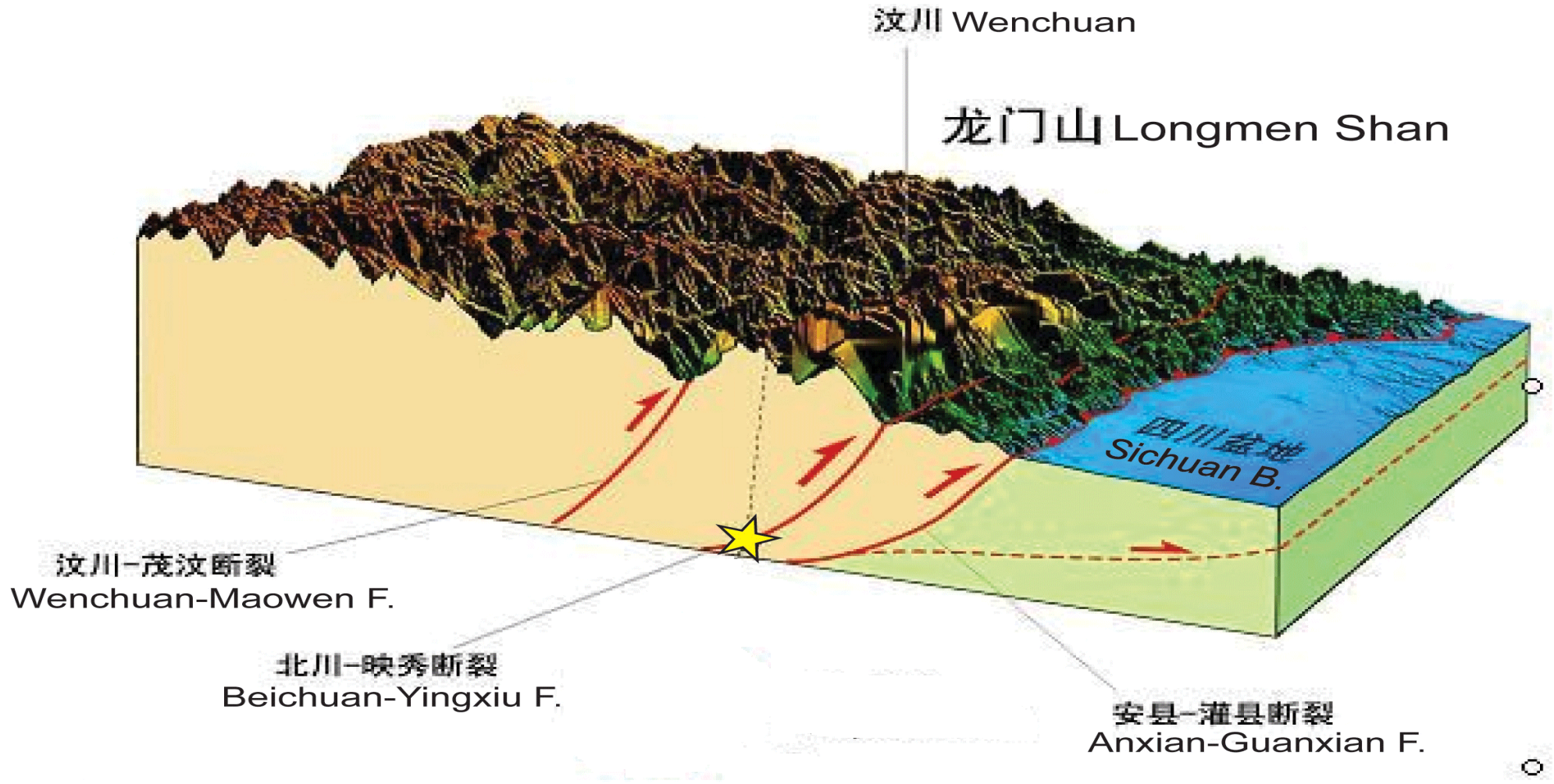
Kaoshiung M6.4 earthquake on 06 February 2016



