ESA - MOST Dragon 2 Programme

2011 DRAGON 2 SYMPOSIUM

中国科技部-欧洲空间局合作 "龙计划"二期

"龙计划"二期2011年学术研讨会

Multi-temporal InSAR analyses in China

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Dragon project ID 5297
TOPOGRAPHIC MEASURAMENT

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Prof Daniele Perissin, Prof Fabio Rocca, European PIs
Prof Deren Li, Prof Mingsheng Liao Chinese PIs

Young scientists in Milan:
Teng Wang, Guido Gatti, Zhiying Wang

In situ surveys and visits in Wuhan and Three Gorges area
Double PhD program Wuhan-POLIMI

Some works carried out in the past…
Urban sites subsidence monitoring:
Tianjin, Shanghai, Badong
Structure stability:
Three Gorges (Dam), Shanghai and Tibet (Railway)
DEM estimation:
Zhangbei (ASAR), Tibet (ALOS)

The current InSAR analysis over the Chinese territory carried out by our group:

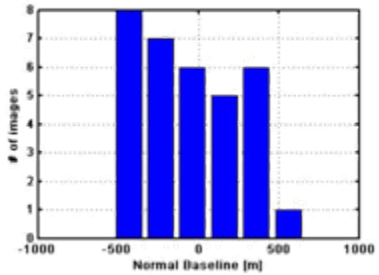
-URBAN monitoring
(Shanghai and Hong Kong)

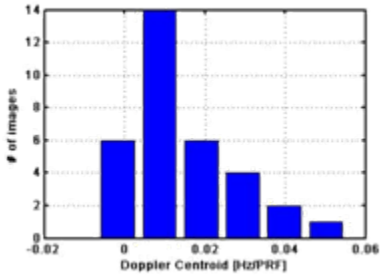
-EXTRA-URBAN analysis
(Tianjin and PRD)

