

GPS Developments in China and Its Applications in Geodynamic Studies of Continental Asia

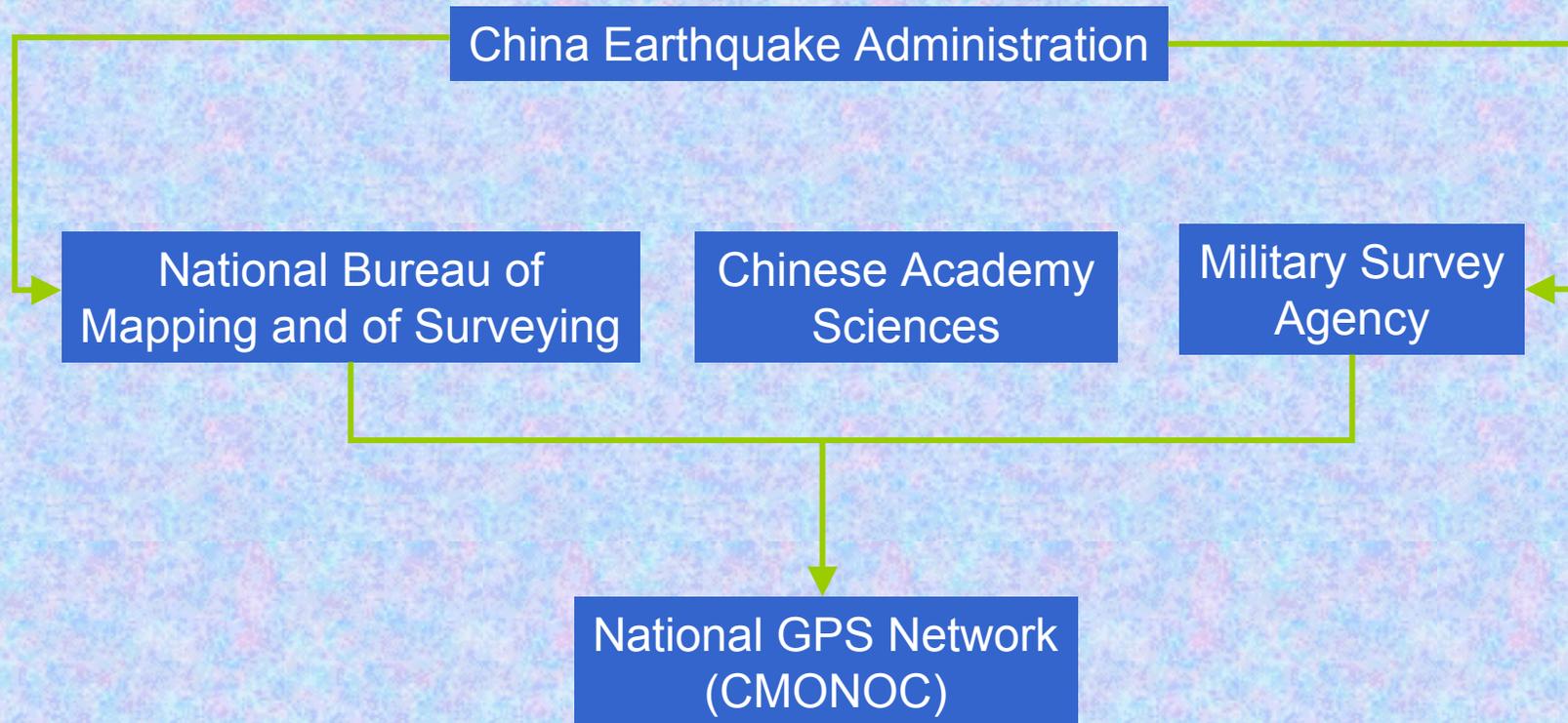
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GPS developments in China

- ❖ **GPS observation started in late 1980s**
- ❖ **Significant advance occurred in 1998 when the first phase of national GPS network was implemented**
- ❖ **There will be second phase of national GPS network in 2005(?)**

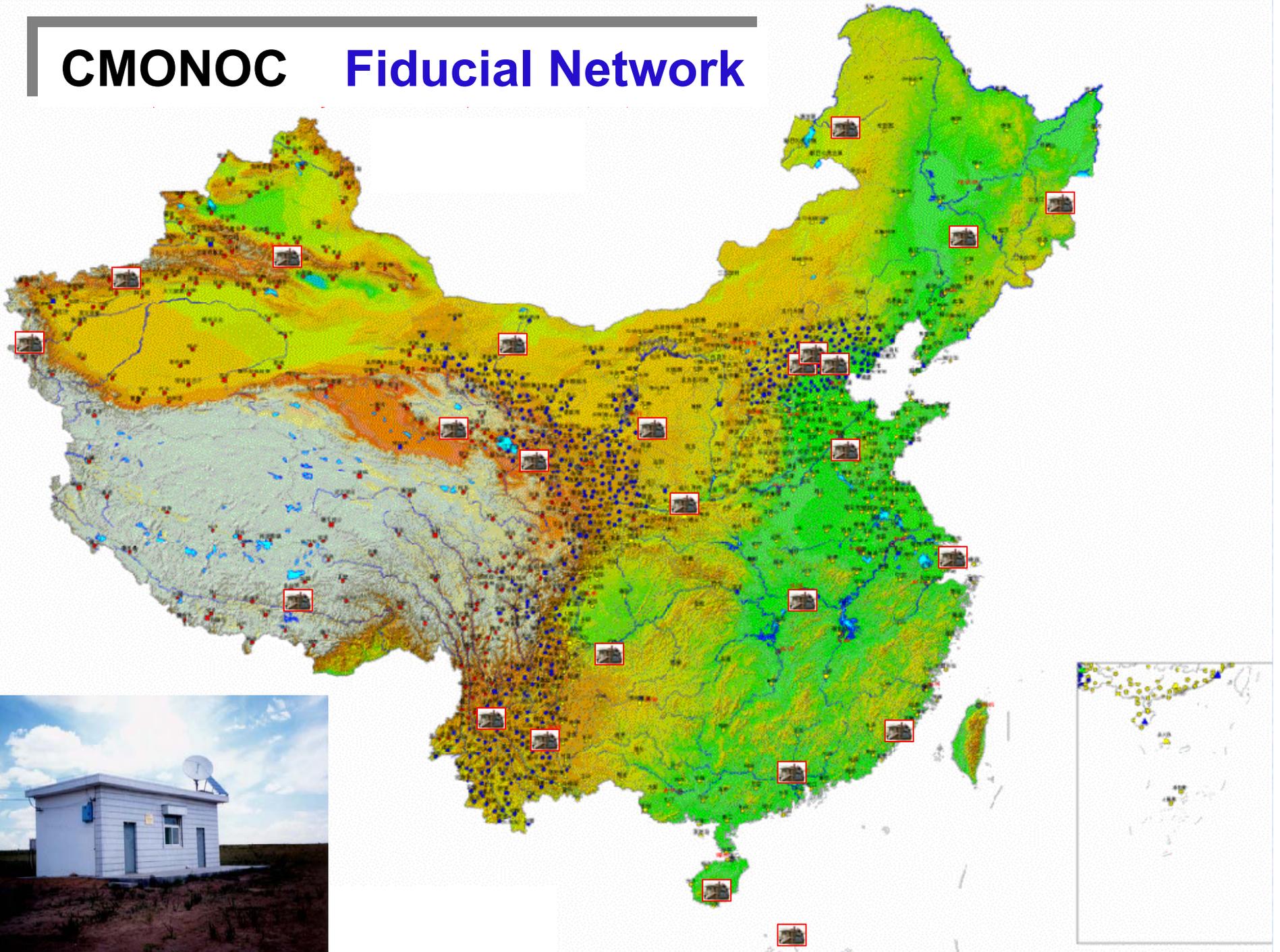
Management structure of Chinese national GPS network



