

Crustal deformation in China and models comparison of the 2008 Wenchuan earthquake

Speaker: Yi-Xiu Lai

References

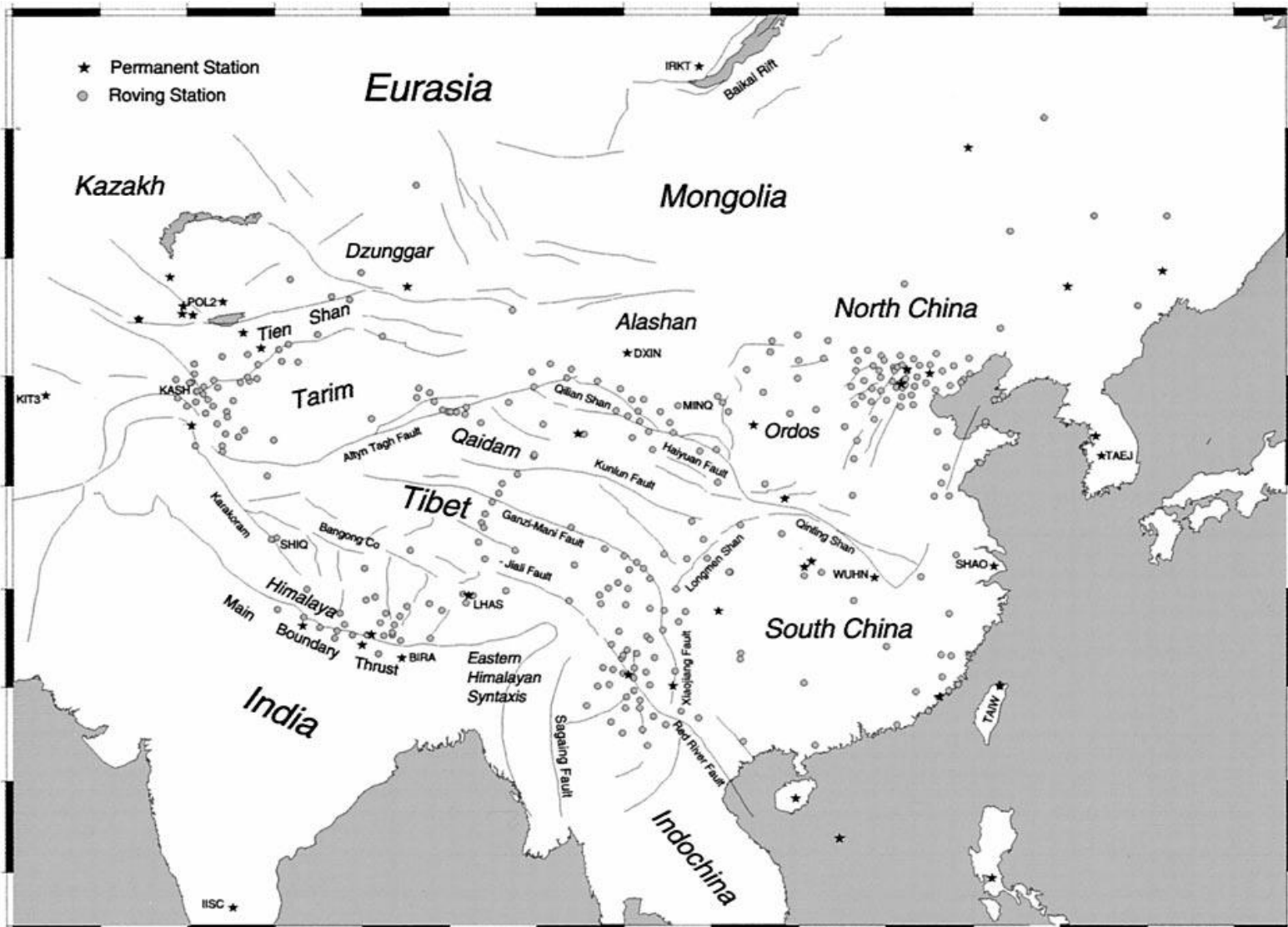
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- Wang, W., Sun, W., Jiang, Z., 2010. Comparison of fault models of the 2008 Wenchuan earthquake (Ms8.0) and spatial distributions of co-seismic deformations. *Tectonophysics* 491 ,85–95