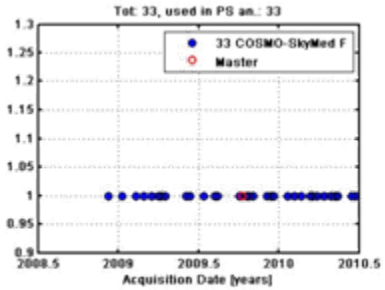
MONITORING TERRAIN SUBSIDENCE CAUSED BY TUNNEL EXCAVATION

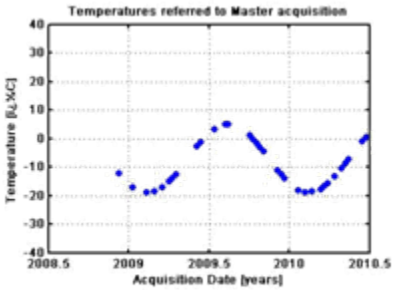
Case Study nr 1: Shanghai

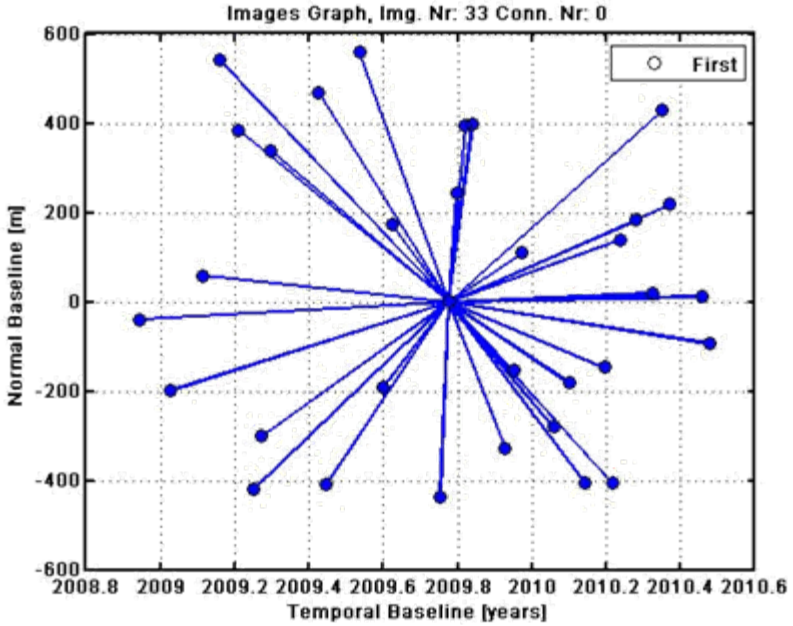
The dataset: 33 Cosmo SkyMed images







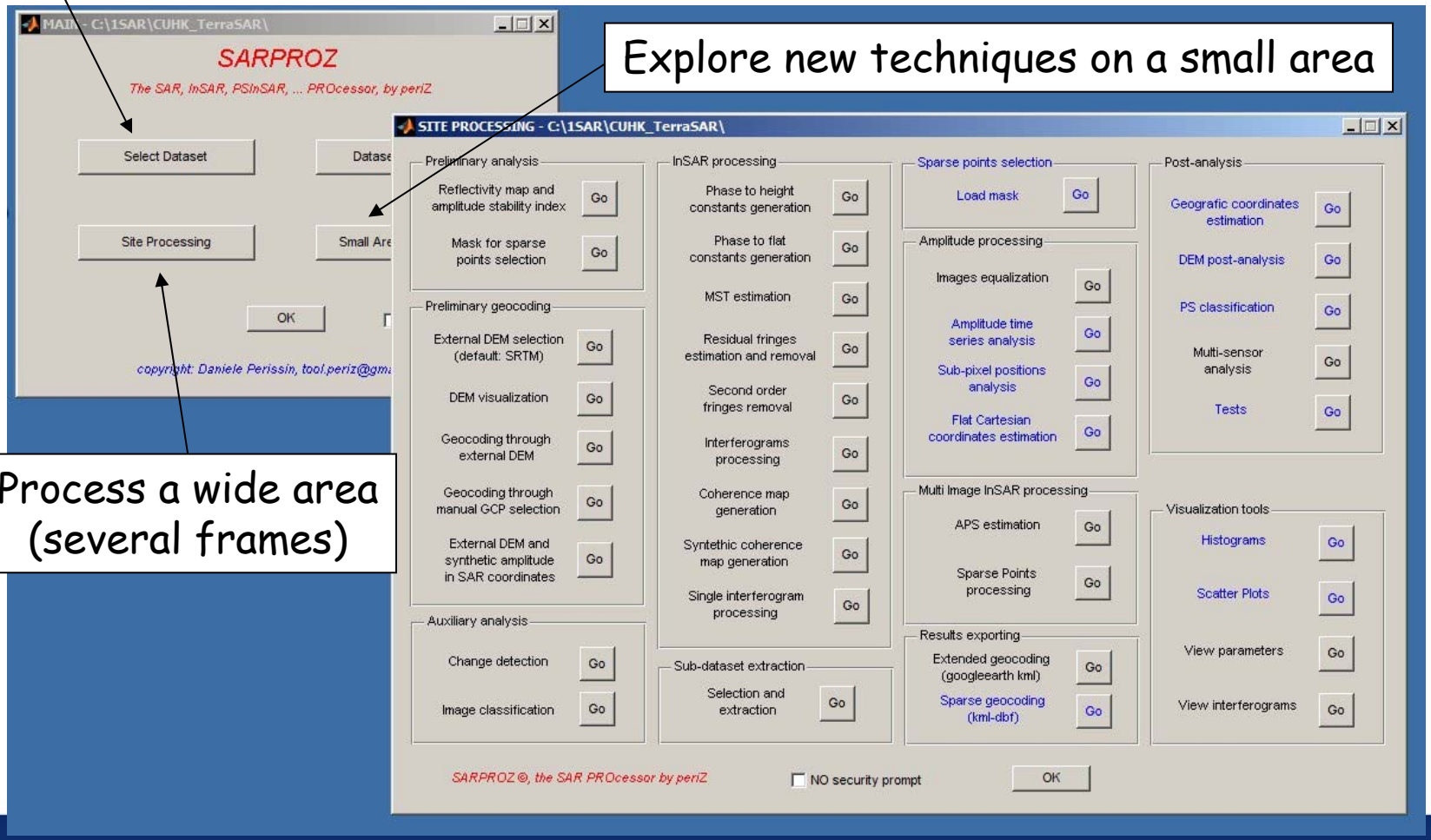




Select a site