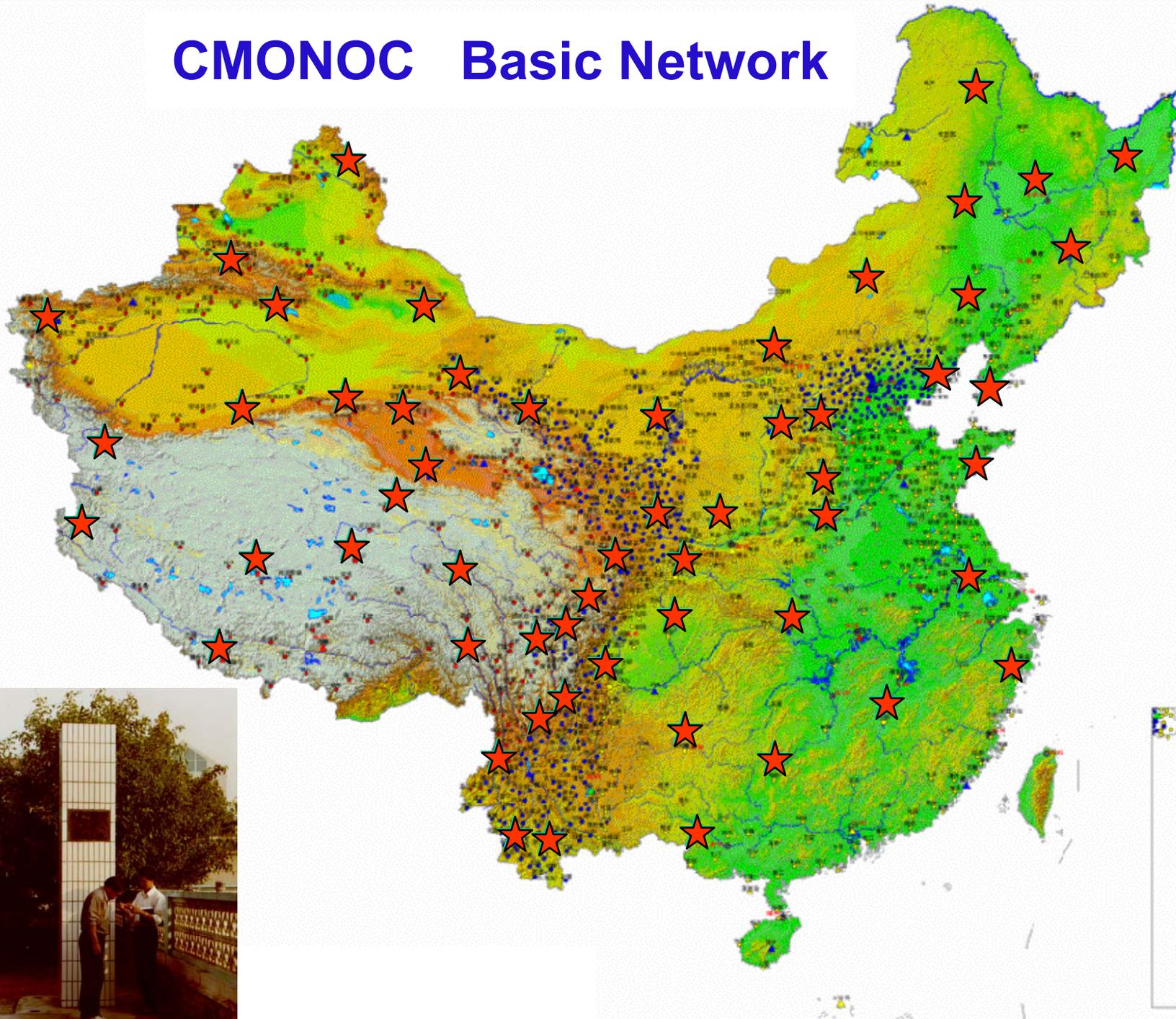
Crustal Movement Observation Network of China (CMONOC)

- ❖ Fiducial Network: 25 continuous GPS stations**
- ❖ Basic Network: 56 regularly occupied GPS stations**
- ❖ Regional Network: 1000 GPS stations**
- ❖ Data Center: data archiving, processing, and analysis**