Outline

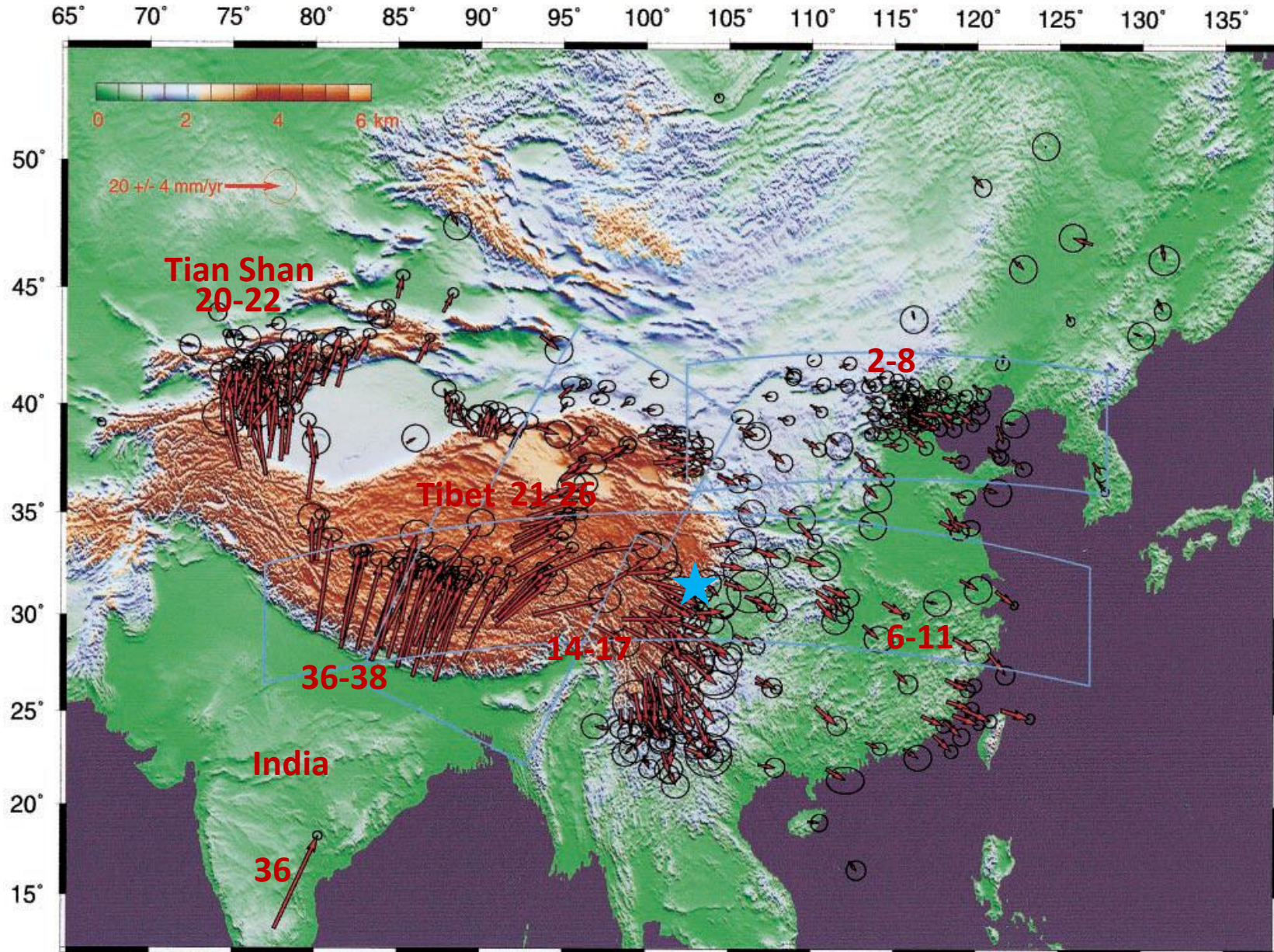
- **Introduction**
- **Models**
 - fault models / dislocation theories / compare result
- **Summary**
- **Compute co-seismic deformations**
 - Displacement / Geoid / gravity
- **Conclusions**