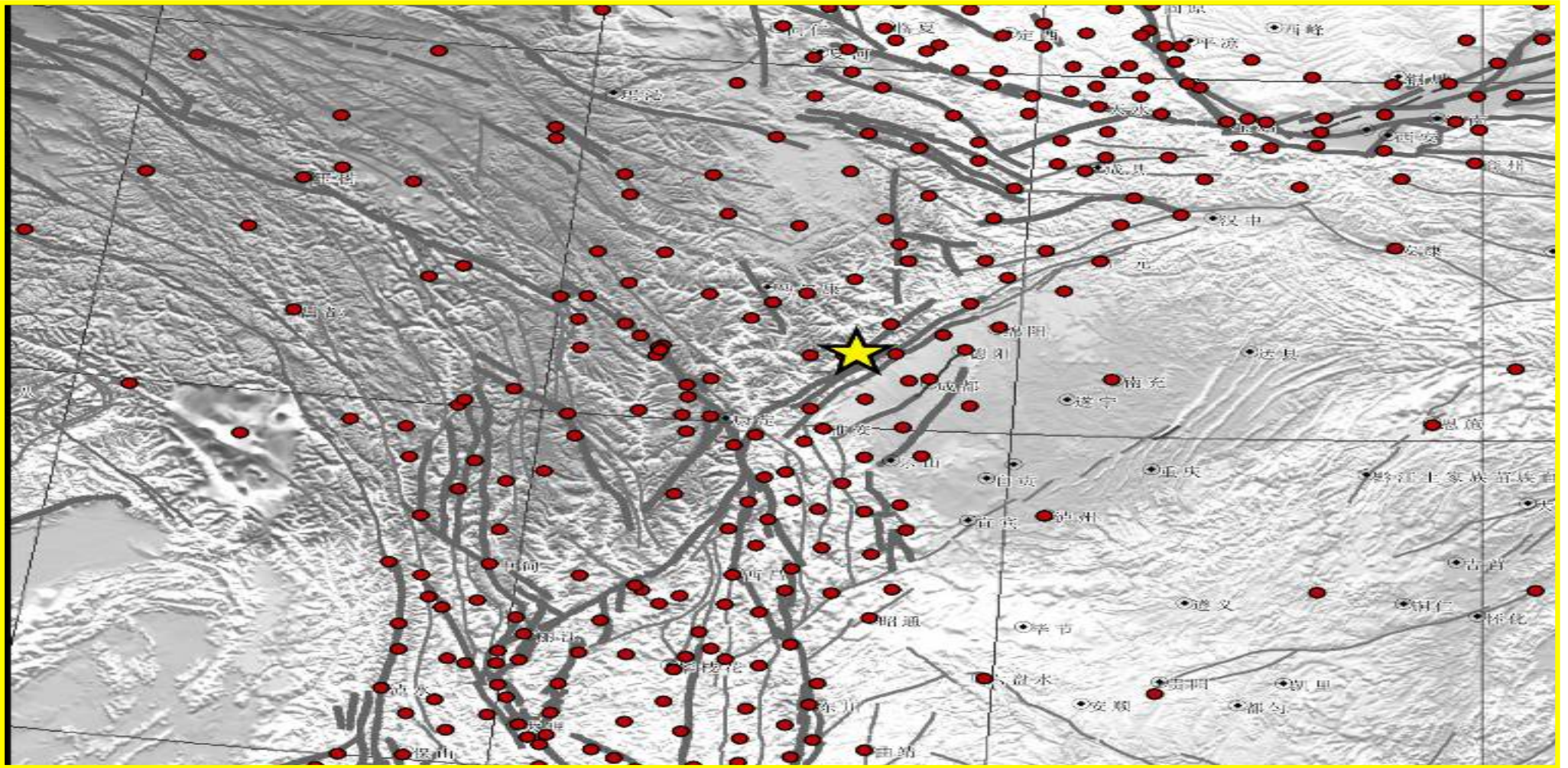
12 May 2008 Wenchuan M8.0 earthquake



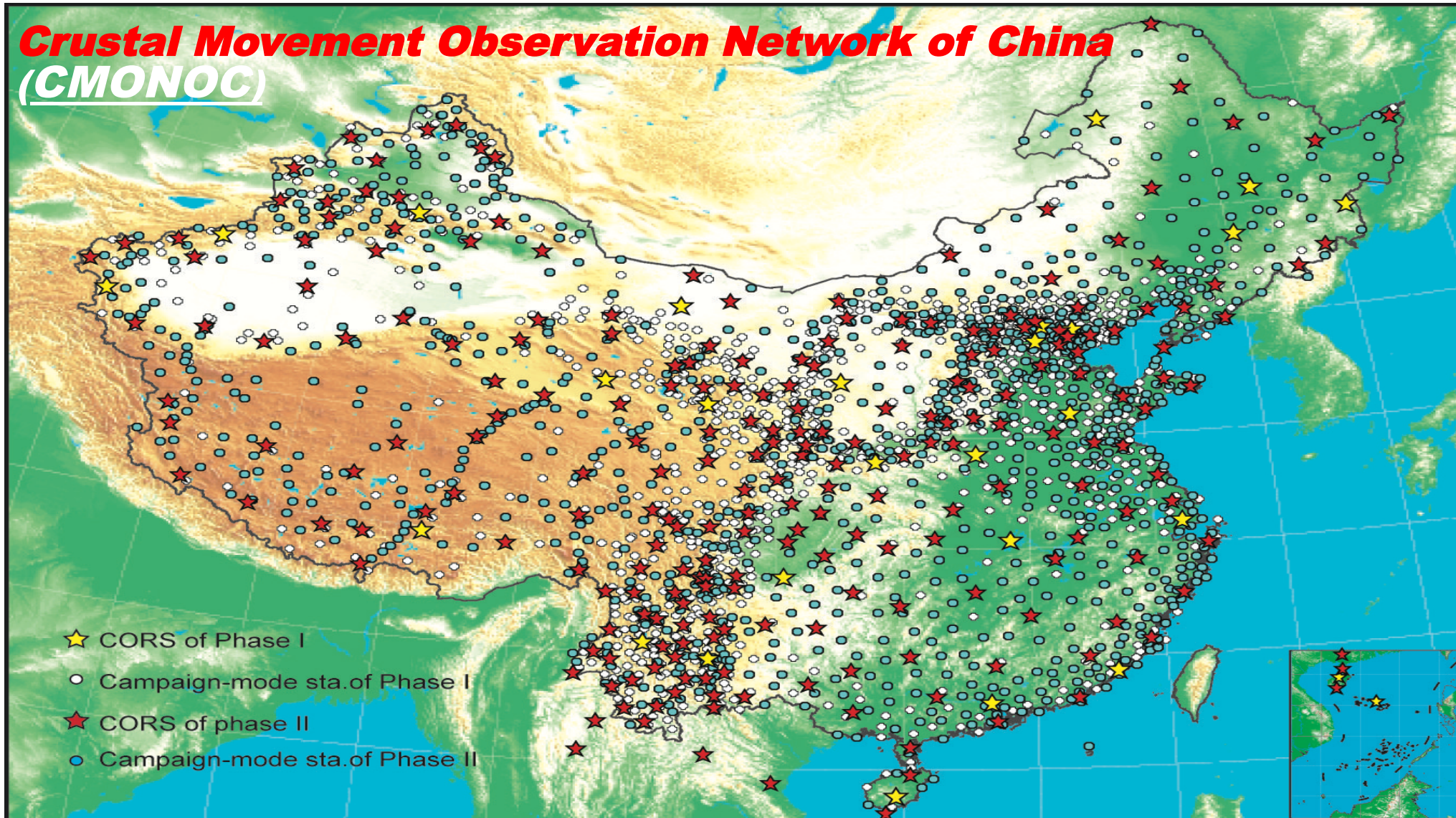
Active Faults along Longmen Shan



GPS Stations Around 2008 Wenchuan M8.0 Earthquake



Crustal Movement Observation Network of China **(CMONOC)**



Pro Bono services available from the ICES Foundation
(Emeritus Professor Max Wyss)

