InSAR partially coherent targets: multiplicity of approaches

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We need to consider partially coherent targets in time / space / seasons / ...

(1) The territory

Rapid (and wild) industrialization
Urban verticalization
Complex topography
Variety of rural scenarios
Desert areas
Deep vegetation
Changes in time
Changes in seasons

Background: The Chinese case

Shenzhen in '70s
Shenzhen now
Hong Kong
Tibetan Plateau
Rice paddies
Taklamkan desert

Tianjin

Desert areas
Deep vegetation
Changes in time
Changes in seasons
Background: The Chinese case

(2) The (available) DATA

Number of images
Revisit time
Total time span
Orbital tube
Resolution
Wavelength

ERS-Envisat
ALOS
TerraSAR-X
Cosmo SkyMed

Different coherence performances in space and time
Background: The Chinese case

(3) The (available) HARDWARE

No processing power to count on...
Background:

The Chinese case meets the POLIMI experience

Which parameters to play with in order to cope with terrain and data variety?

\[
\sum_{(i,k)} \gamma_{p}^{i,k} e^{j(\Delta\phi_{pq}^{i,k} - \Delta\phi_{Model}^{i,k})} \\
\]

Processing weights

Delaunay Graph

PSC Graph

Redundant Graph

"Flowered tree"
Tibet: distributed scatterer

Coherence matrix

Tibet: seasonal scatterer

Coherence matrix

Hong Kong: temporary target

Amplitude incoherent Mean

Amplitude changes matrix

Amplitude time series
1st case study: Shanghai with Cosmo data
2nd case study: Hong Kong Government project

Hy(S)Q/007/2011 - Research on SPPST in Ground Settlement Monitoring
Hong Kong with TerraSAR data: study and test of CR’s

Cheap, light, easy to carry, easy to mount, resistant to HK weather,

...and: temporary.
Analysis that includes temporary PS's

Hong Kong with TerraSAR-X data

PS's Height w.r.t local DTM
Hong Kong with TerraSAR-X data

ID: 169765
Ellipsoidal Height (WGS84) [m]: 33
Res. Height [m]: 15.8
Velocity [mm/year]: -14.1
Displ. to Temp. Rat. [mm/degC]: 0.04
Temporal Coherence: 0.33
Sample: 0667, Line: 4632

by SARPROZ (c)
Directions: To here - From here
3\textsuperscript{nd} case study: Tianjin with TerraSAR and ALOS data

Height w.r.t DTM

Power lines in TSX PS's
4th case study: Tibet with Envisat and ALOS data

Partially coherent targets, 11 images, 30 interferograms

The residual DEM

The movement

Optical data
Conclusions (1)

We can use different approaches depending on:
- Terrain properties, Available data, Target of the estimate

By studying partially coherent targets, options are:
- Images graph, PSC graph, strategies for weighting

The more complex a case, the stronger the impact of the chosen strategy
In a complex case, results provided by partially coherent targets need to be carefully interpreted.
Conclusions (2)

China offers a huge quantity and variety of interesting cases

After 2 years, several projects are starting and I can finally open some positions in ISEIS, Chinese University of Hong Kong:

1 position as research assistant/postdoc

1 position for a PhD student starting in half 2012
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