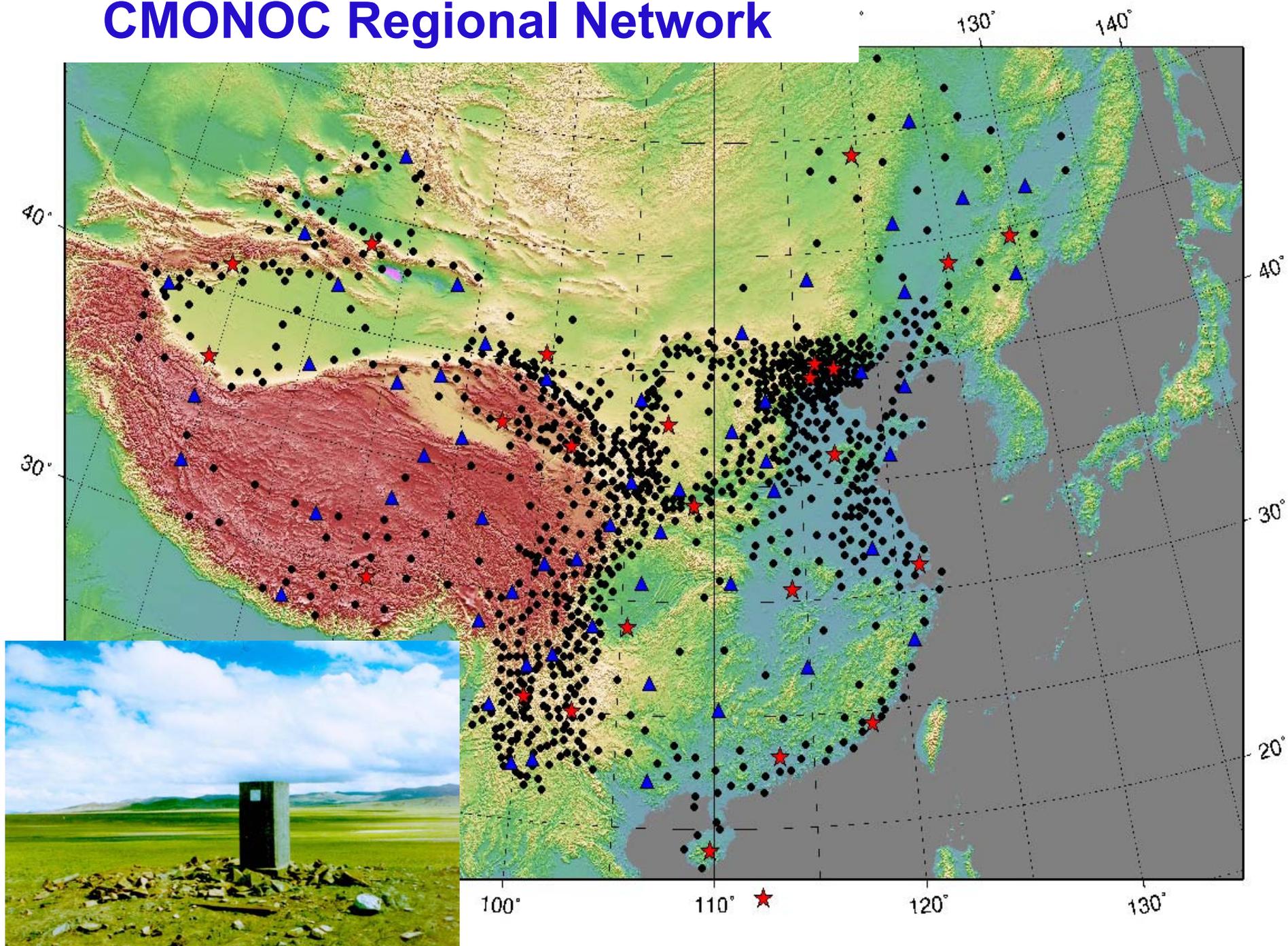
CMONOC Fiducial Network



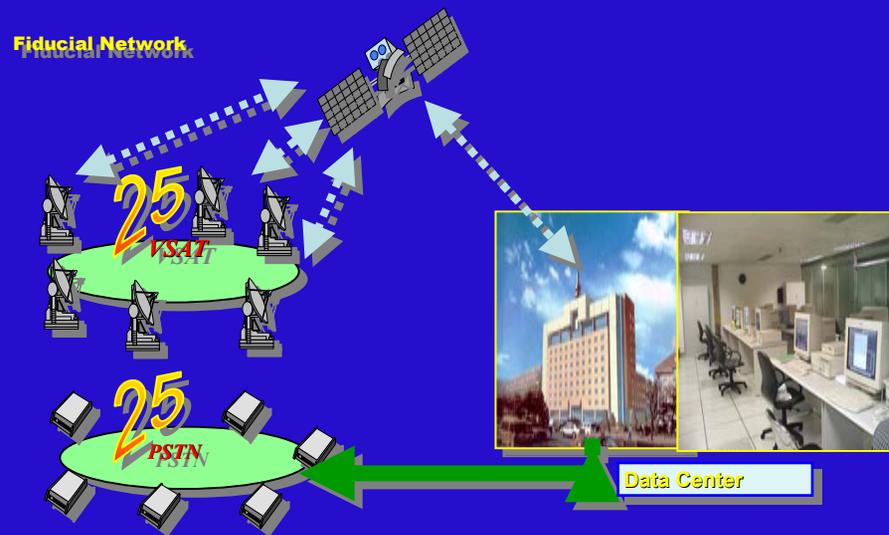
CMONOC Basic Network



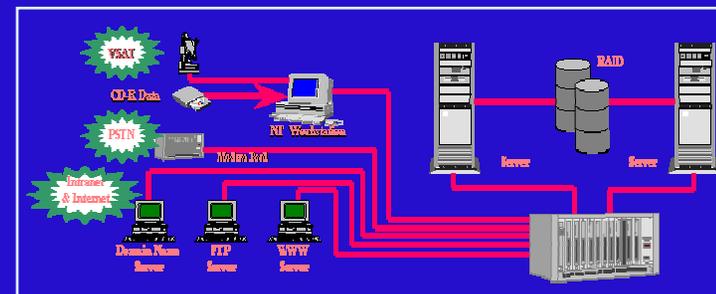
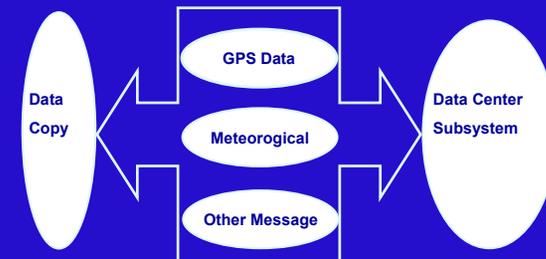
CMONOC Regional Network