Introduction 1/3

354 GPS stations



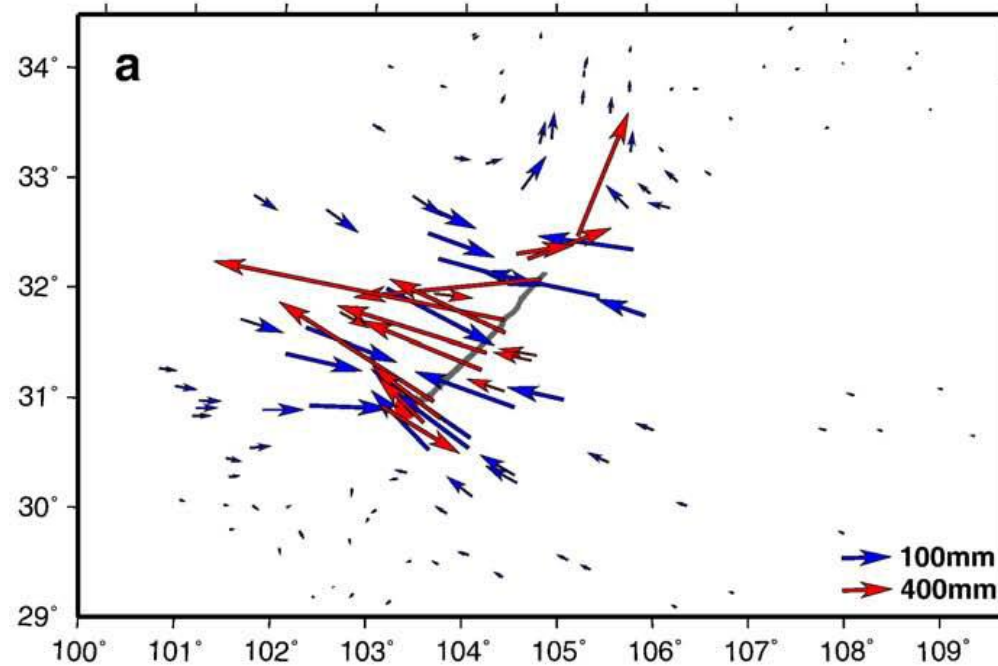
Introduction 2/3



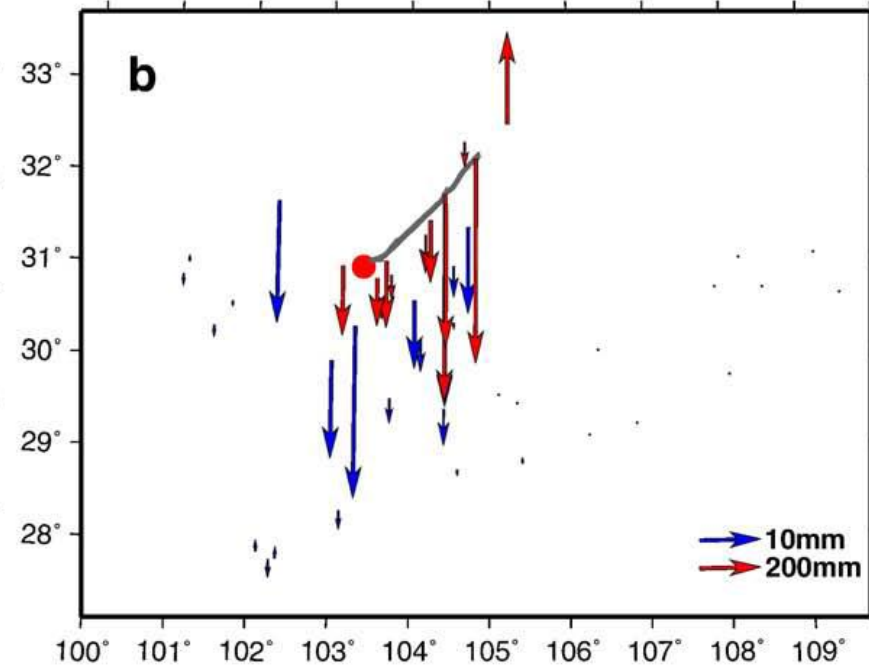
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Observed co-seismic displacements

