

- ① Multi-track InSAR time series analysis
- ② Coastal subsidence in Shenzhen, PRD
- ③ Conclusions

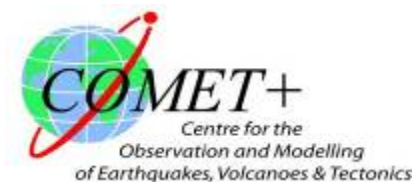
InSAR Reveals Coastal subsidence in the Pearl River Delta, China

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❑ Most of the world's deltas are suffered by SLR and land subsidence

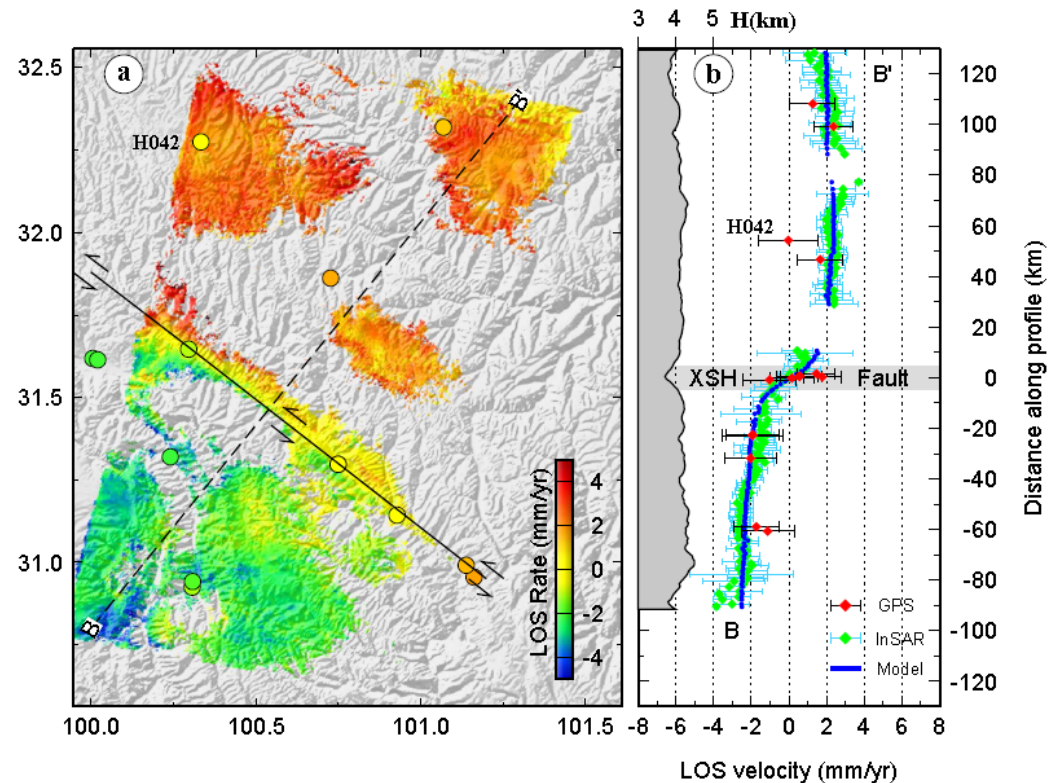
Sinking hole in Shenzhen



- ❑ Most of the world's deltas are suffered by SLR and land subsidence
- ❑ “National Land Subsidence Protection”(2011-2020) Launched

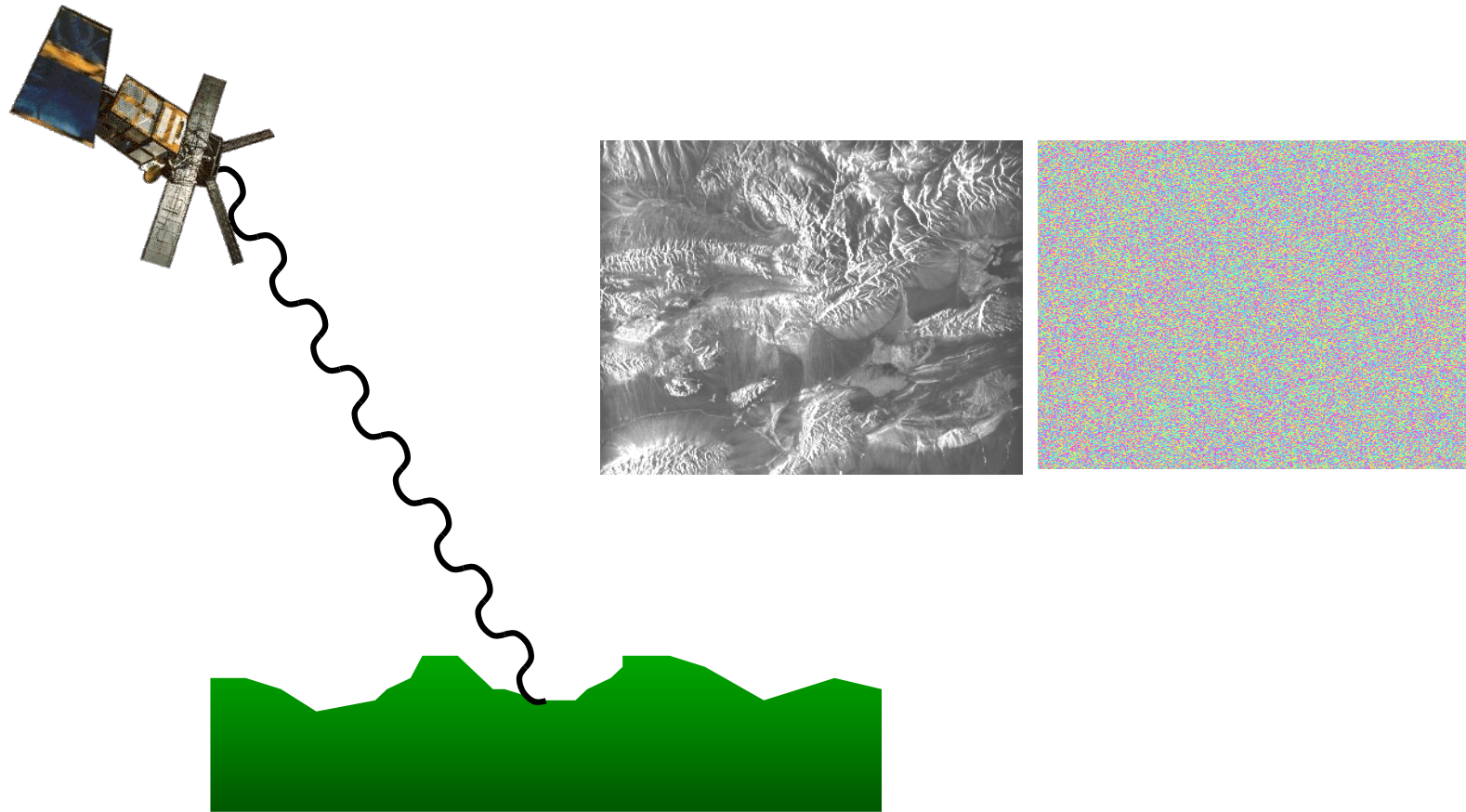
Why use InSAR ?