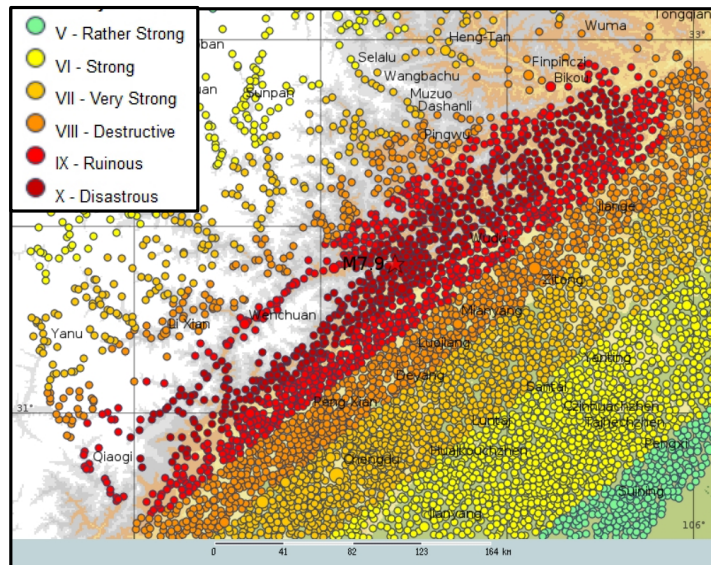
QLARM earthquake loss estimation tool
(Quake Loss Assessment for Response & Mitigation)

Over 900 estimates in last 12 years

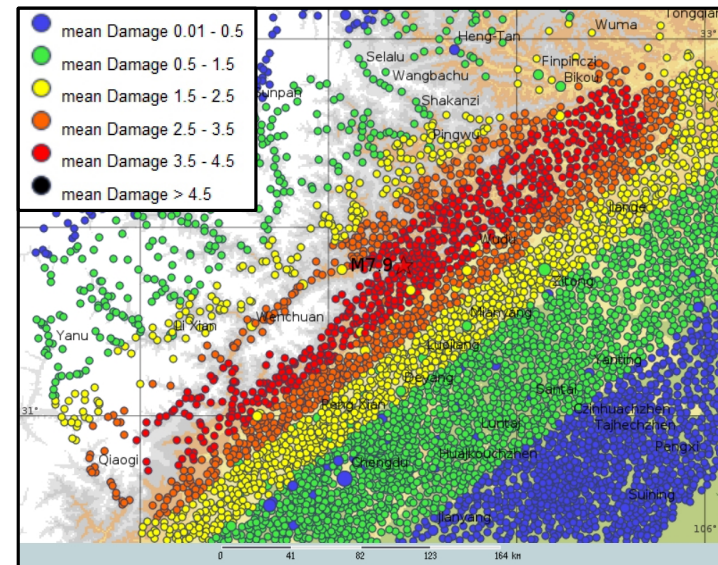
Real-time mode: results published within an hour

Scenario planning mode: preparing for what might happen

Shortly after the M7.9 Wenchuan earthquake of 12 May 2008, a **QLARM fatalities estimate of 55,000 ± 30,000 was publically distributed**. Many days later, fatalities were officially reported as 85,000.