horizontal 122 stations



Vertical 44 stations

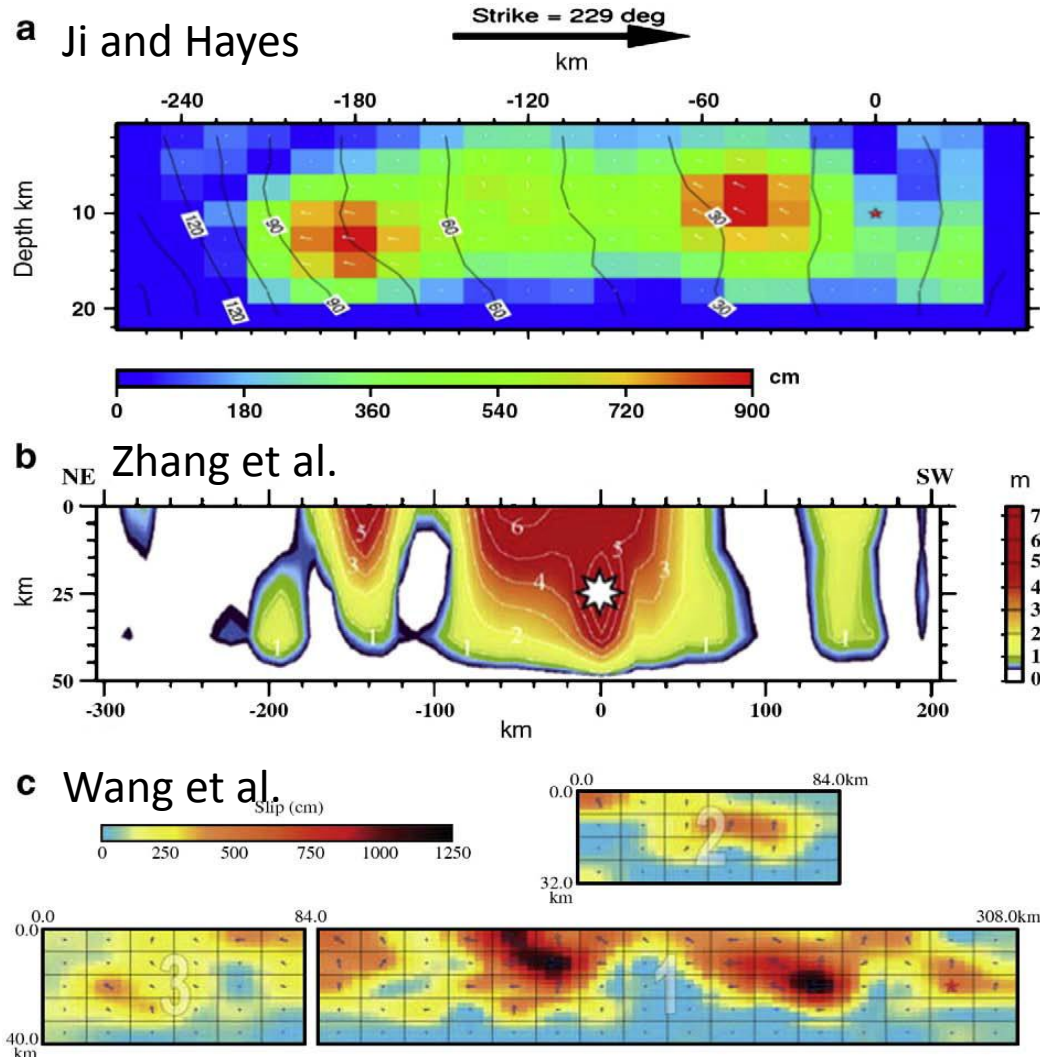


Zhang et al., 2008a

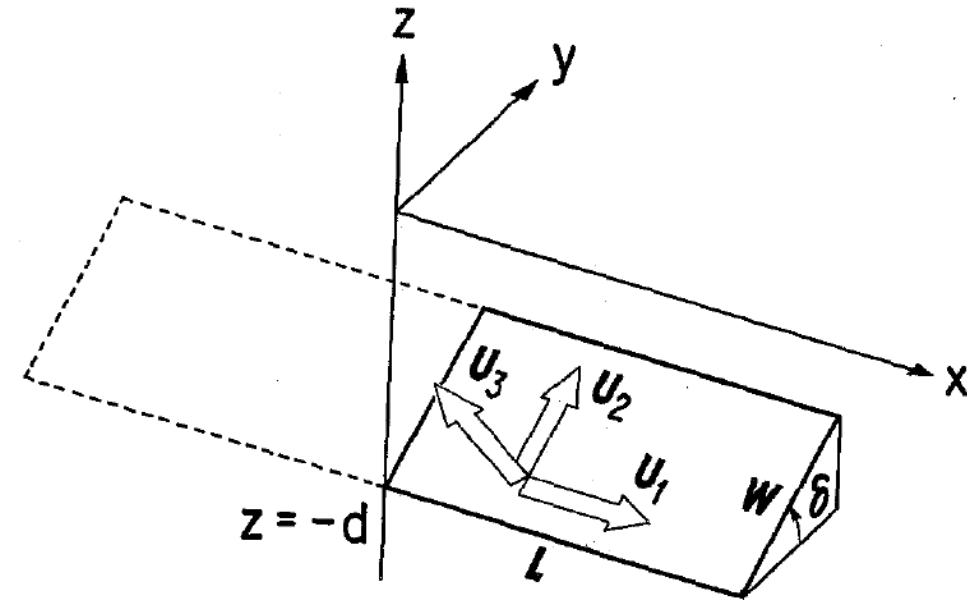
model 1/4

- GSN broadband waveforms
- 17 teleseismic broadband P waveforms
- 10 broadband SH waveforms
- 30 long-period surface waves
- teleseismic waveforms
- local 37 GPS stations

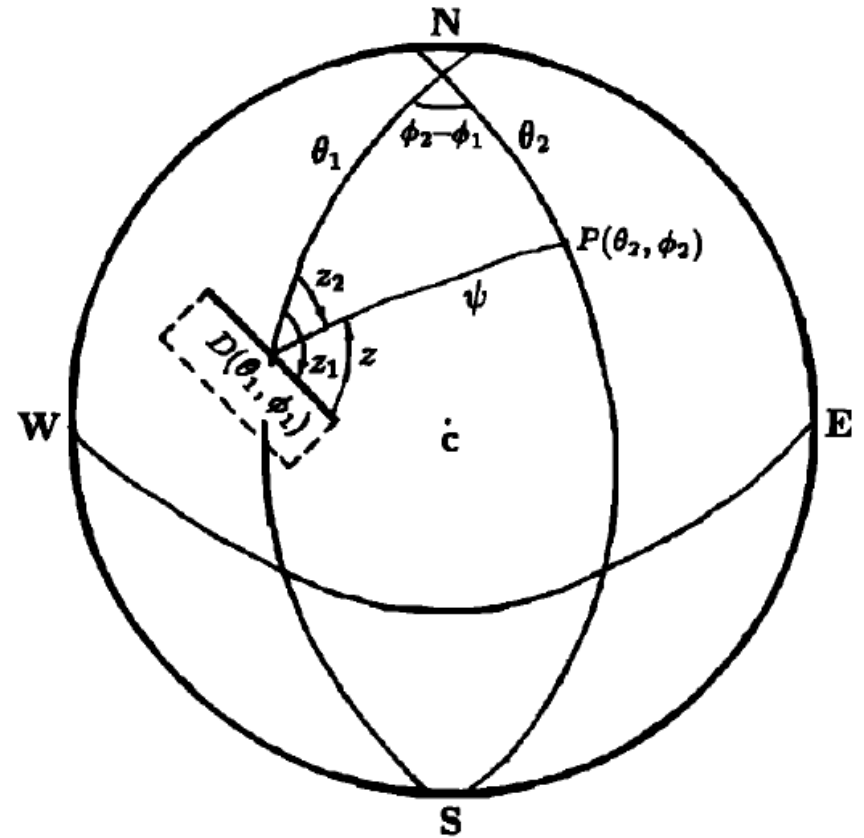
	subfaults	Cell-size	Strike	Dip	Slip
a	21x8	15*15 (km)	229°	33°	9m
b	31x5	20*10 (km)	225°	39°	7m
c	3 pieces	14*8 (km)			12.5m