- ▶ None in-situ measurements
- ▶ High Accuracy (mm)
- ▶ High Resolution (m)
- ▶ Large-Scale (100s km)
- ▶ Long-term archived data



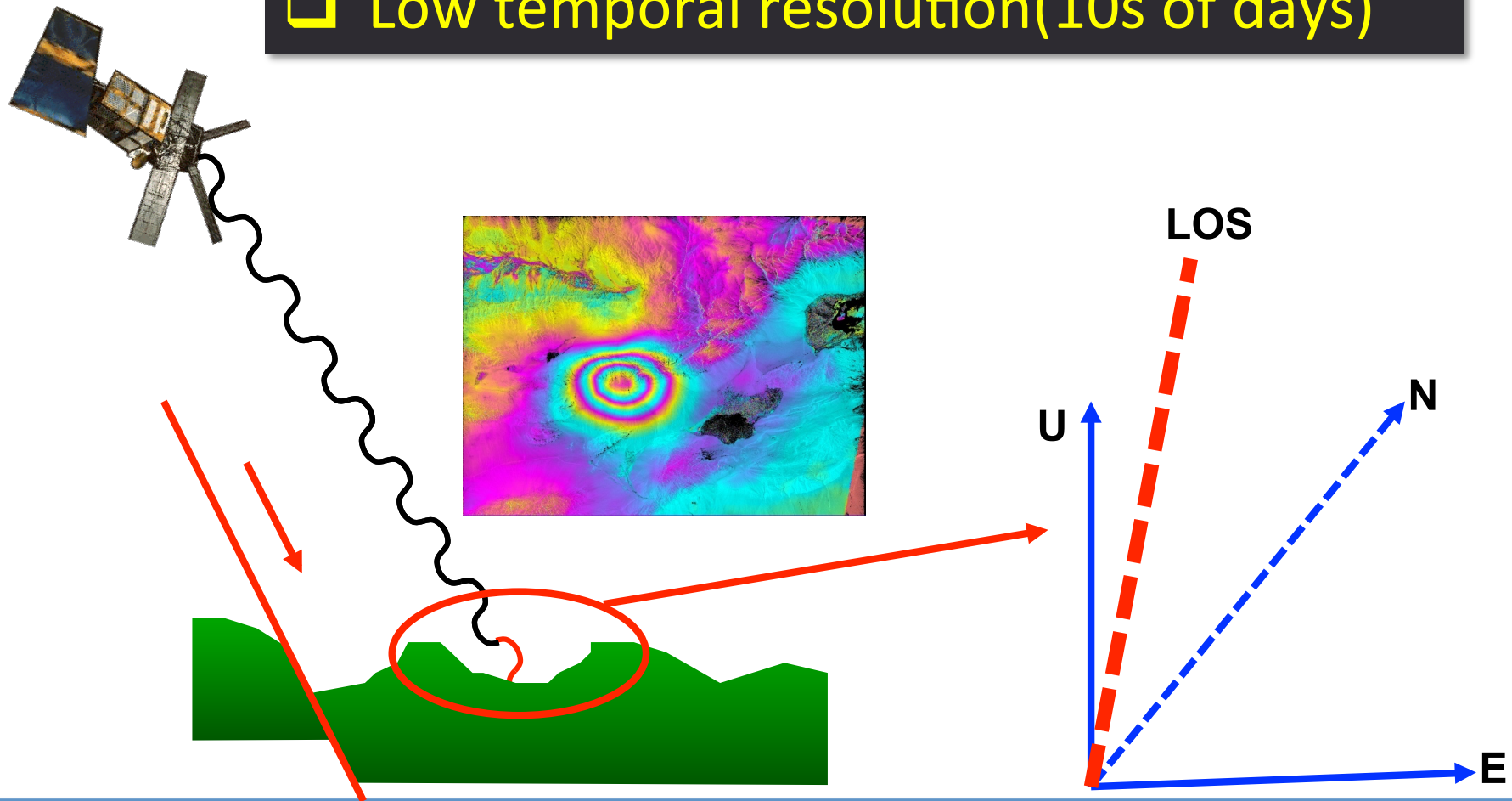
Wang et al., 2009, GRL

1-D (LOS) measurement of InSAR



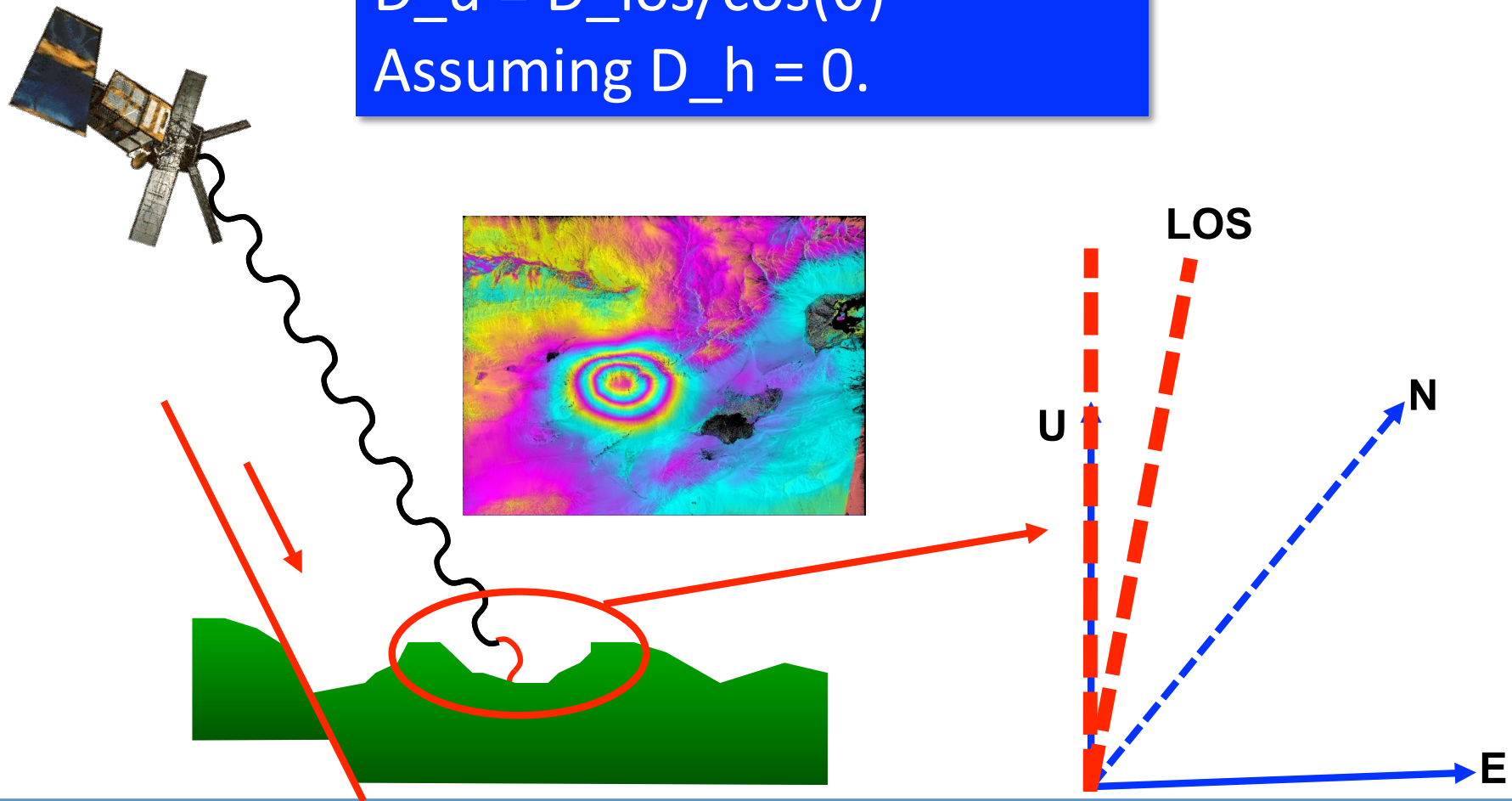
1-D (LOS) measurement of InSAR

- ❑ Variable incidences
- ❑ Low temporal resolution(10s of days)