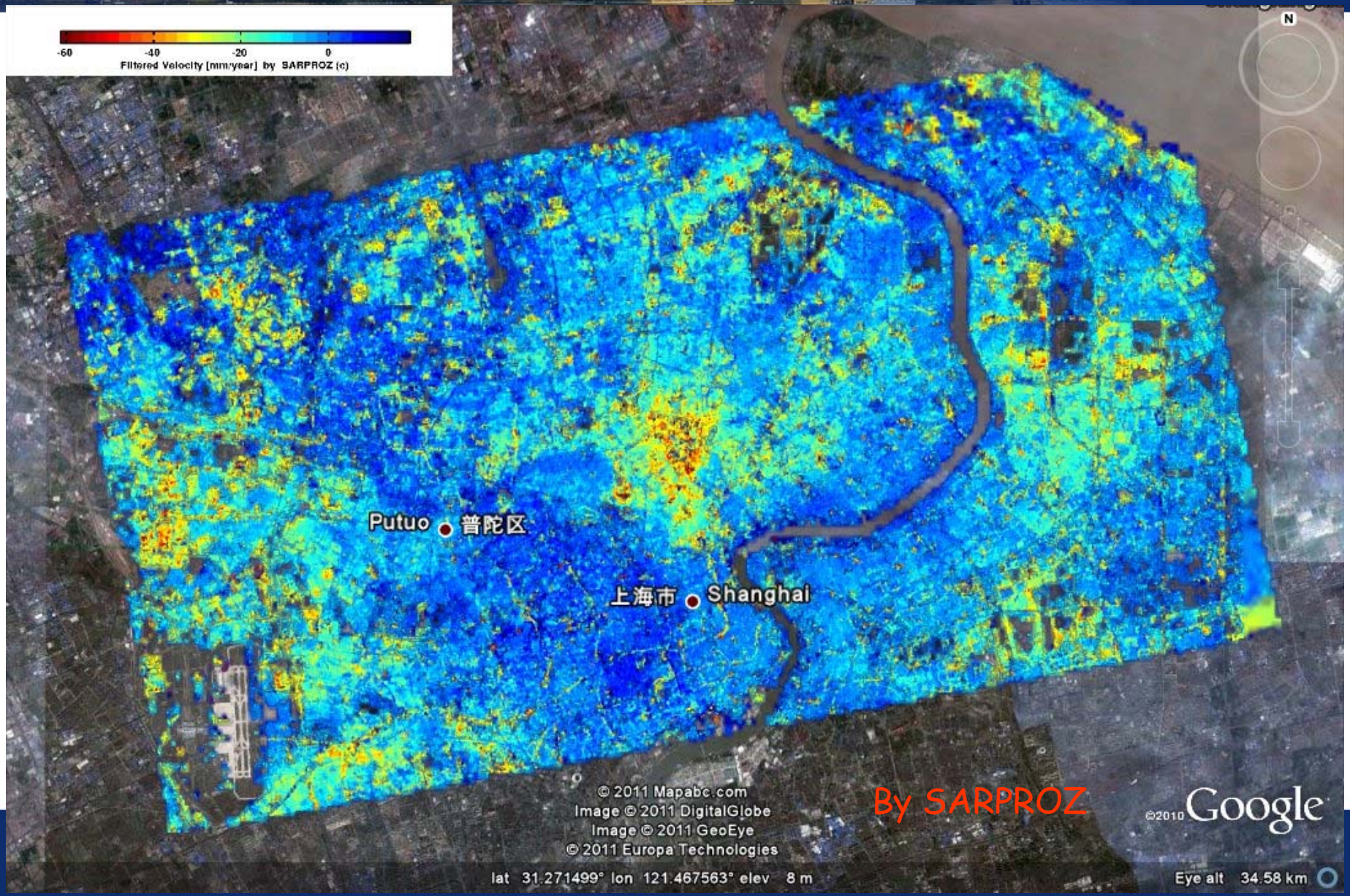
The software: SARPROZ

Explore new techniques on a small area

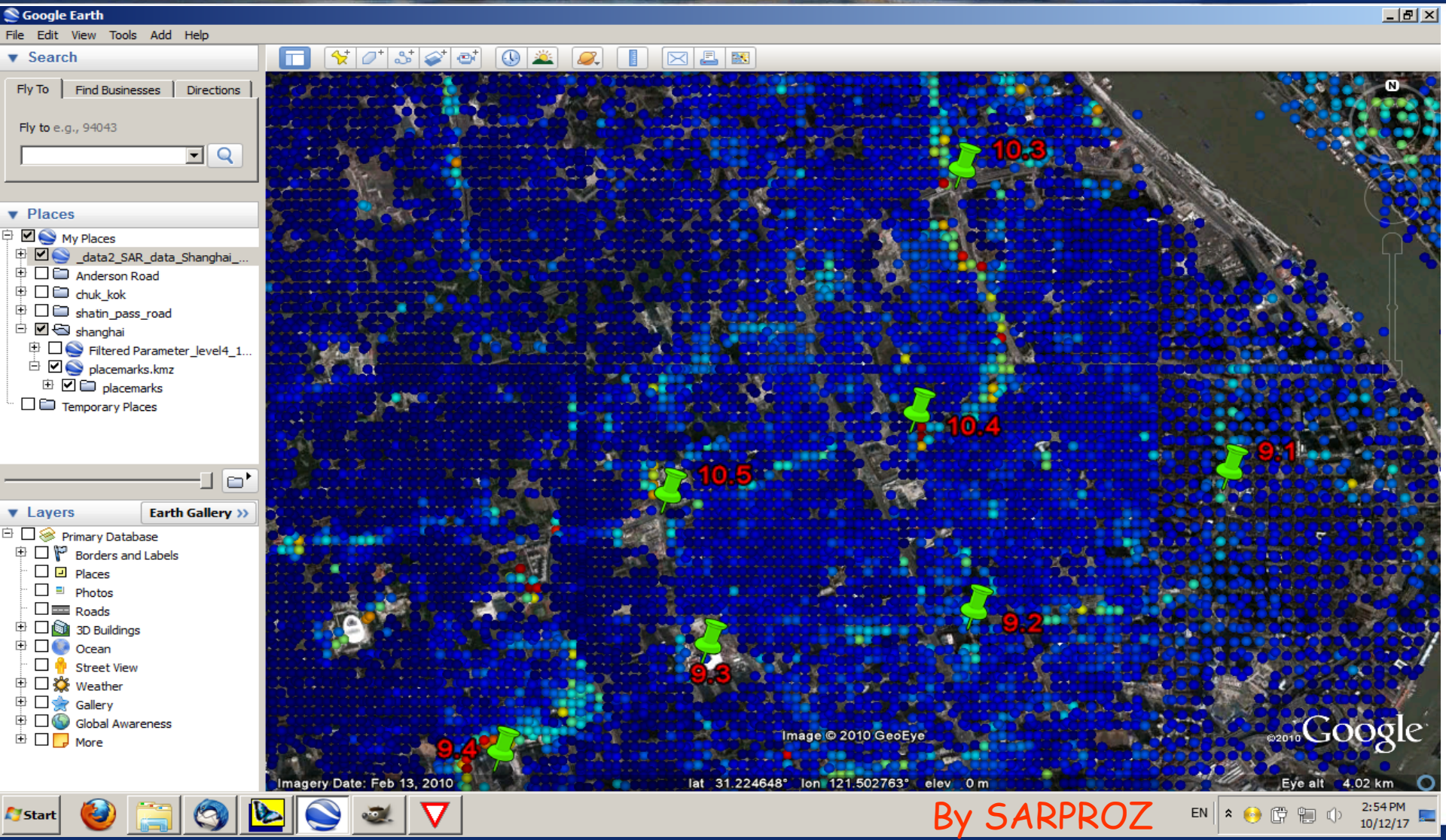


Process a wide area (several frames)