model 2/4



half-space Okada, 1985



spherical Sun et al. 1996

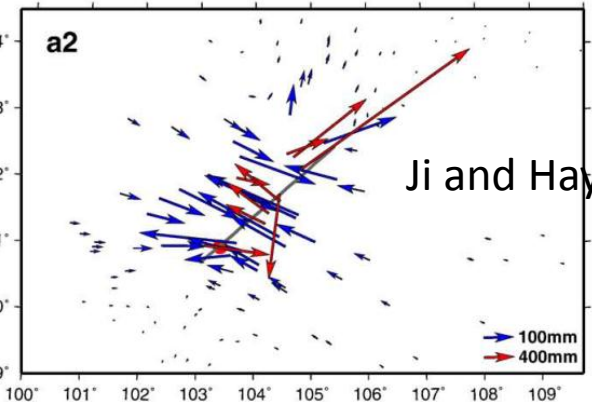
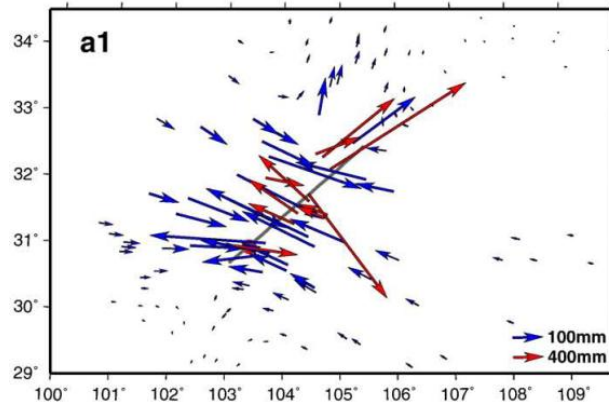
model 3/4

Horizontal result

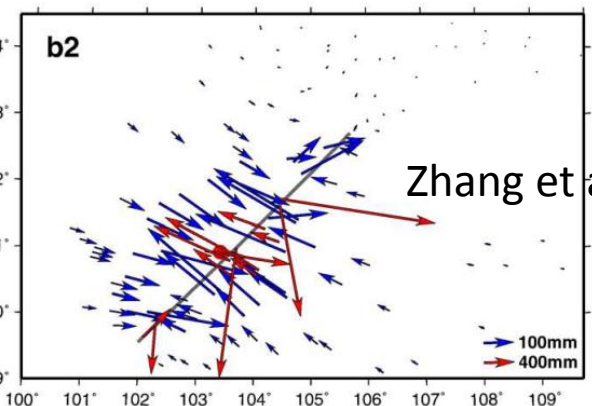
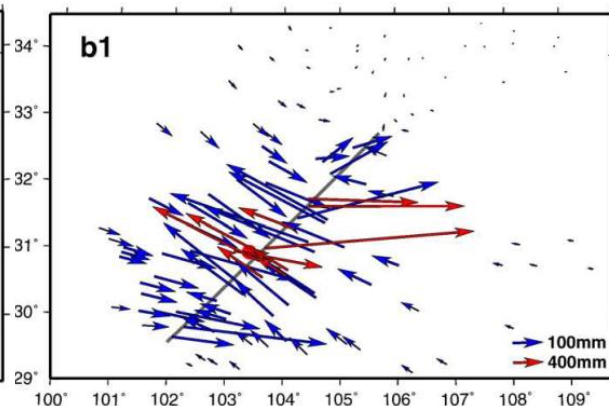
observation

half-space

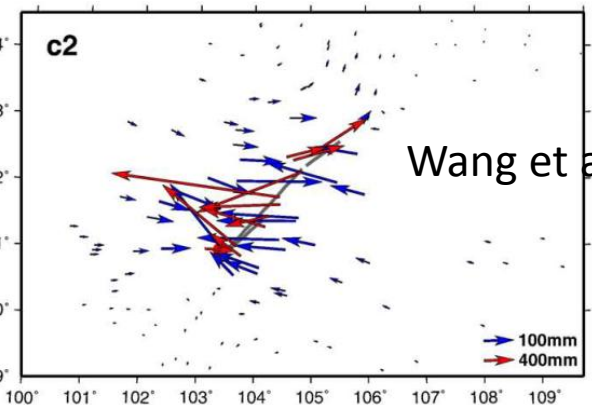
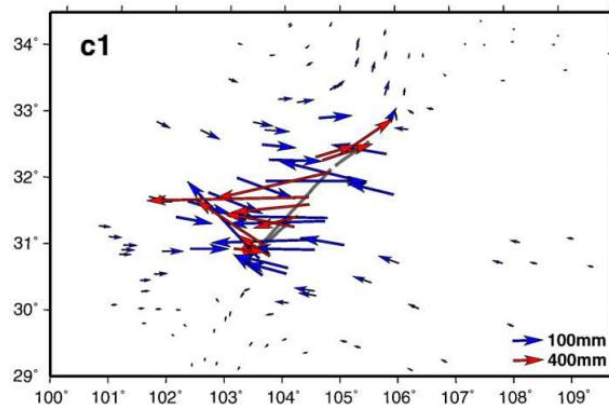
spherical