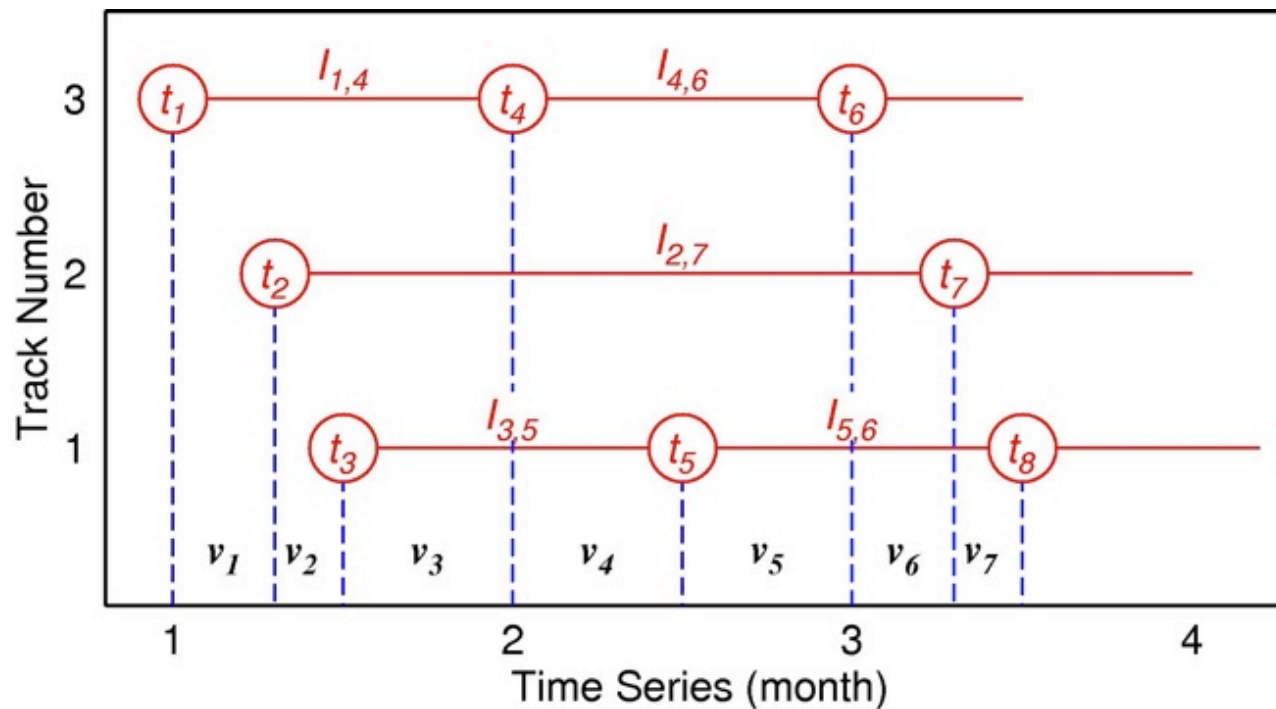
Multi-track InSAR time series

For subsidence monitoring,
 $D_u = D_{los} / \cos(\theta)$
Assuming $D_h = 0$.

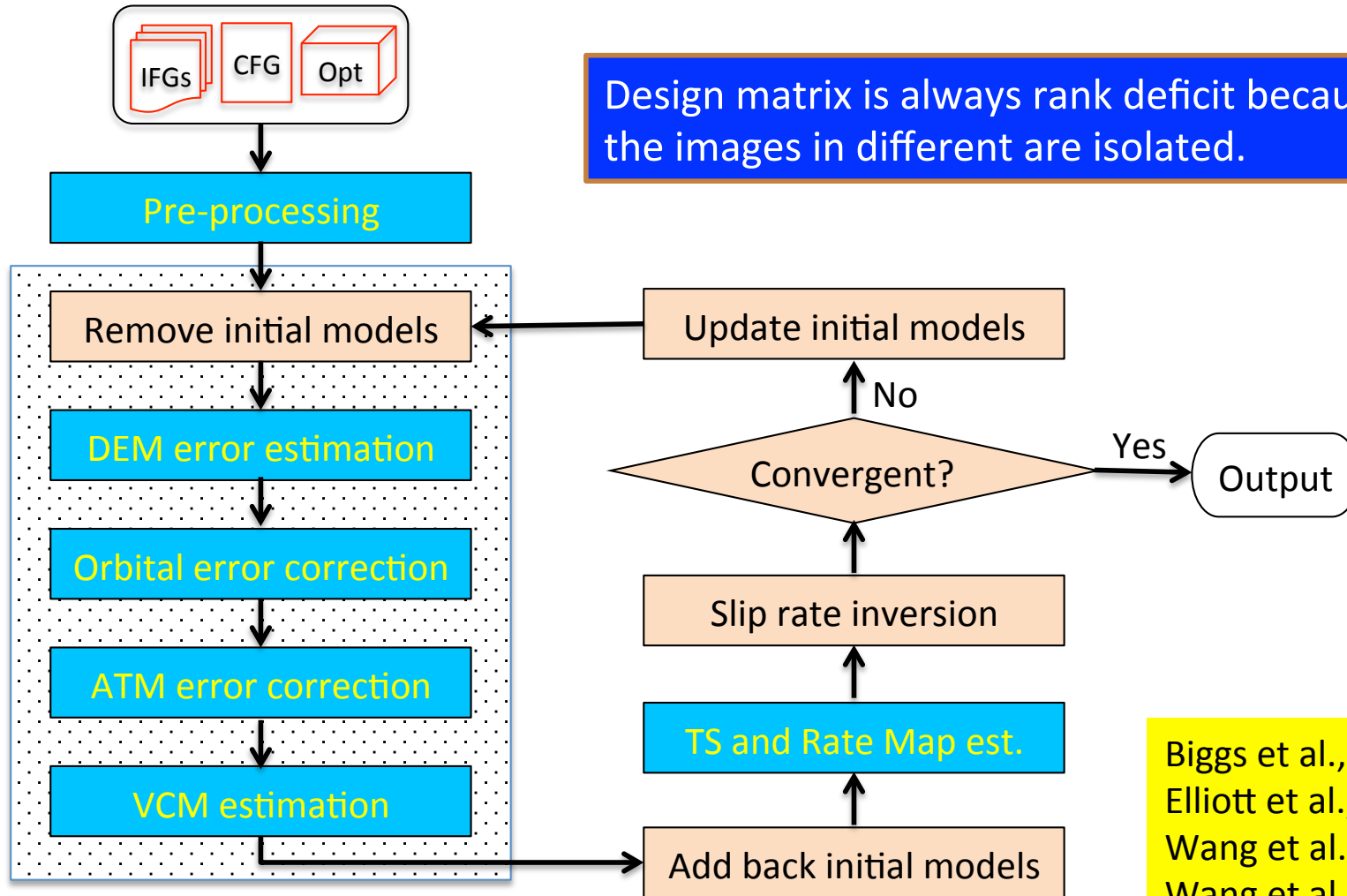


Multi-track InSAR time series

- Coregistration to a single DEM
- Displacements projected from LOS to vertical
- Time series analysis by combining data in all tracks