Data Center



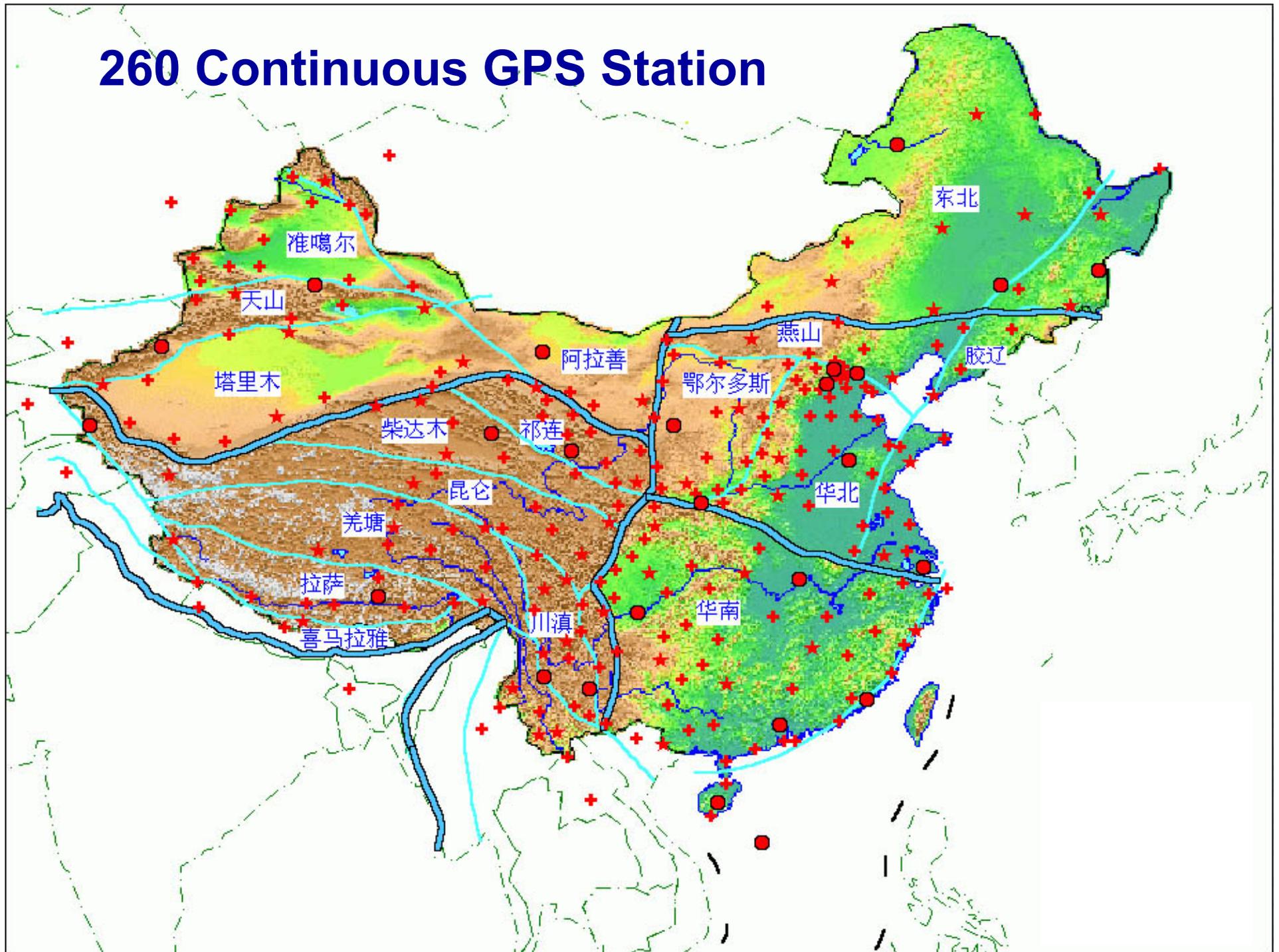
Data Collecting and transferring



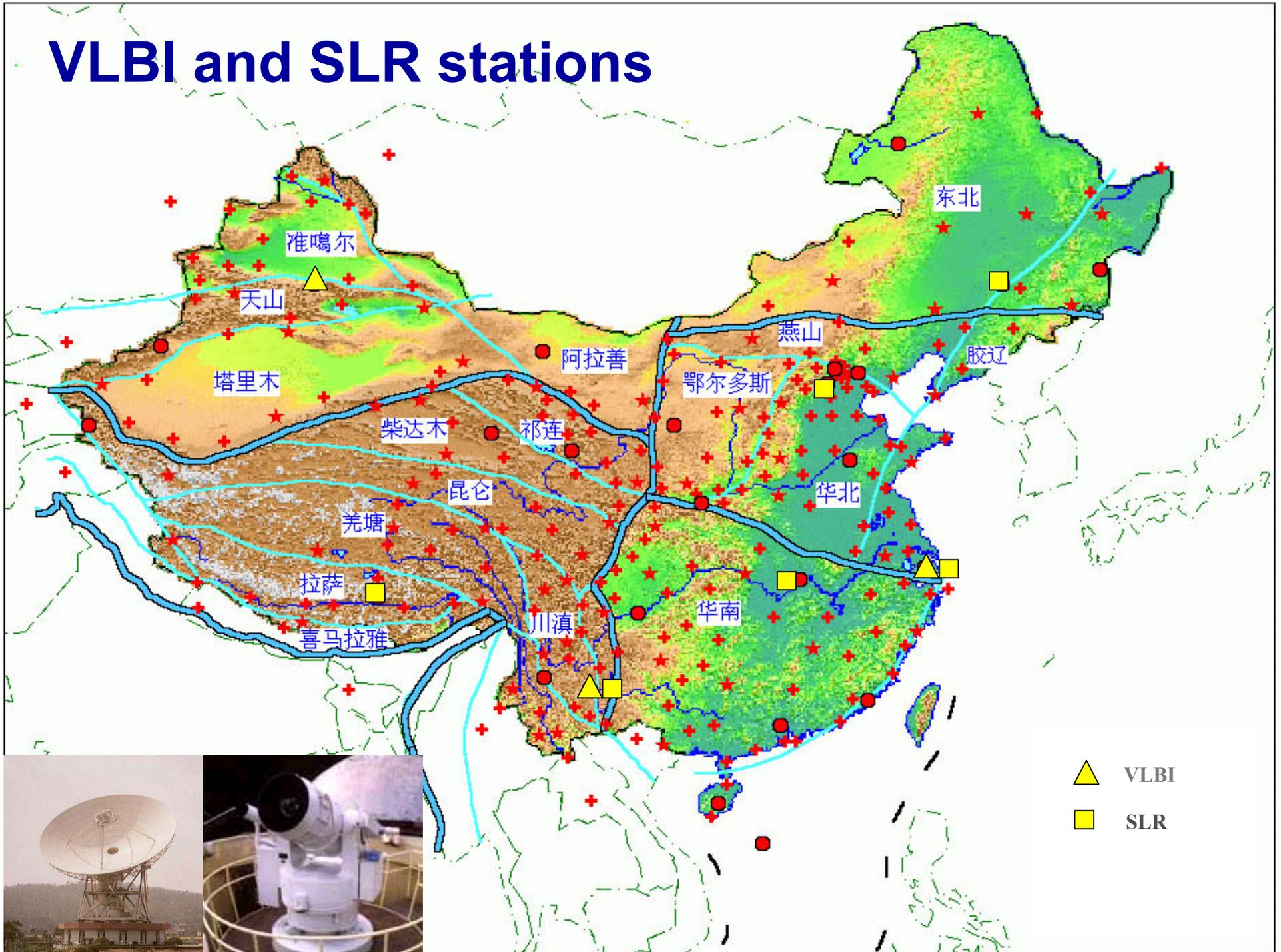
Fiducial Stations Control

Second Phase of CMONOC

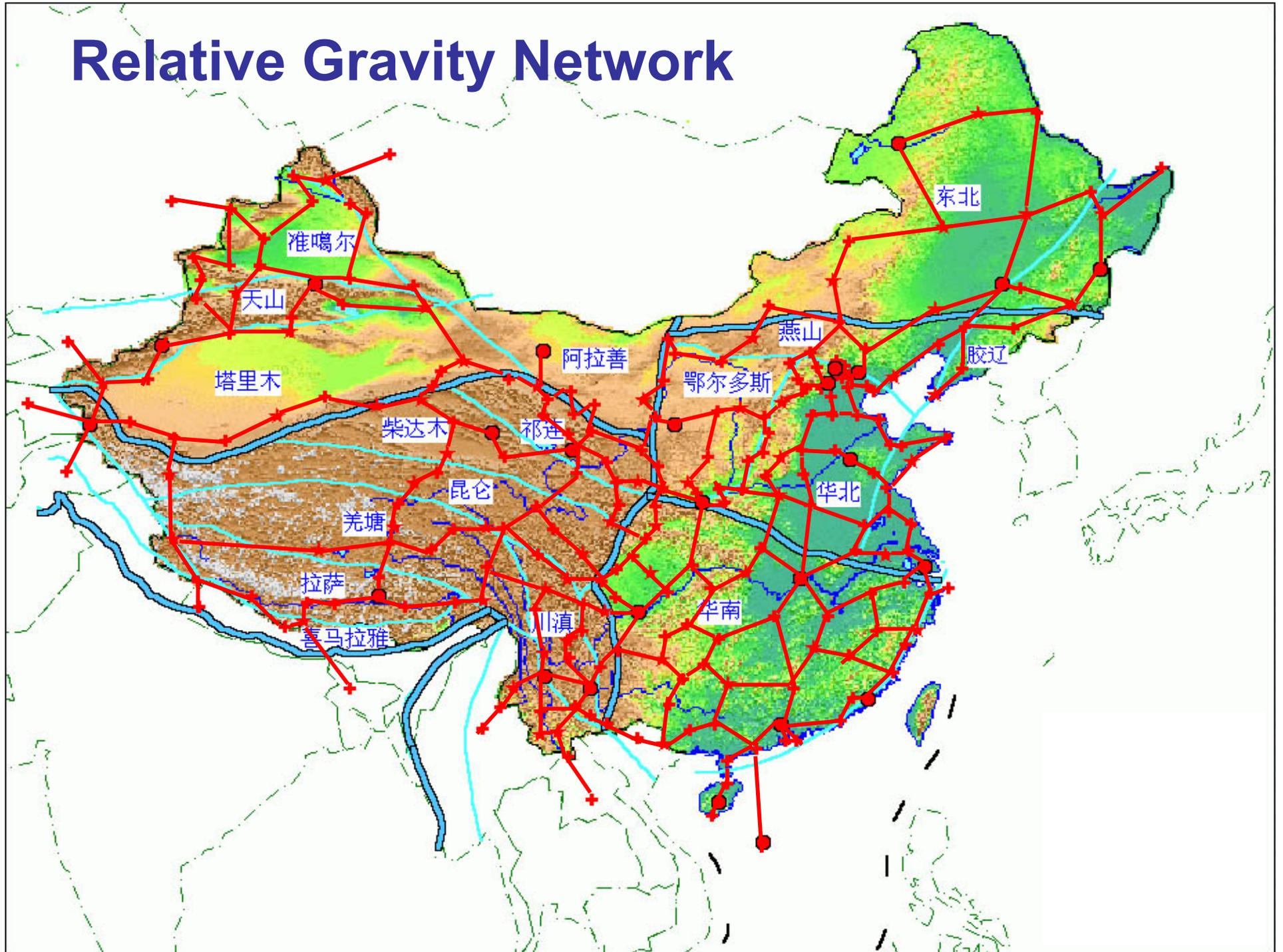
260 Continuous GPS Station



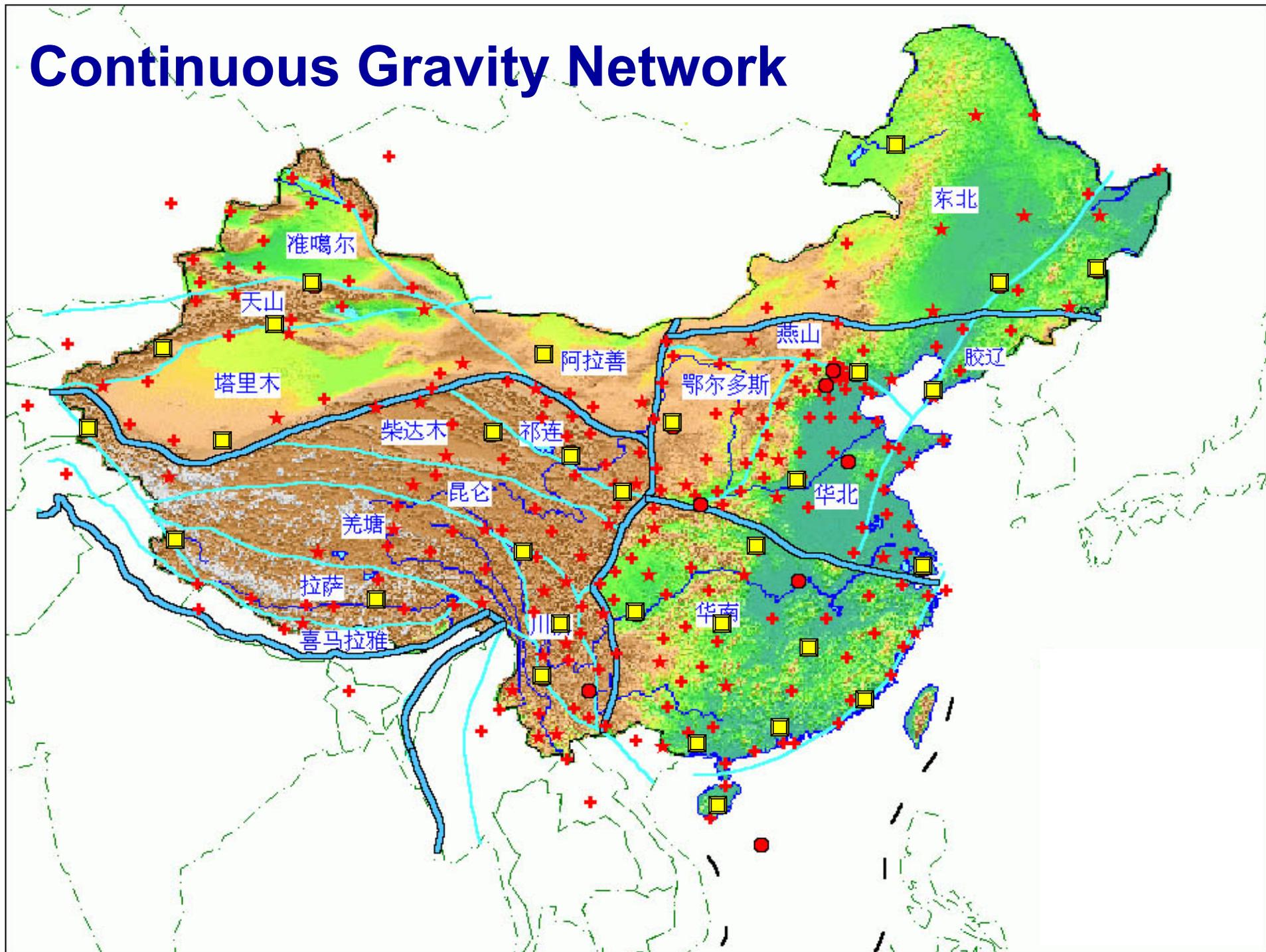
VLBI and SLR stations



Relative Gravity Network