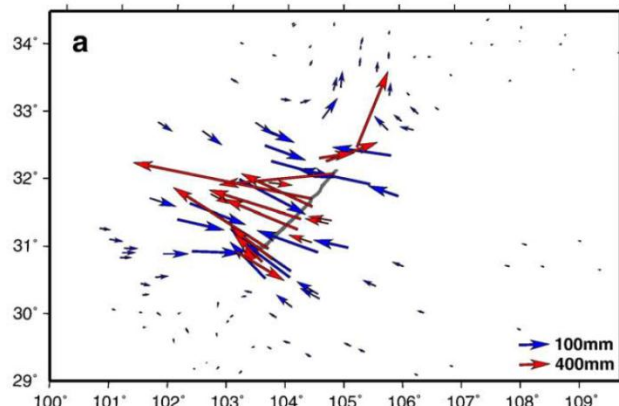
Ji and Hayes



Zhang et al



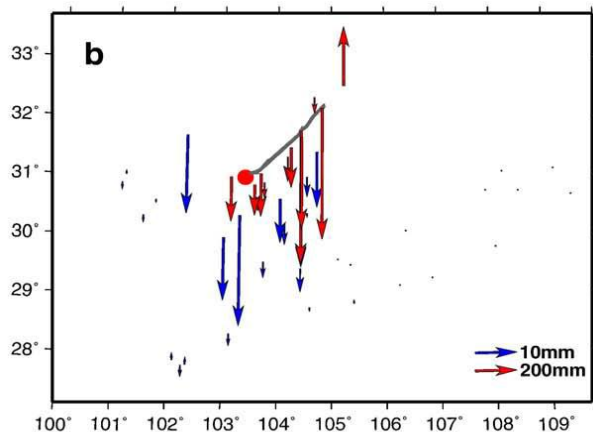
Wang et al.



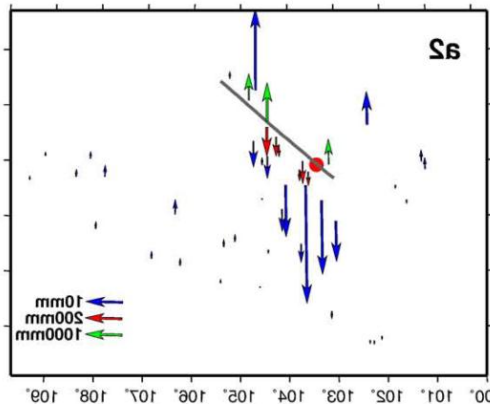
model 4/4

vertical result

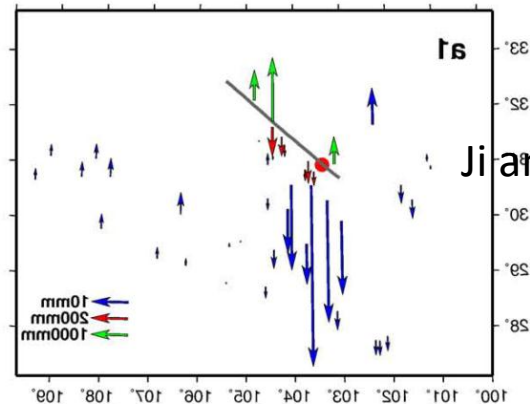
observation



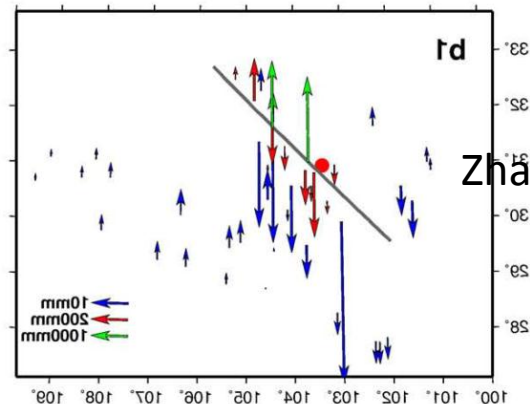
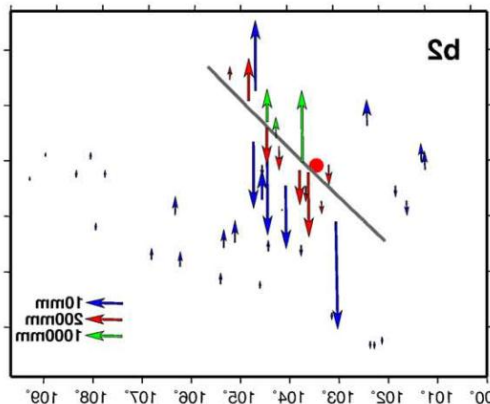
half-space



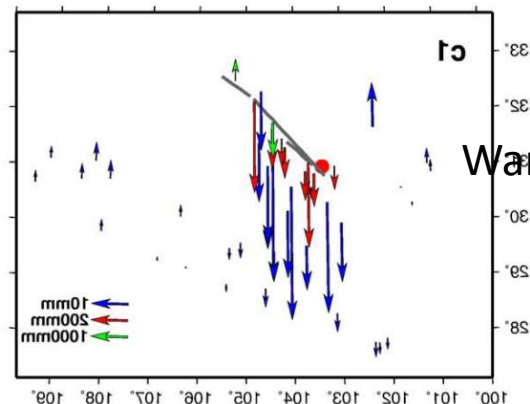
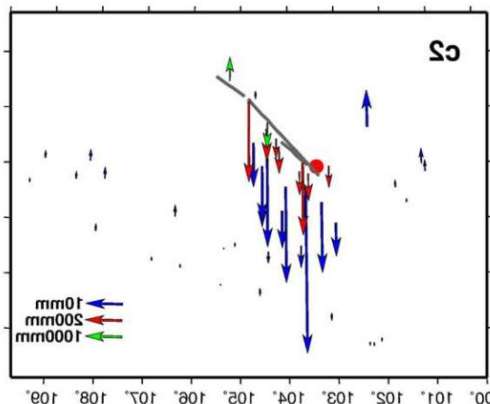
spherical