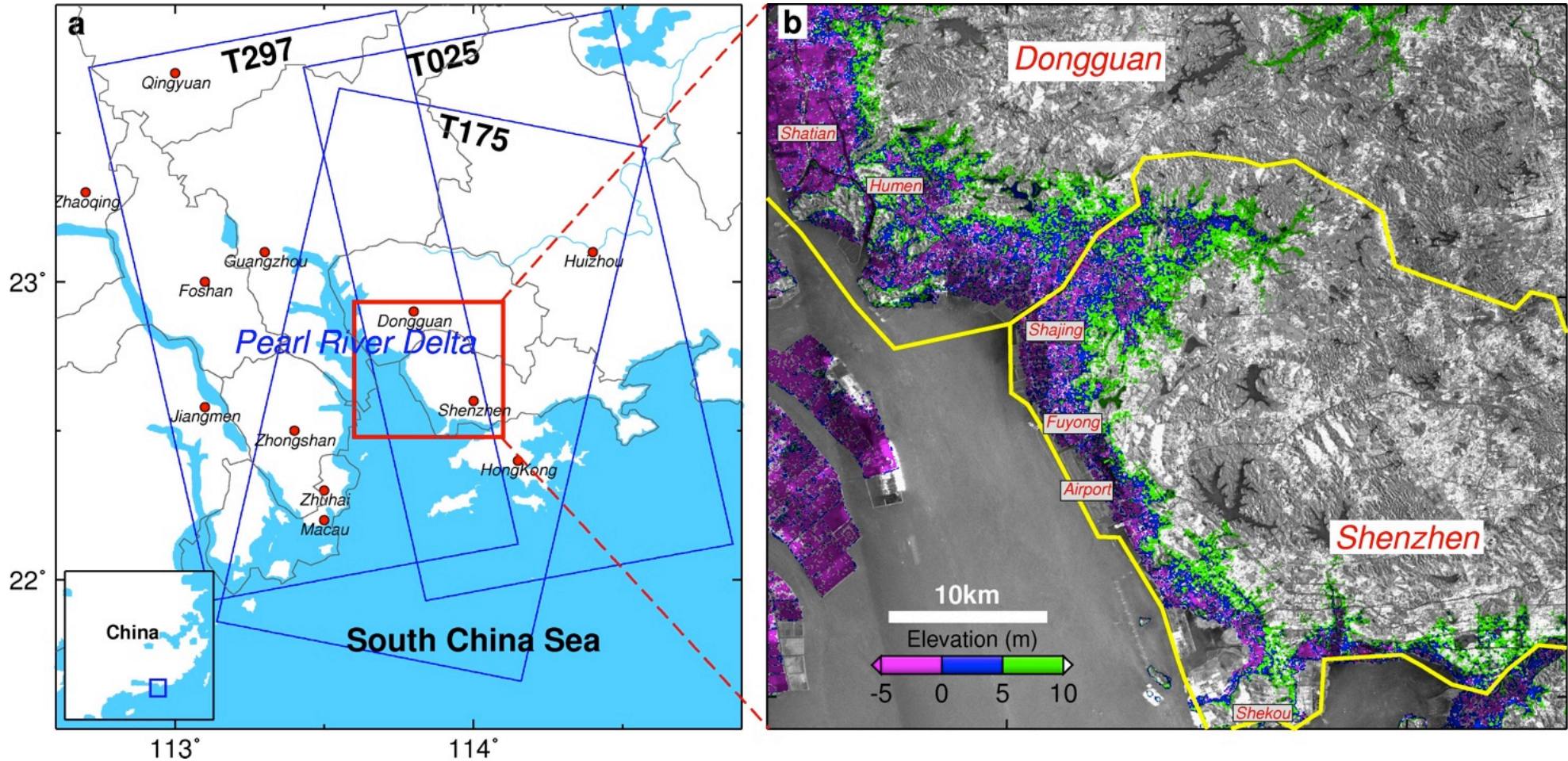


Implemented in Pi-RATE

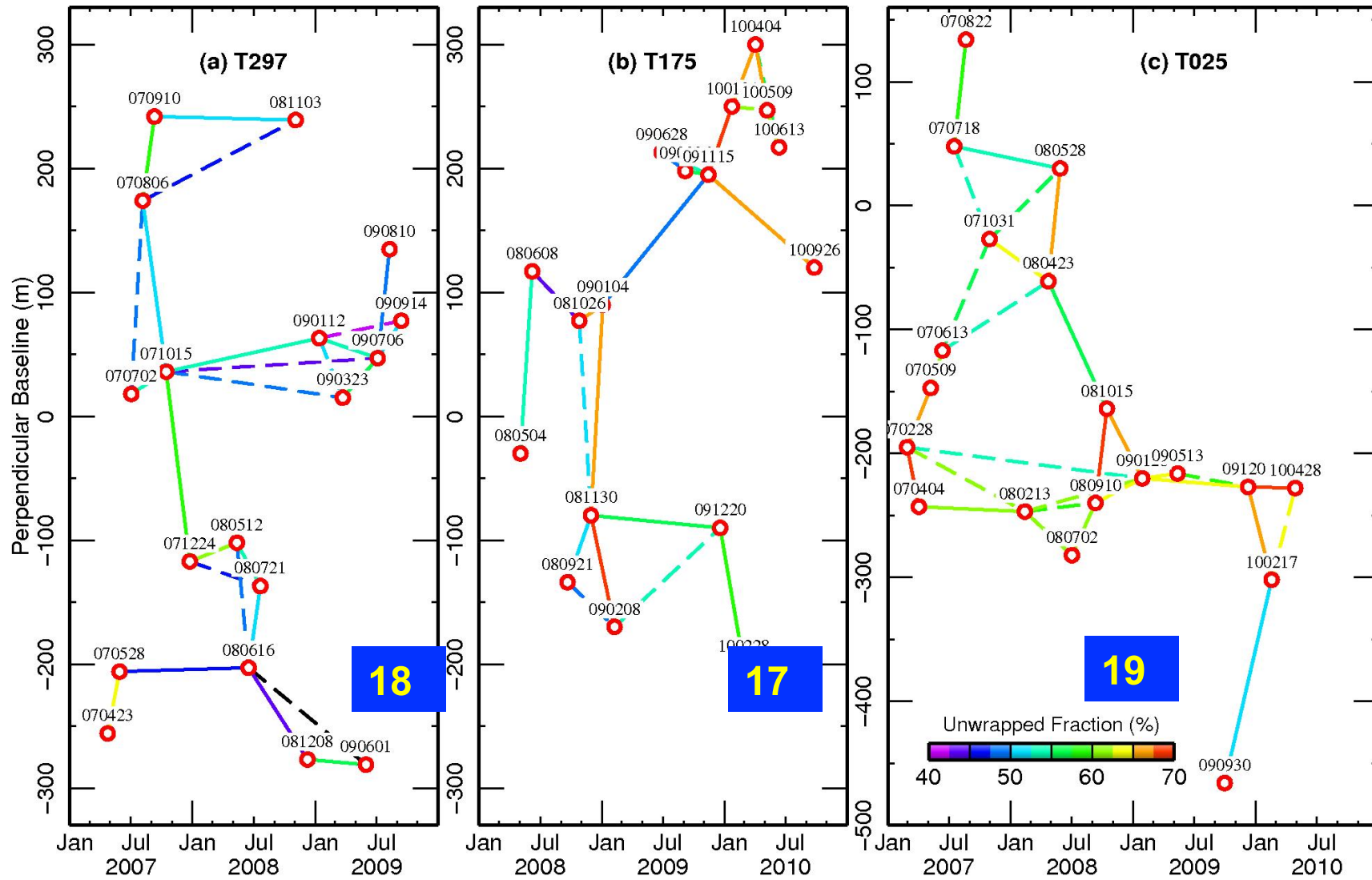


Biggs et al., 2007, GJI
Elliott et al., 2008, GRL
Wang et al., 2009, GRL
Wang et al., 2012, GJI