Continuous Gravity Network



Applications in China

Positioning

Navigation

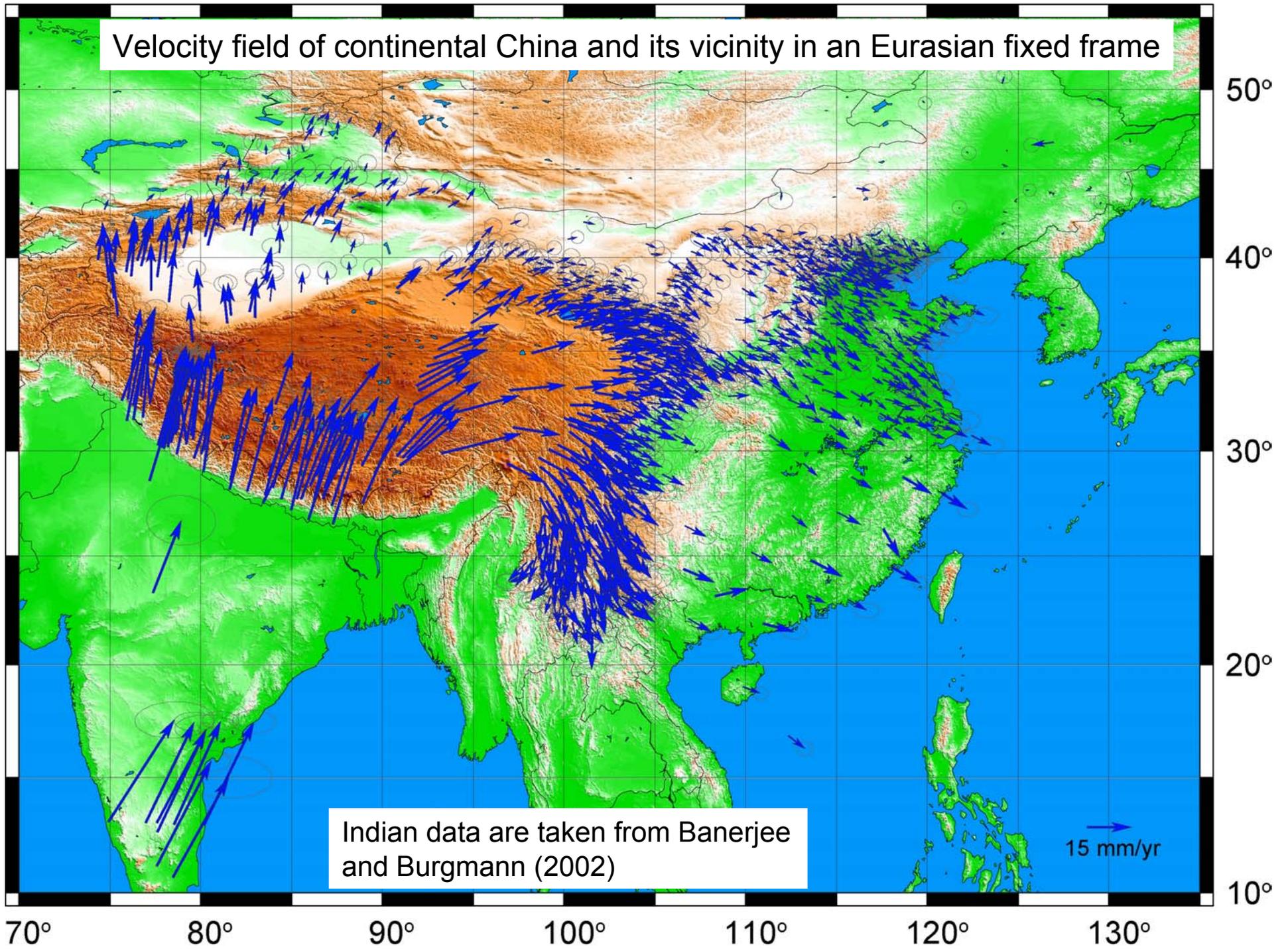
Engineering

Geodynamic studies

Natural disaster reduction

Earthquake prediction researches

Velocity field of continental China and its vicinity in an Eurasian fixed frame



Indian data are taken from Banerjee and Burgmann (2002)