Ji and Hayes



Zhang et al



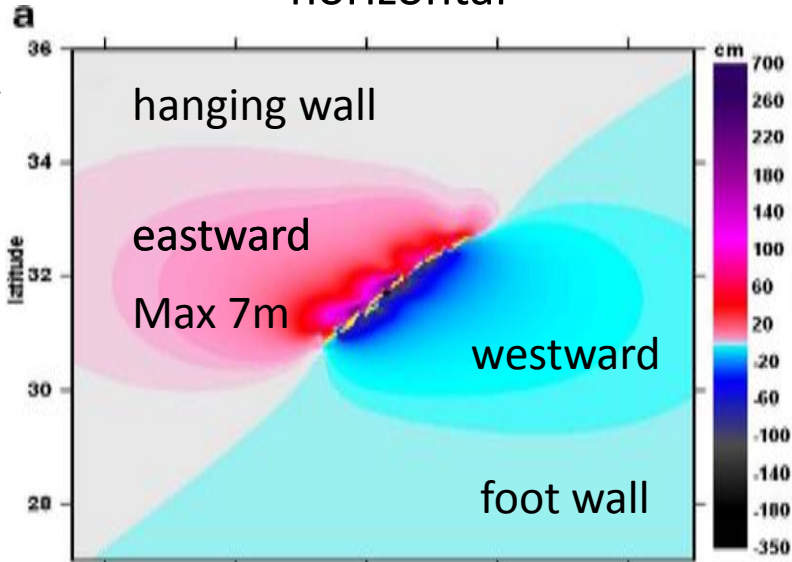
Wang et al.

Summary

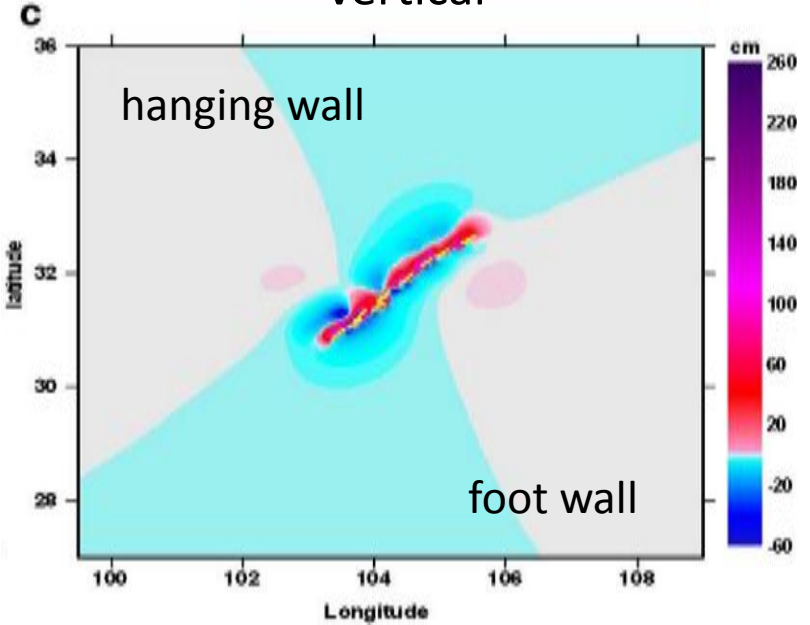
- Fault model constrained by local geodetic observations is better than the model only from seismic waveform data.
- Dislocation theory for a spherical earth model is better than that for a half-space earth model.