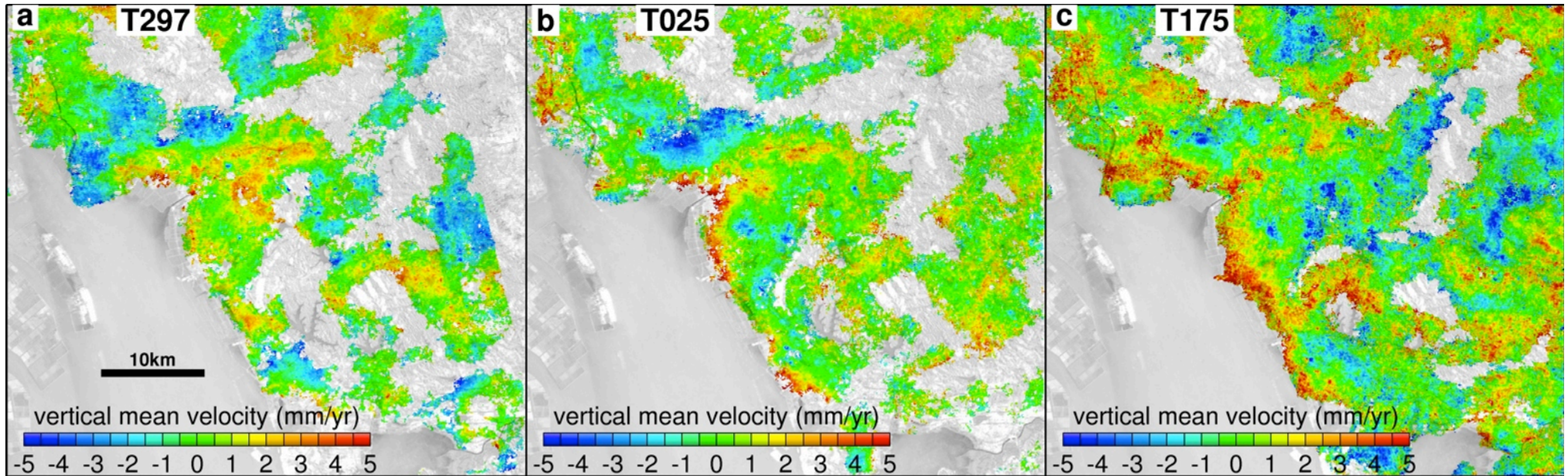
Shenzhen-Dongguan map



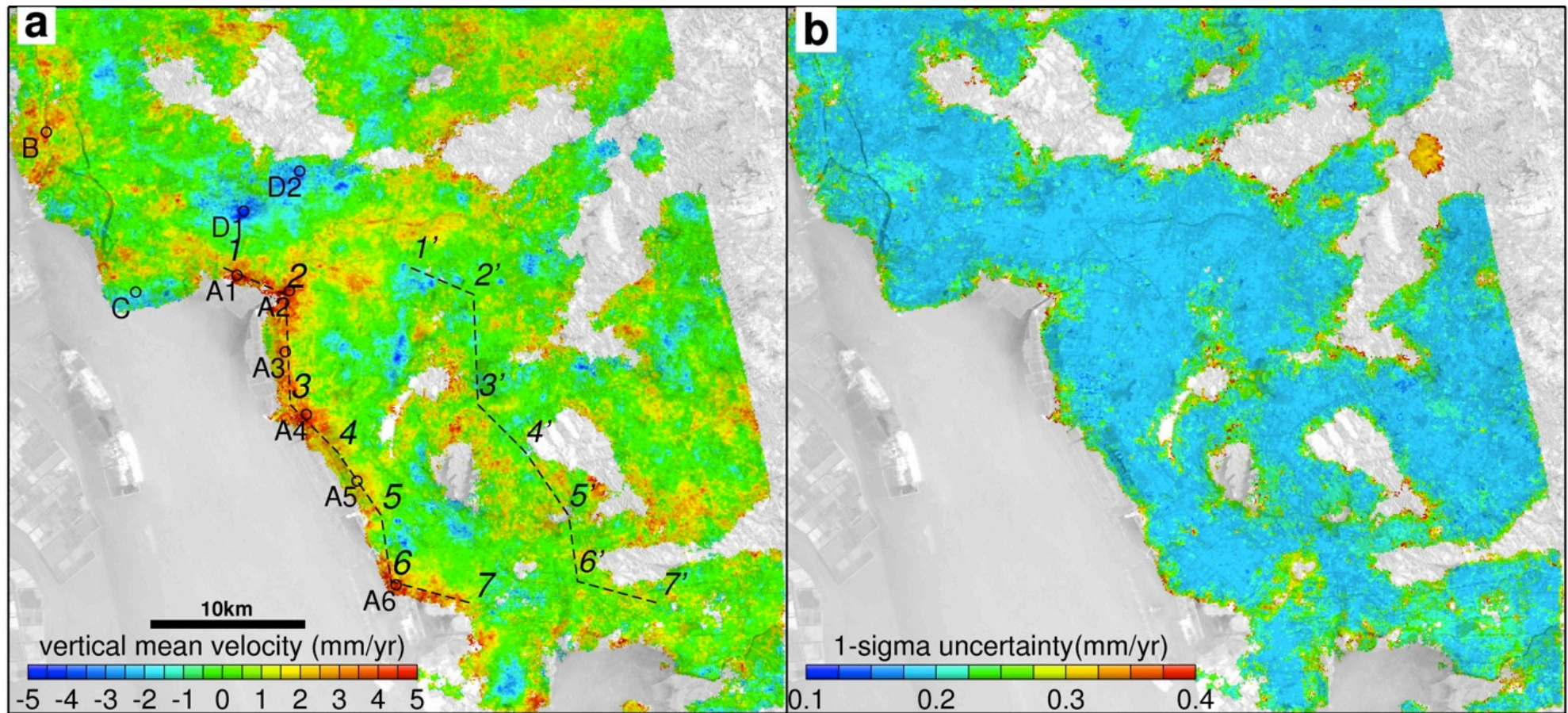
Baseline plots



Rate map for each orbit

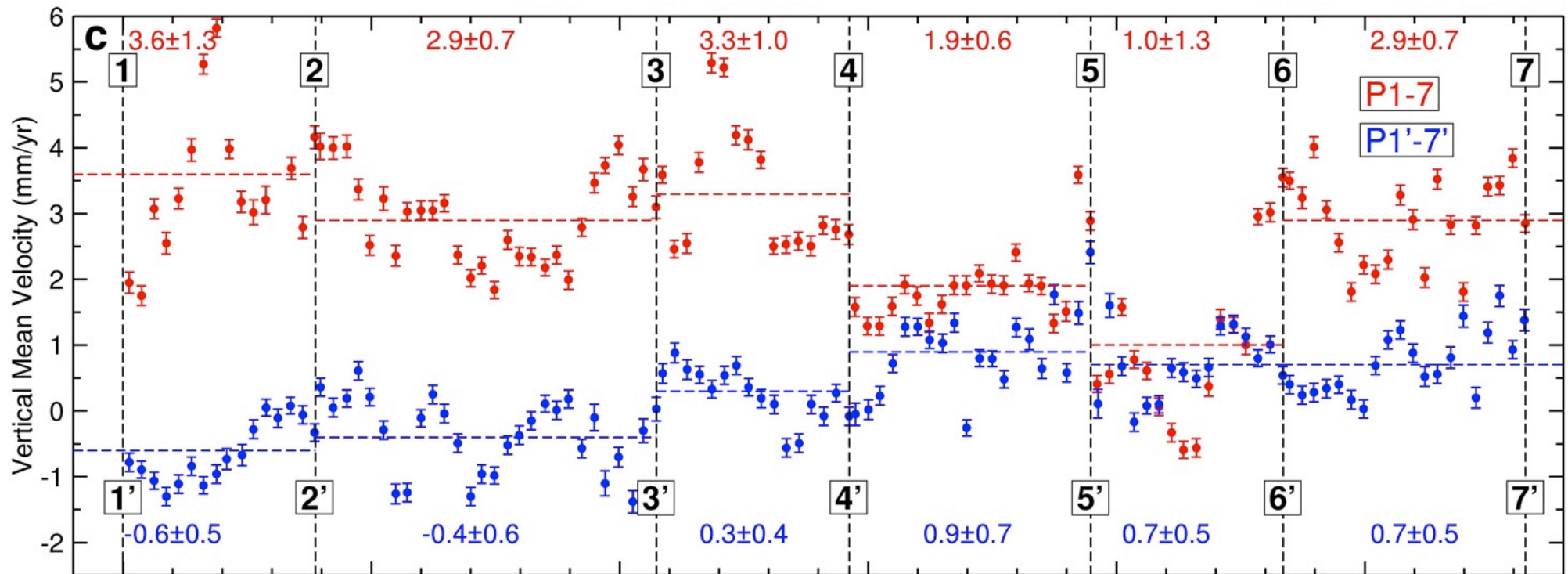