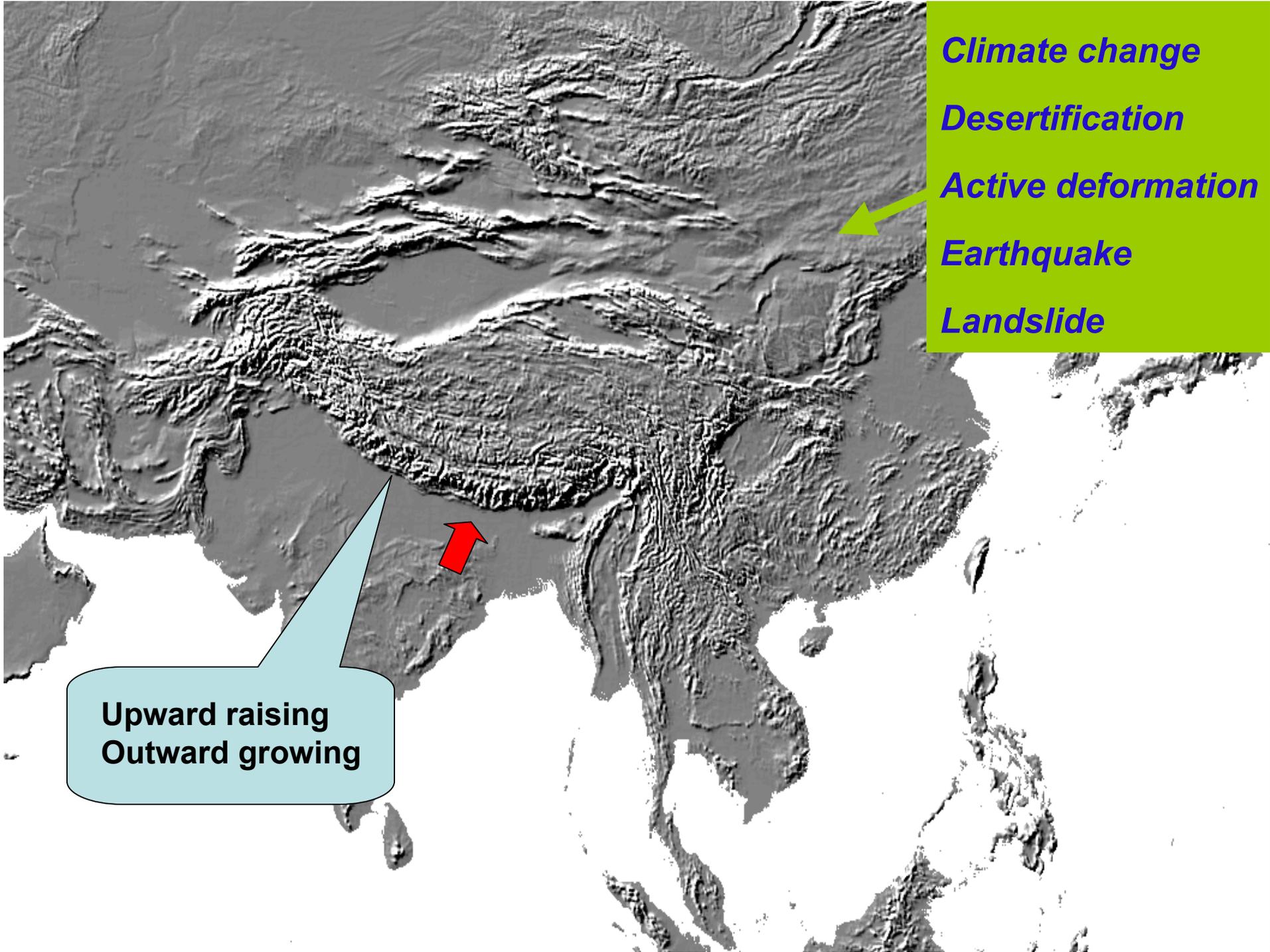
15 mm/yr

Example of application in geodynamics

A premise for geodynamic study is to understand the kinematics of crustal deformation

GPS provides a powerful means to measure the kinematics

The best example is geodynamics of the Tibetan Plateau



Climate change

Desertification

Active deformation

Earthquake

Landslide

Upward raising
Outward growing

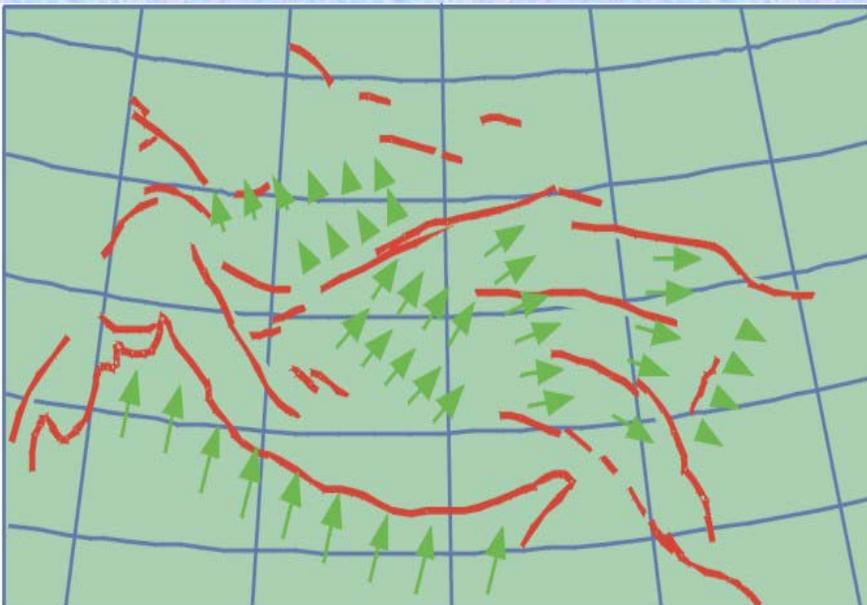
***How does the Tibetan Plateau deform
in response to the collision between
India and Eurasia ?***

***Or, does the Tibetan Plateau deform
in the fashion of rigid plate-like or
viscous fluid-like ?***

Two end-member models of Tibetan dynamics

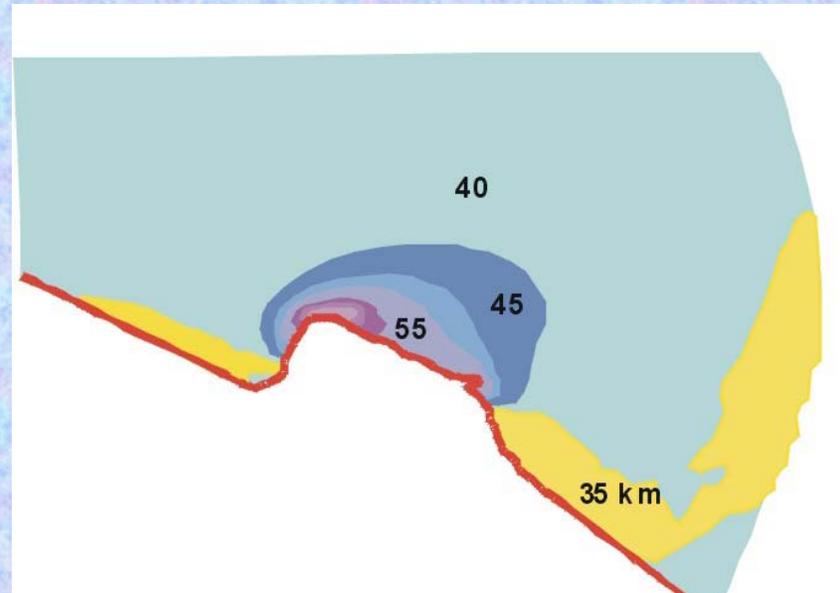
“Continental Escape”

(Tapponnier et al., 1982)

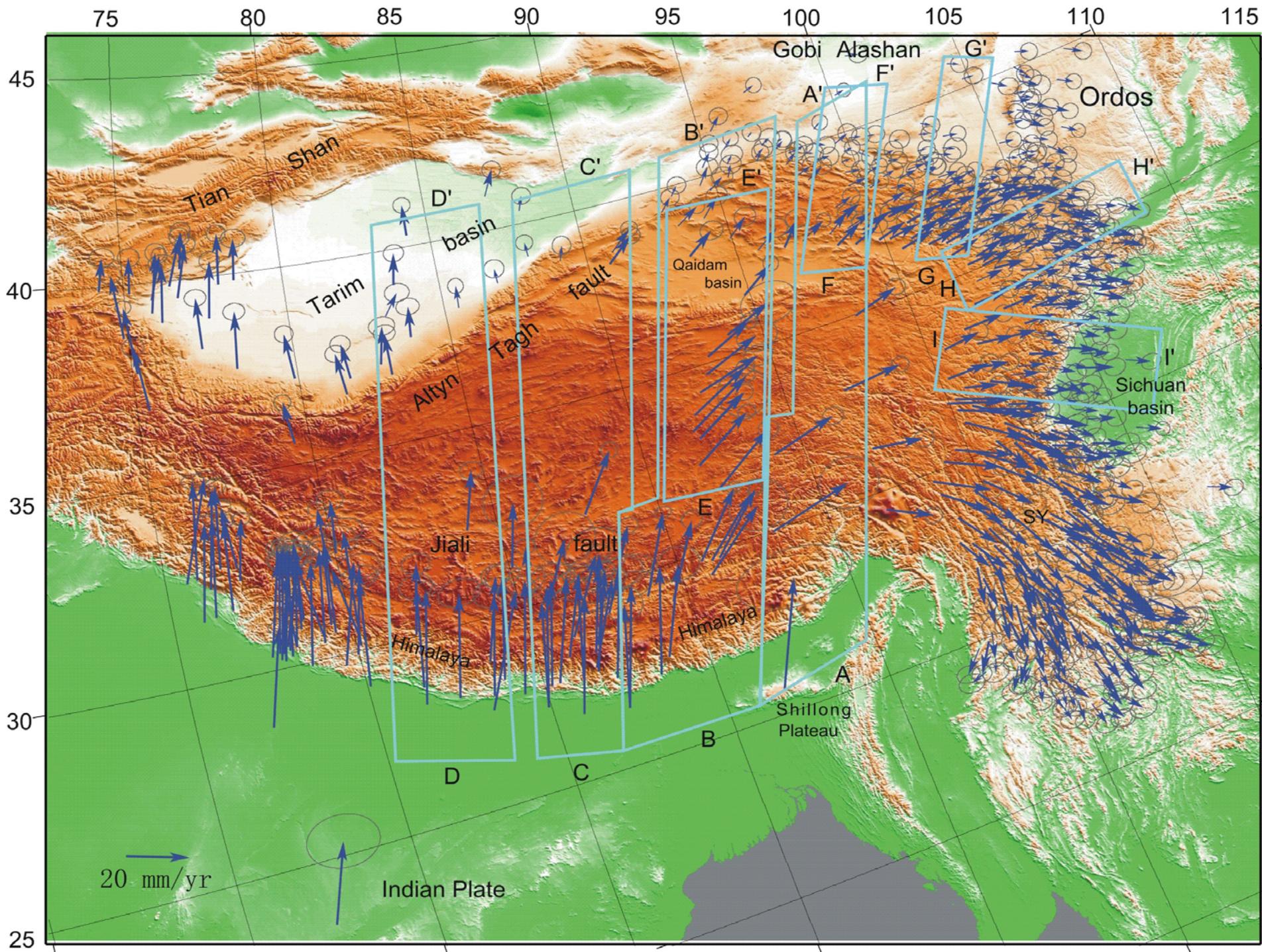


“Continuum Deformation”