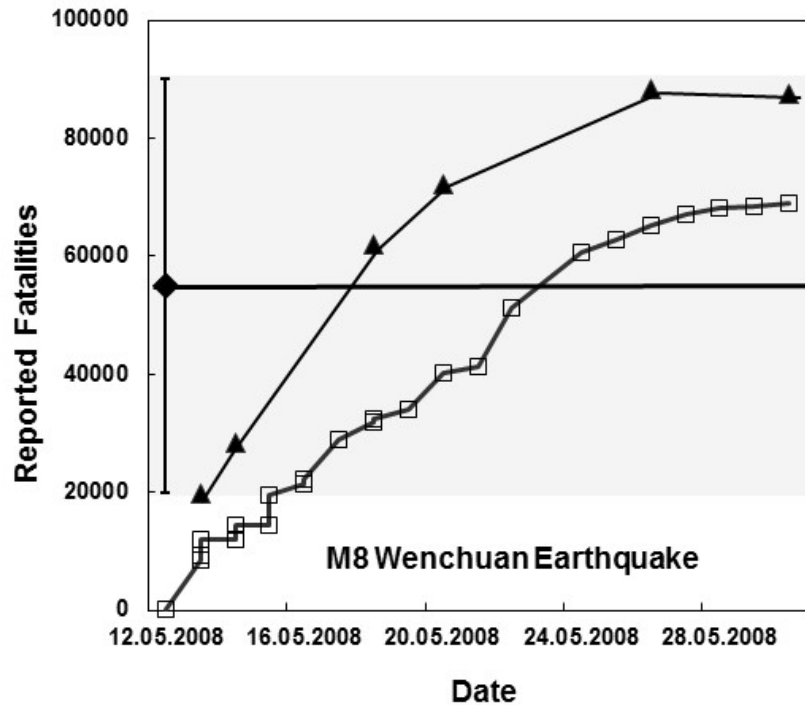
Calculated intensities in settlements near the earthquake epicentre



Calculated mean damage in settlements near the earthquake epicentre

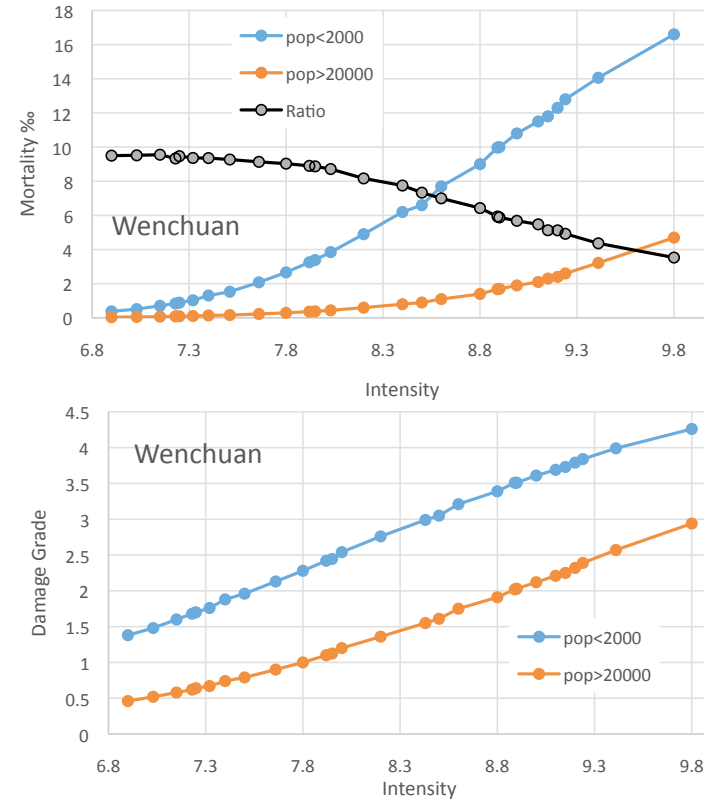
The value of timely reporting for rescue operations

FATALITY ESTIMATE AS A FUNCTION OF TIME



The number of fatalities reported by the official Chinese news agency (open squares), as a function of time after the 2008 Wenchuan earthquake. Solid triangles mark the sum of fatalities plus missing persons. **The QLARM estimate (solid diamond) with its error (vertical line) was issued 100 minutes after the earthquake.**