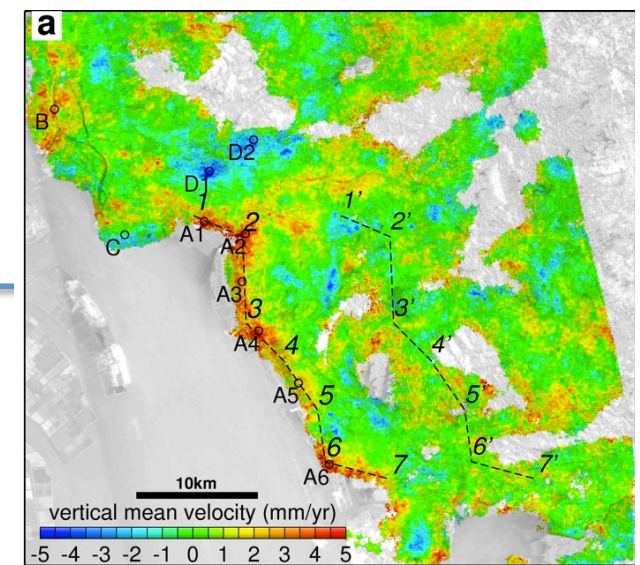


Rate map from multi-track processing



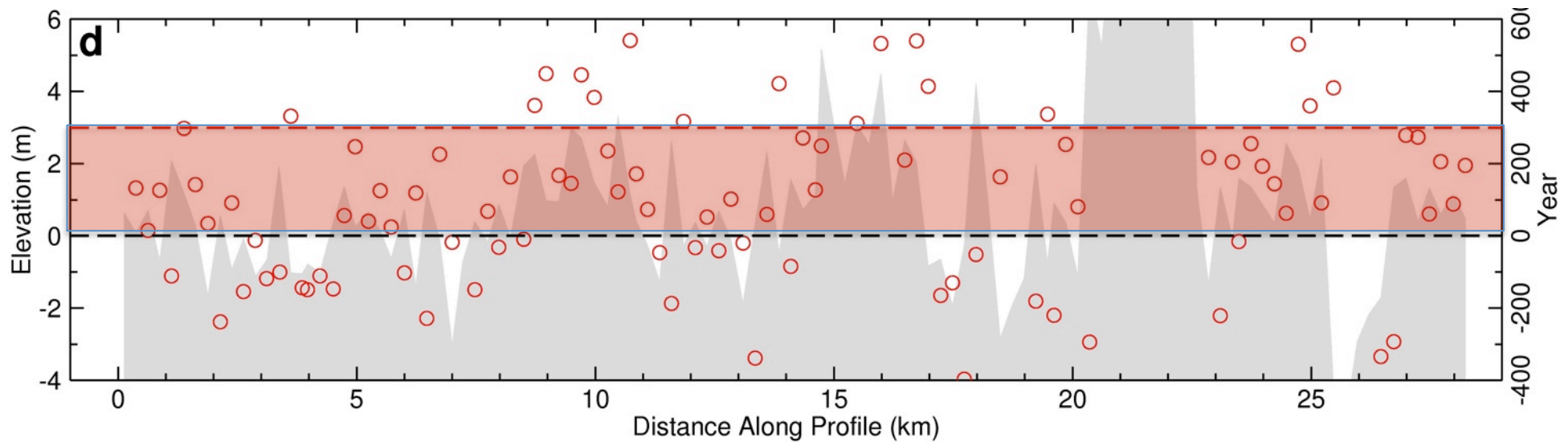
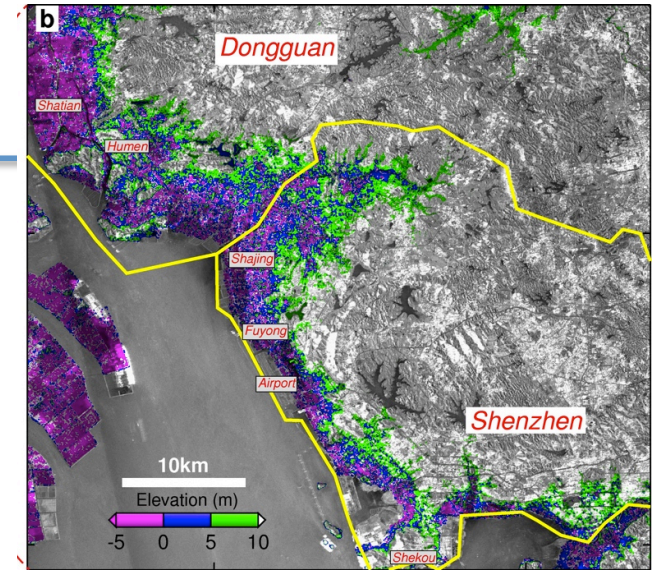
Profiles