(England and Houseman, 1986)



GPS observation offers critical test of geodynamic models

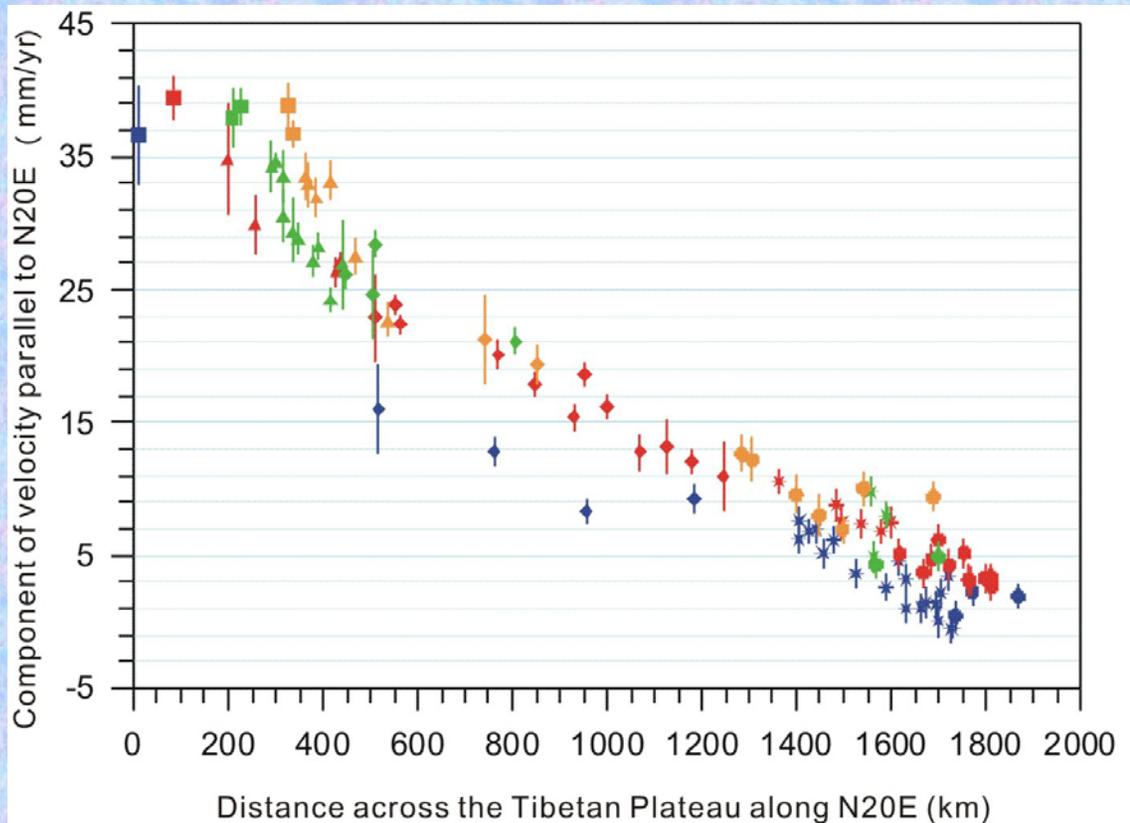


Distributed rather than localized deformation within Tibetan Plateau

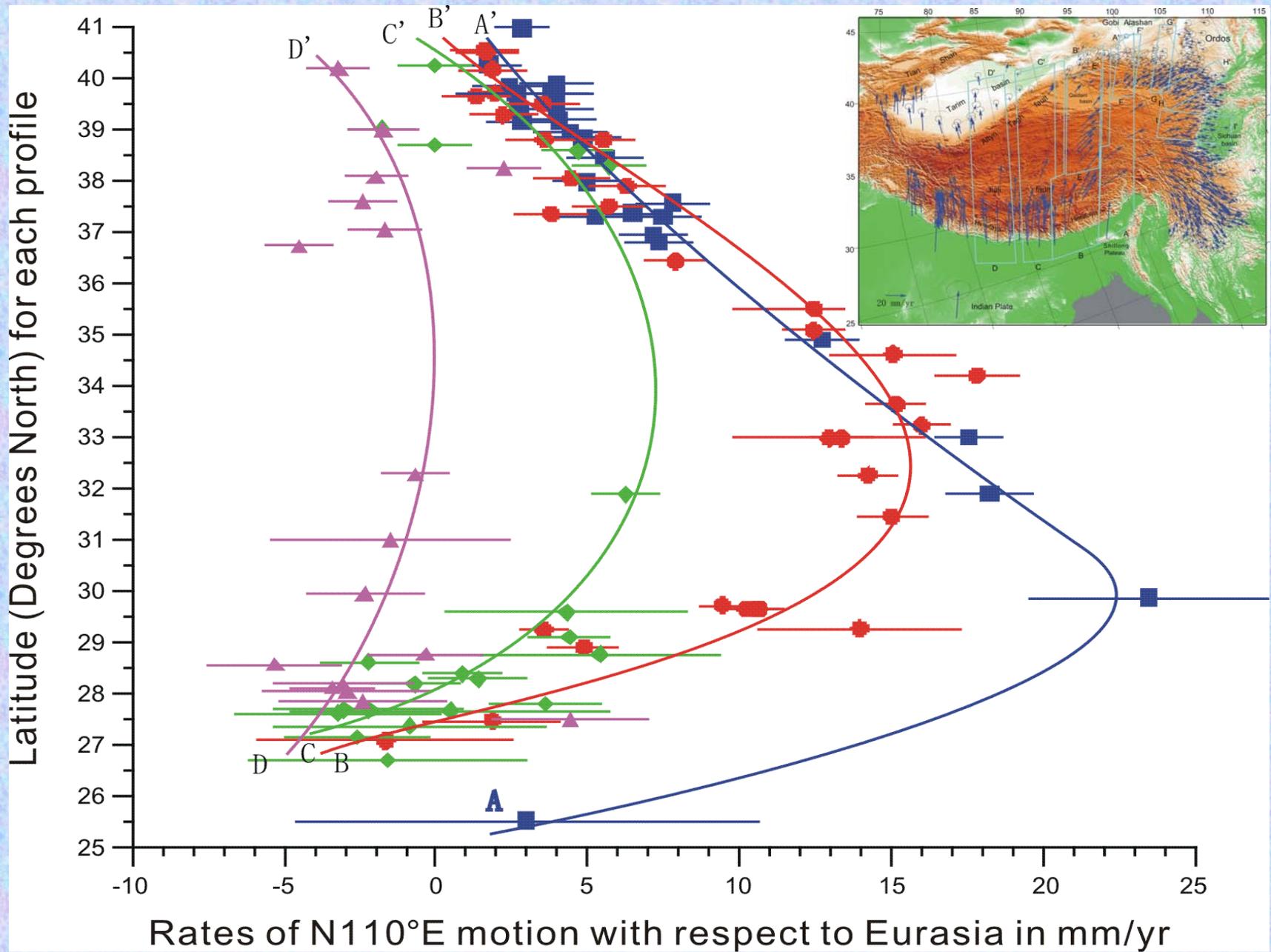
**Eastern Tibet absorbs
between 85-94%**