DISADVANTAGE OF THE POOR RURAL POPULATION



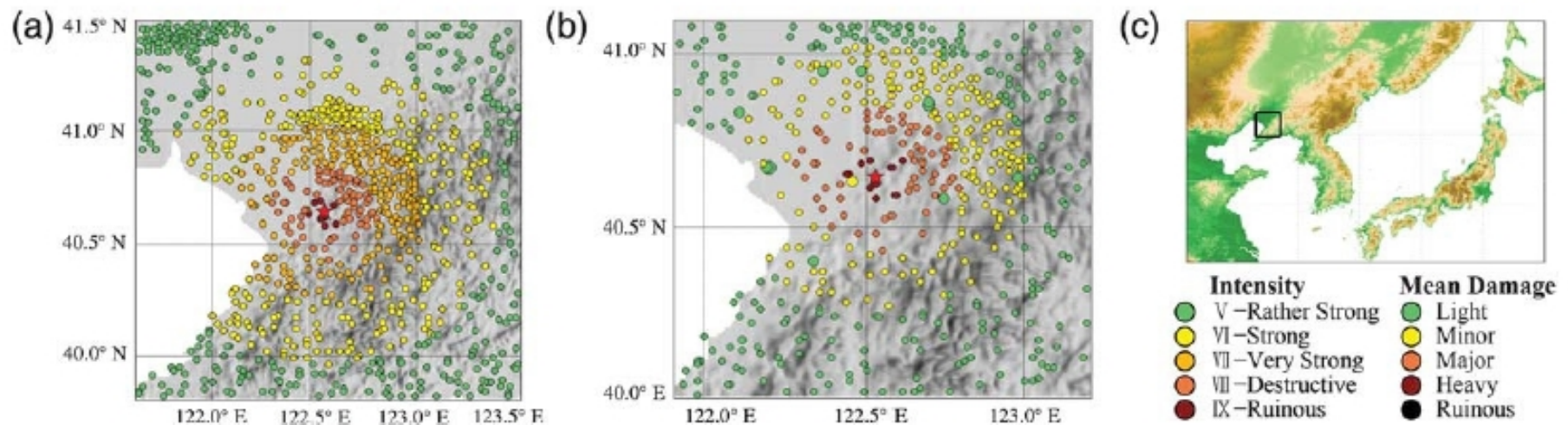
Mortality rate in small settlements (blue) compared to that in large ones (orange). The rural population is significantly disadvantaged, especially in low intensity shakes (based on models for the built environment in China)

Haicheng, M7.3 earthquake of 04.02.1975

(this is the only quantitative estimate of the effectiveness of a mitigating measure in reducing human losses)

REDUCED Casualties = casualties estimated by QLARM *minus* the official reported casualties

Maps for intensities (a) and mean damage (b), calculated by QLARM for an assumed point source



Conclusions

Based on theoretical calculations of the casualties that would have resulted ***without evacuation*** before the 1975 Haicheng earthquake, we estimate that approximately 8,000 lives and 27,000 injuries, $\pm 60\%$, were saved.