- Mean subsidence rate of 2.5 mm/yr

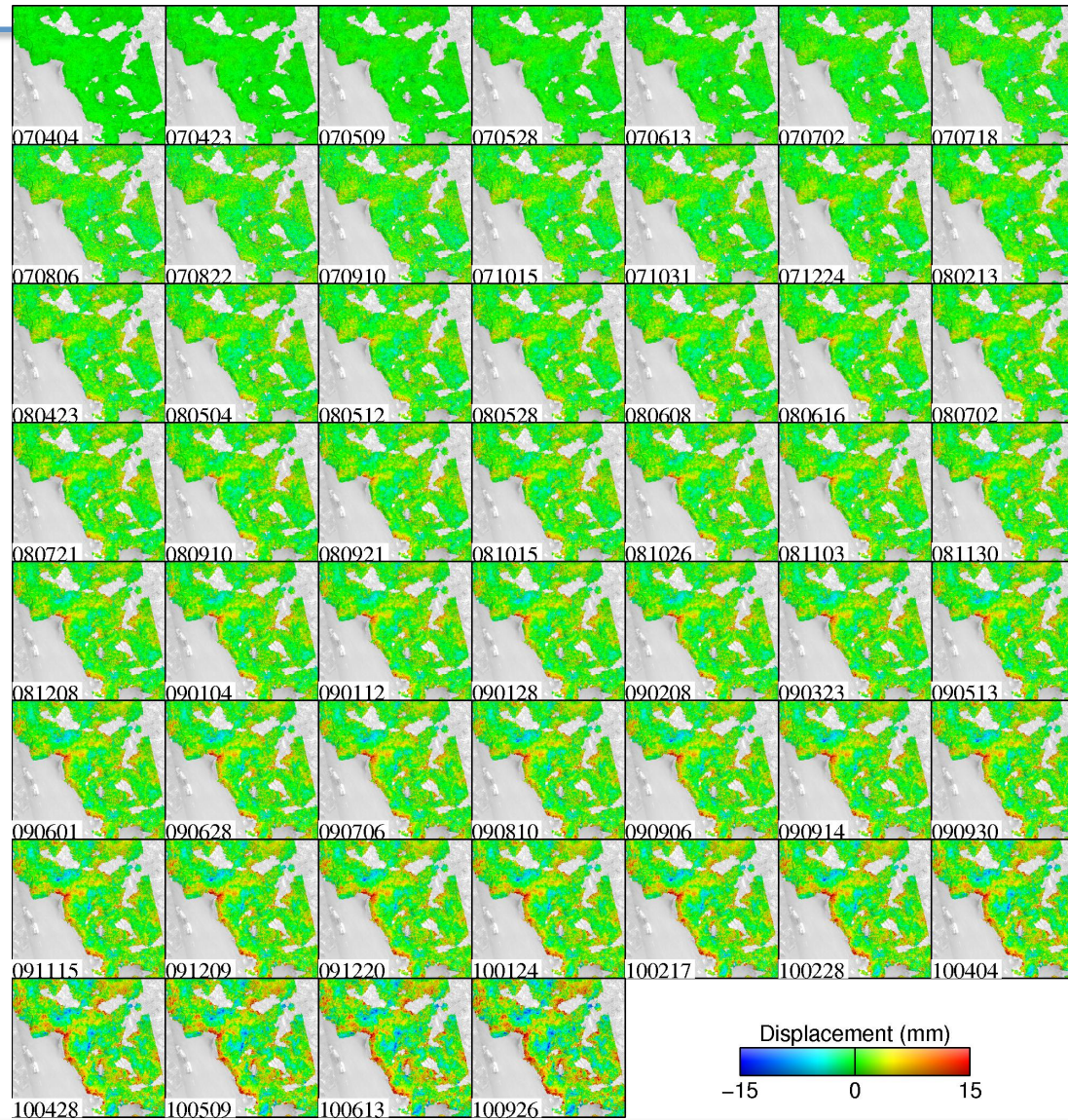


SLR and Land subsidence

- Global sea-level-rise of 3 mm/yr

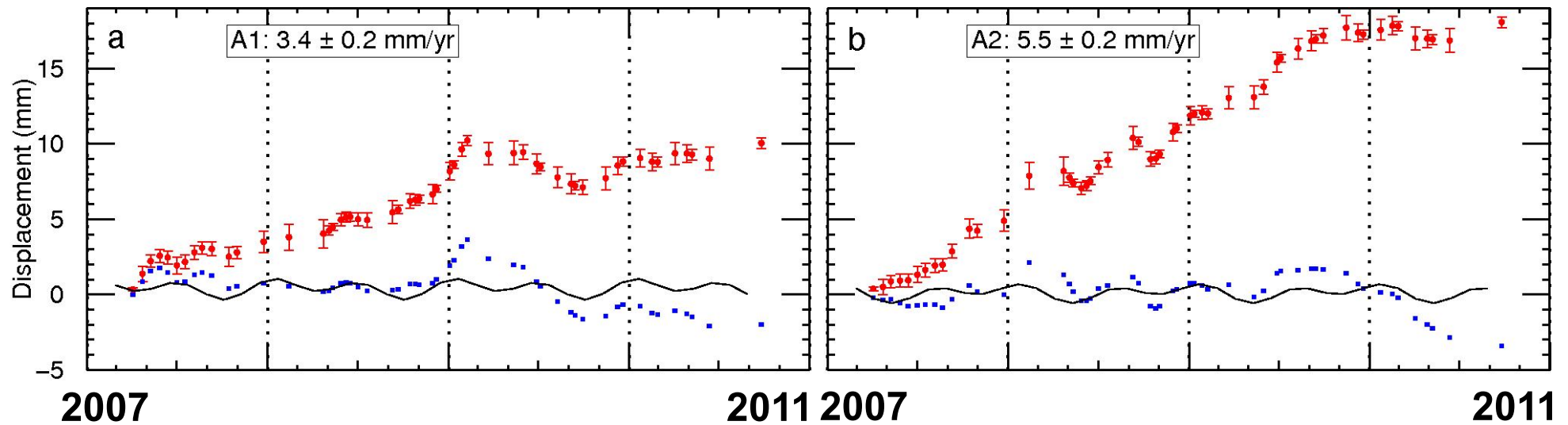
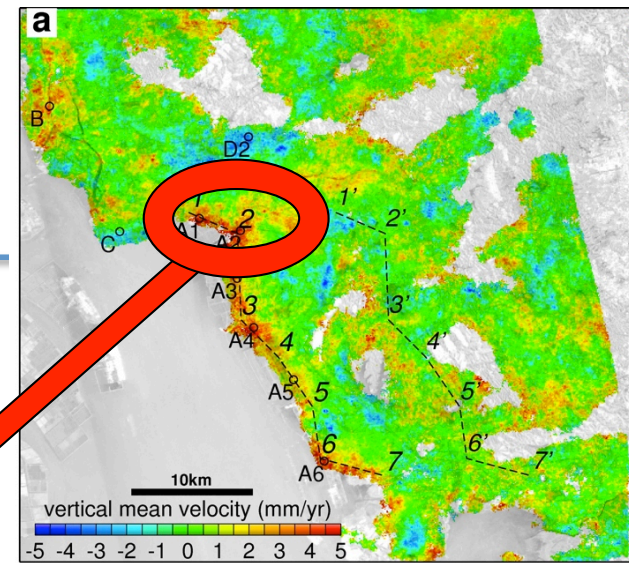