**Western Tibet absorbs
between 70-91%**

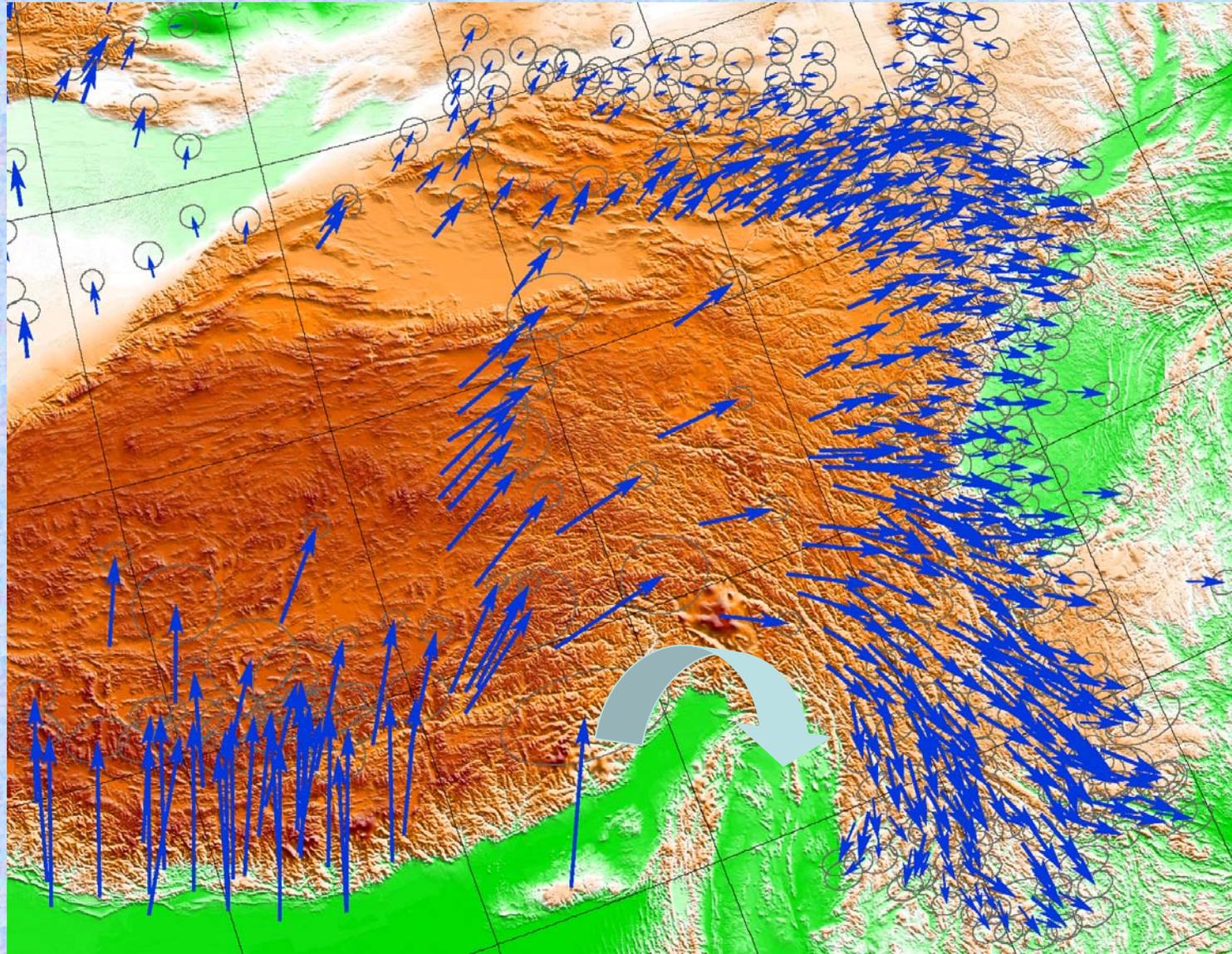
**Smoothly varying velocity
gradients indicate
distributed deformation**

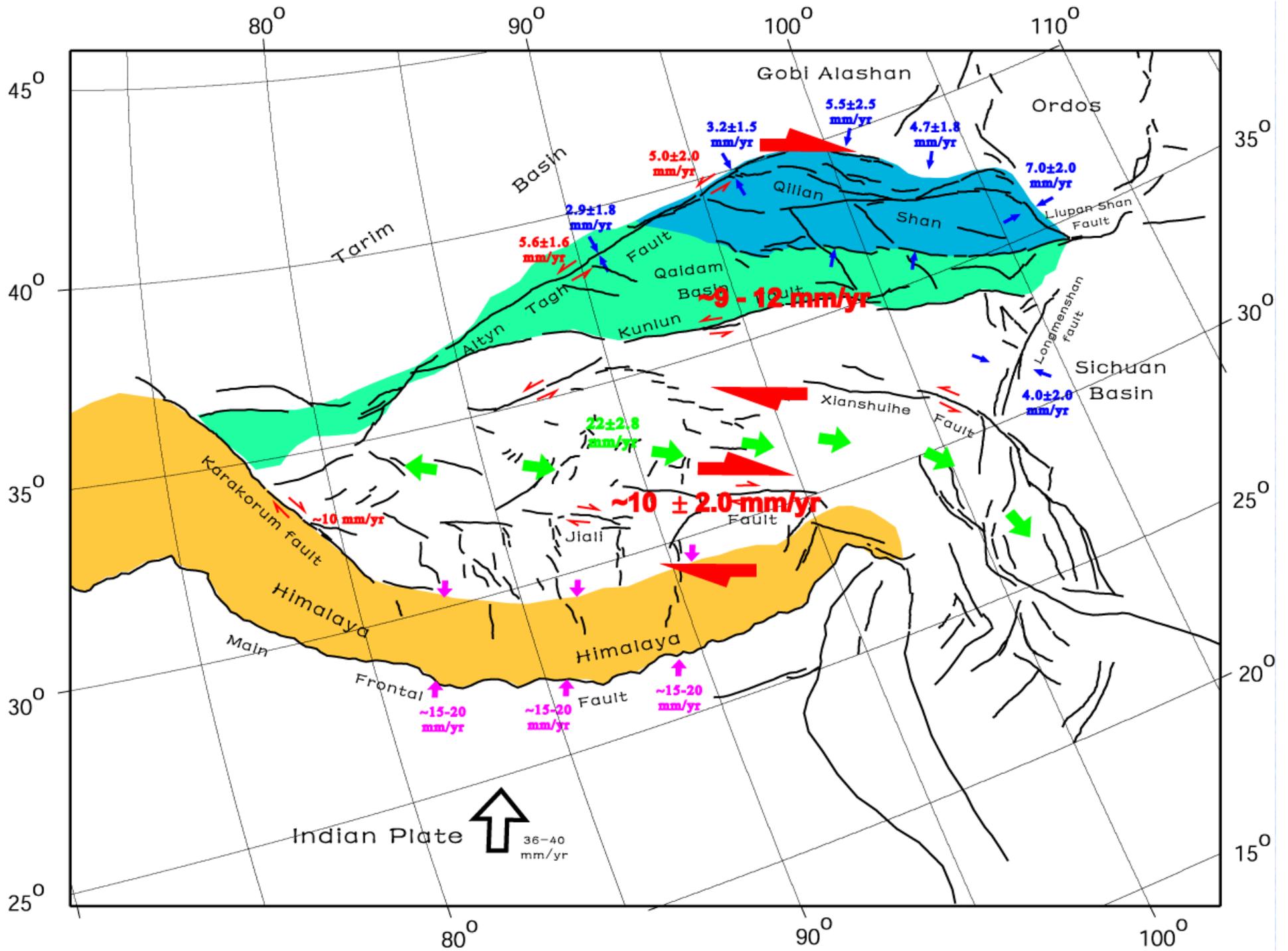


Outward flow of crustal material in the interior of Tibetan Plateau



Vortical fluid rotation around the eastern Himalaya





Conclusion

National GPS network in China was established in 1998, and its second phase will probably begin in 2005.

Applications of GPS technology has been in various fields including navigation, positioning, engineering, and scientific researches.

GPS results demonstrate that the present-day tectonics in the Tibetan Plateau is characterized by crustal shortening along its margins, outward flow of crustal material in the plateau interior, and clockwise rotation around eastern end of Himalaya, rather than by rigid block rotation.