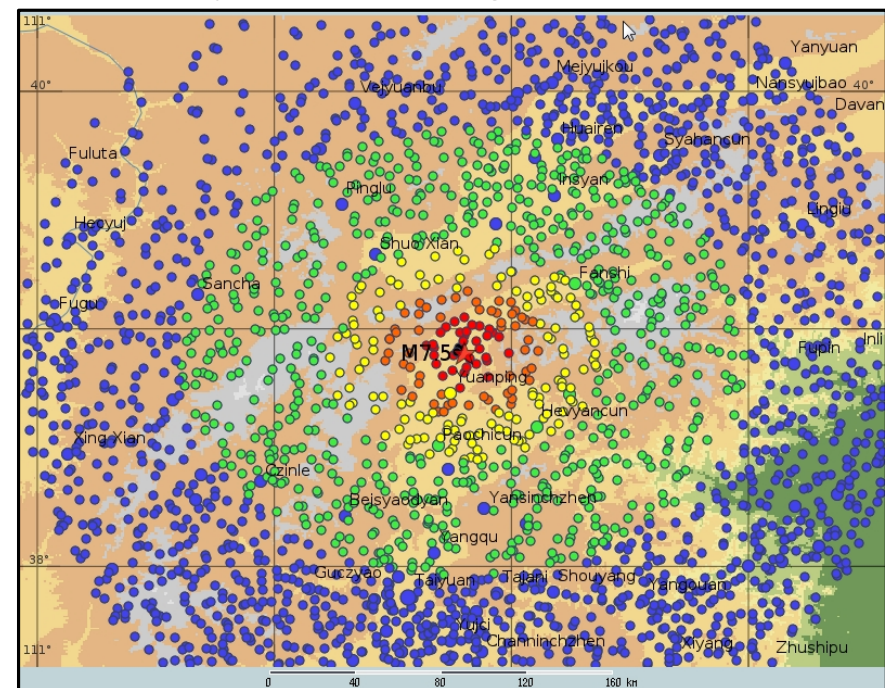
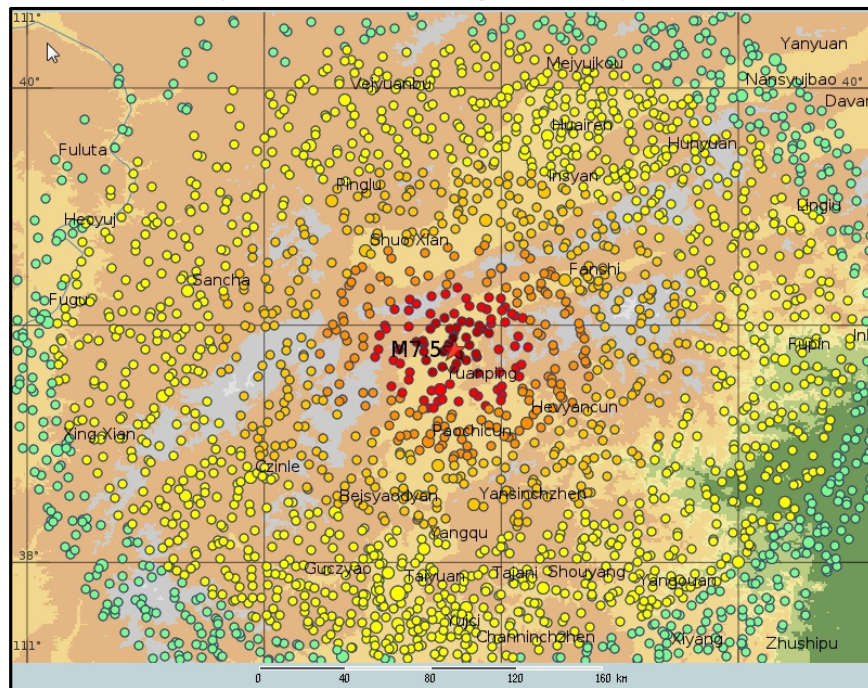
Wyss, M., and Z. L. Wu (2014), *Seismol. Res. Lett.*, 85(1), 126-129.

Using QLARM as a scenario planning tool for future disaster reduction

In a repeat of the Year 512 Shanxi earthquake, QLARM estimates that 4 times more people would perish:

Year	M	Lat	Lon	Fatalities	Injured
512	7.5	38.9	112.8	5,310	?
2016	7.5	38.9	112.8	22,700	65,000

If this earthquake occurred again today, QLARM estimates that the intensity and mean damage would be as follows:



Is China prepared for this situation?

Risk analysis & mitigation against floods, landslides & earthquakes

- Vulnerability of all schools
- Vulnerability of all hospitals and medical facilities
- Vulnerability of critical infrastructure – water, food, power & transport

Prepare for building relocations, retrofits and installing earthquake closets



**Helping guide the successful transformation of human society
in an era of rapid climate change and frequent natural disasters.**

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