Time series



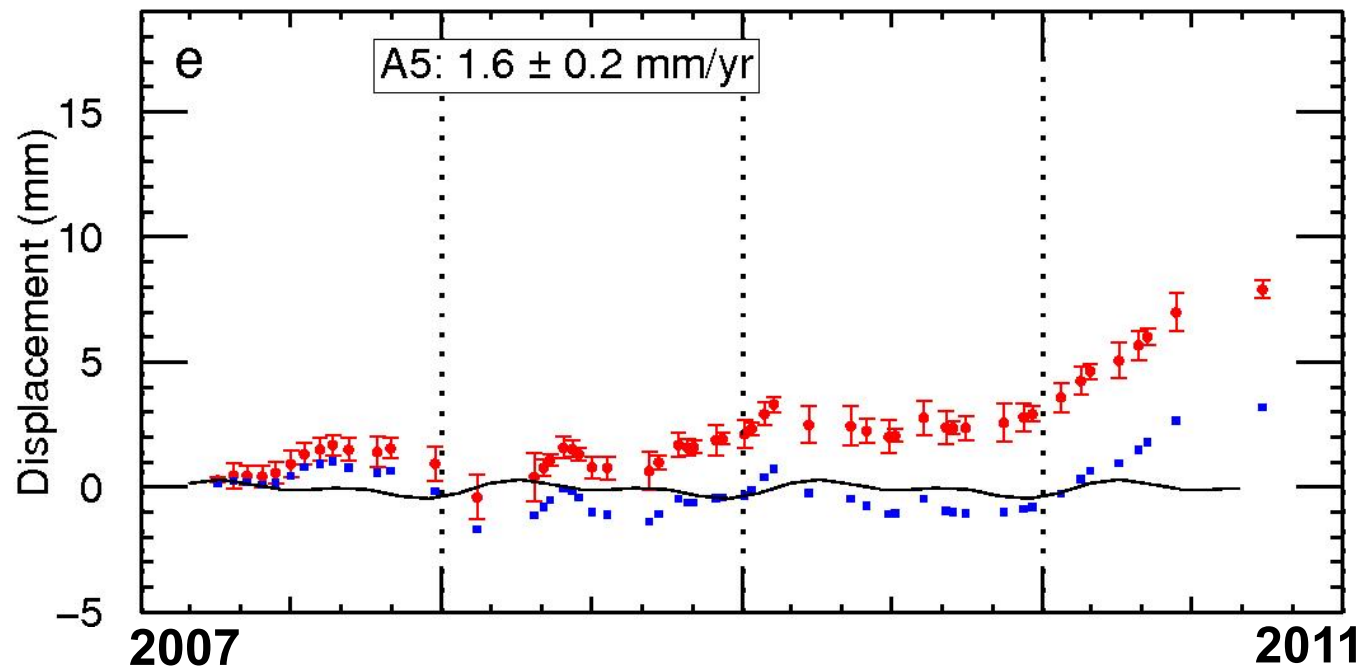
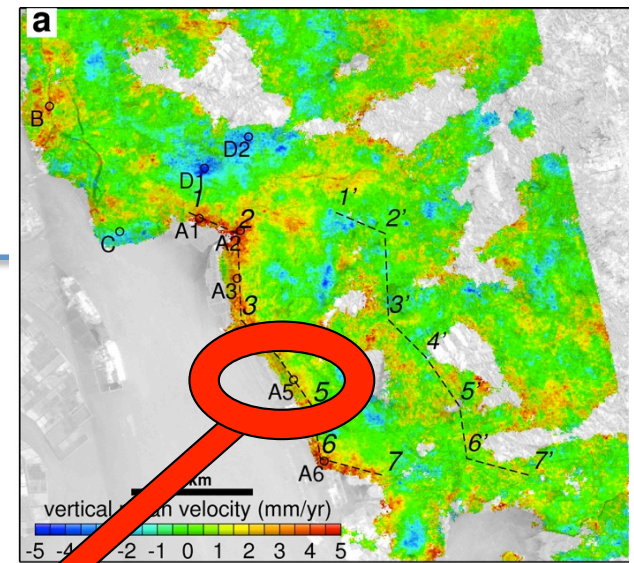
Time series

Shenzhen Binghai New Town (Shajing)



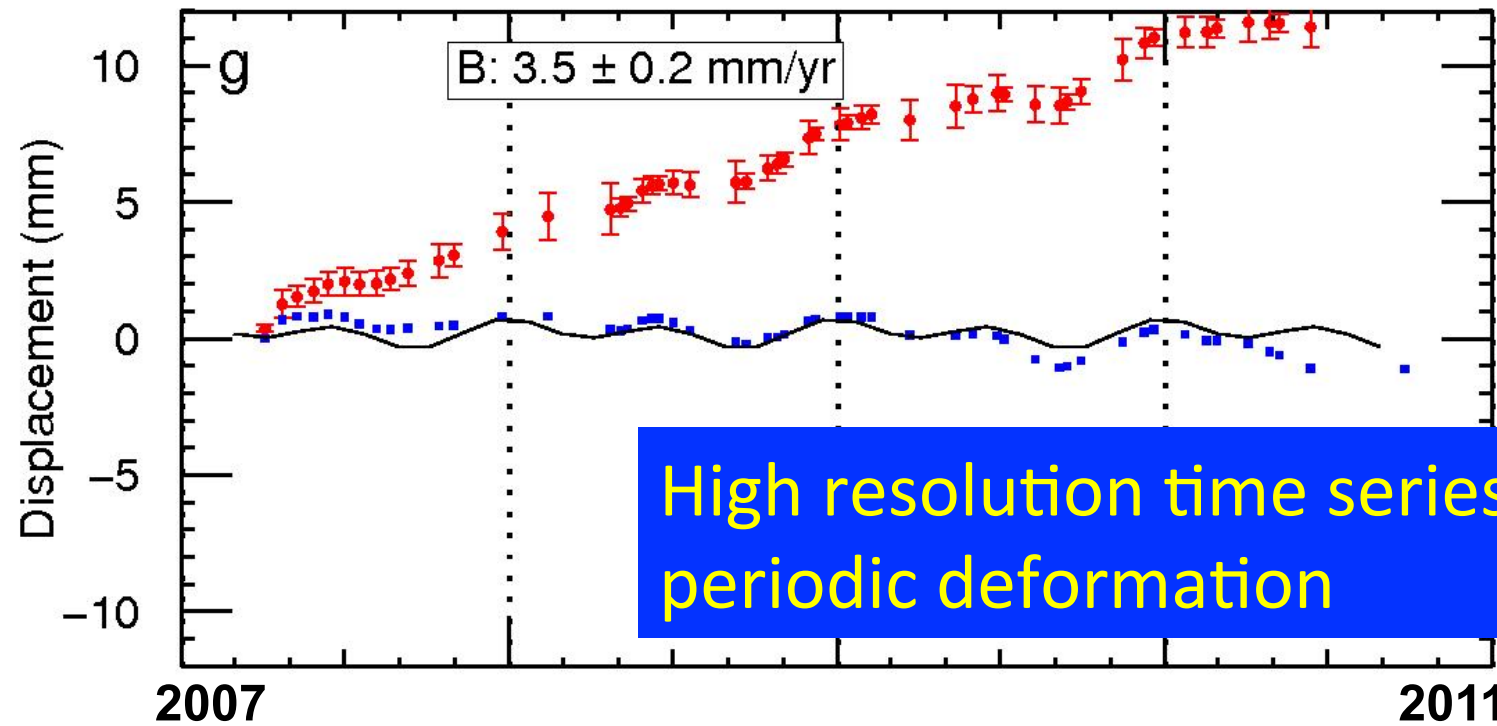
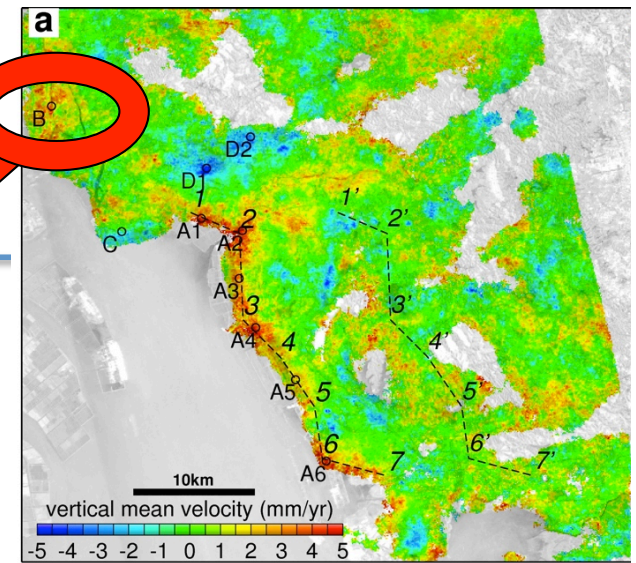
Time series

Shenzhen Bao'an International Airport



Time series

Dongguan
Shatian



High resolution time series indicate periodic deformation

Conclusions and future work

- Multi-track InSAR time series analysis can improve temporal resolution and accuracy
- InSAR results reveals coastal subsidence in Shenzhen (max: 6-7 mm/yr, mean: 2.5 mm/yr)
- InSAR results show land subsidence rate of 2-4 mm/yr in Dongguan due to soft layer compaction
- Daily time-series are expected using multi-track processing by combination of multi-satellite data