Compute co-seismic deformations

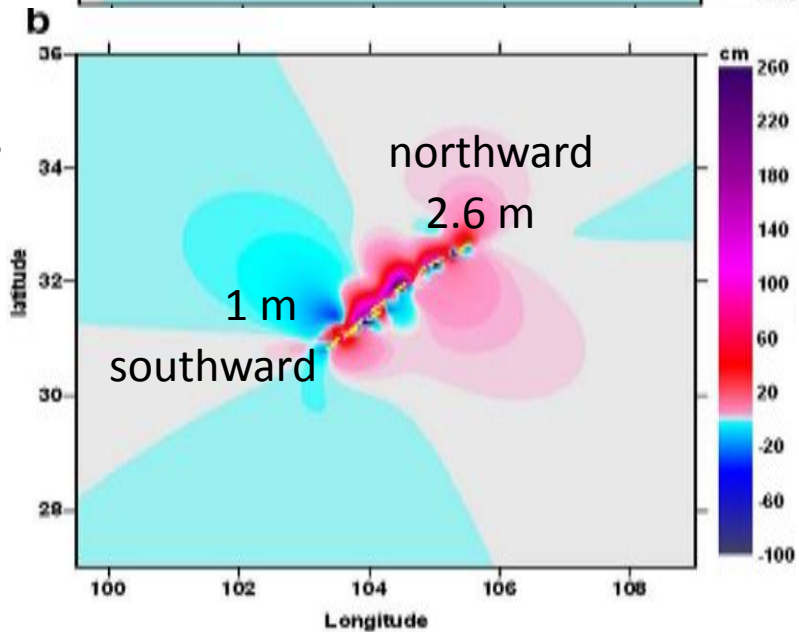
horizontal



vertical

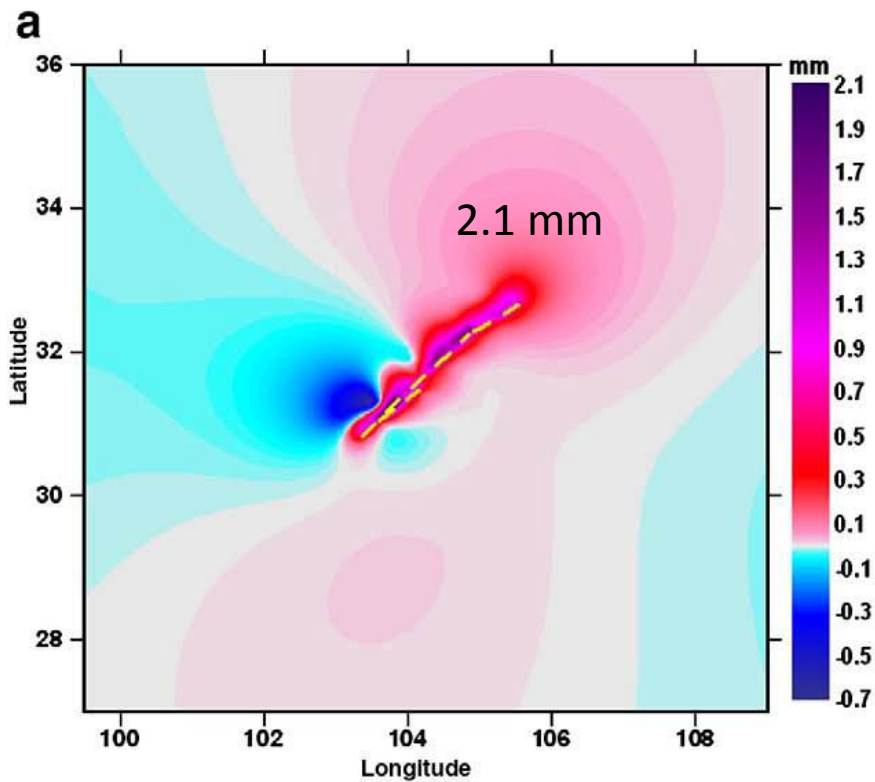


NS

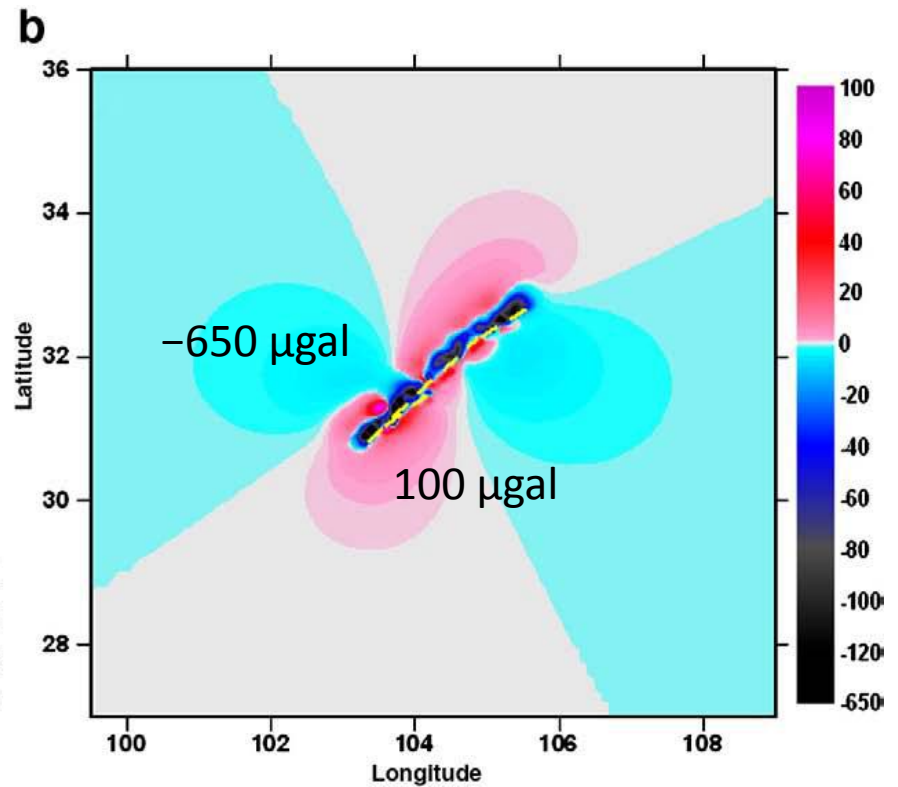


Compute co-seismic deformations

geoid



gravity



Conclusions

- Spherical theory is better than the half-space theory indicating that the effects of the curvature should be considered, especially for such a large seismic event.
- The spatial distributions of the crustal deformations, which are useful for inverting seismic faults and studying the interior structure of the earth.
- Discussion is based on spherically symmetric earth model which is not represent the lateral heterogeneity of the crust and upper mantle structures. An effort to consider the lateral heterogeneity (3D structure) deserves special study in the future.