The result: linear deformation map

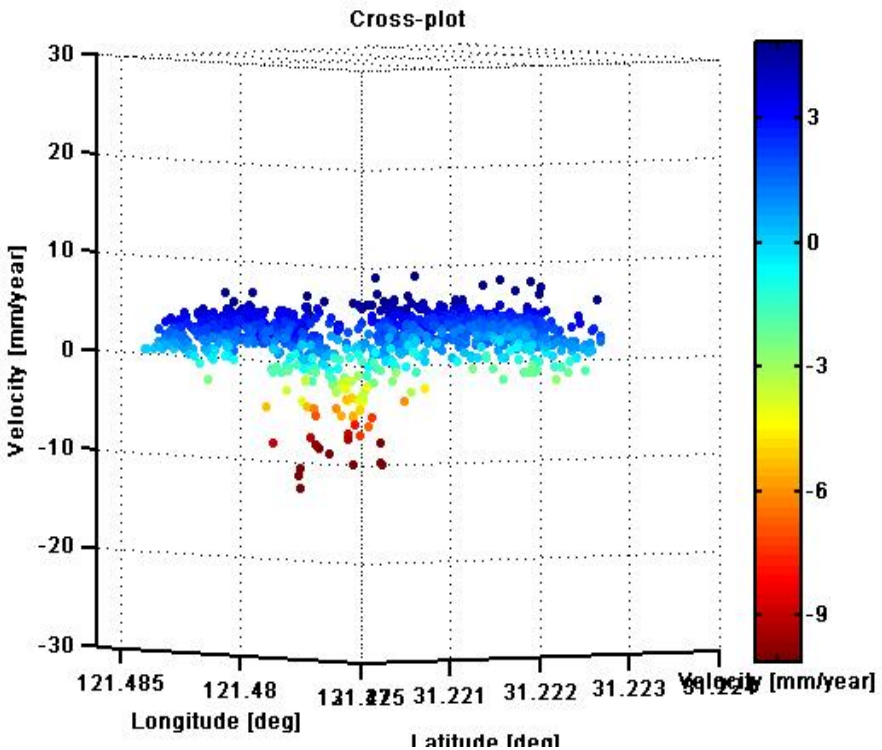


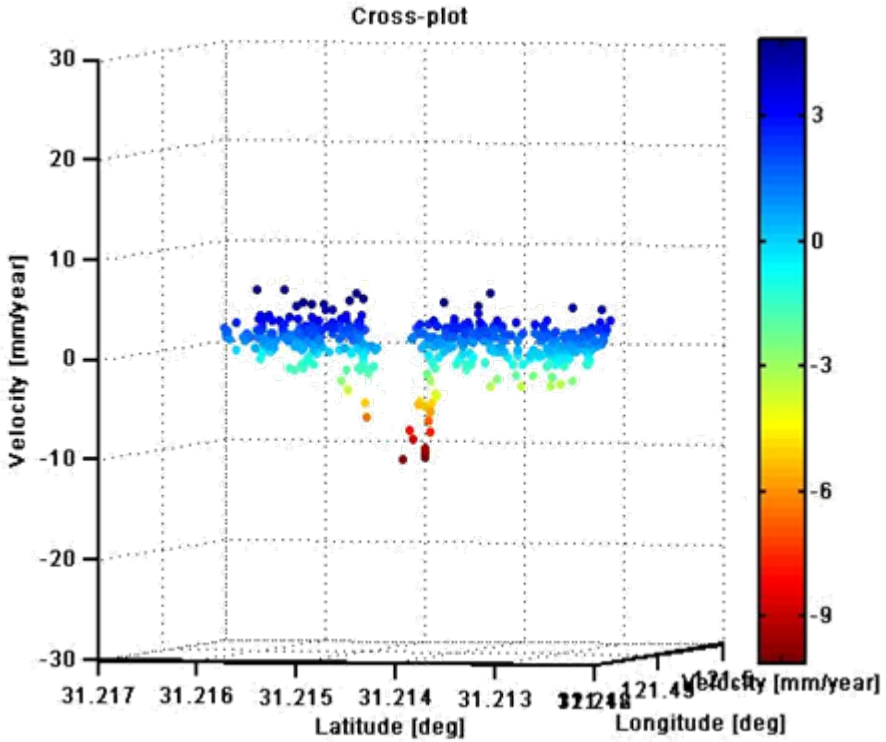
The main outcome: tracking the new subway lines through the surface subsidence (see the poster)

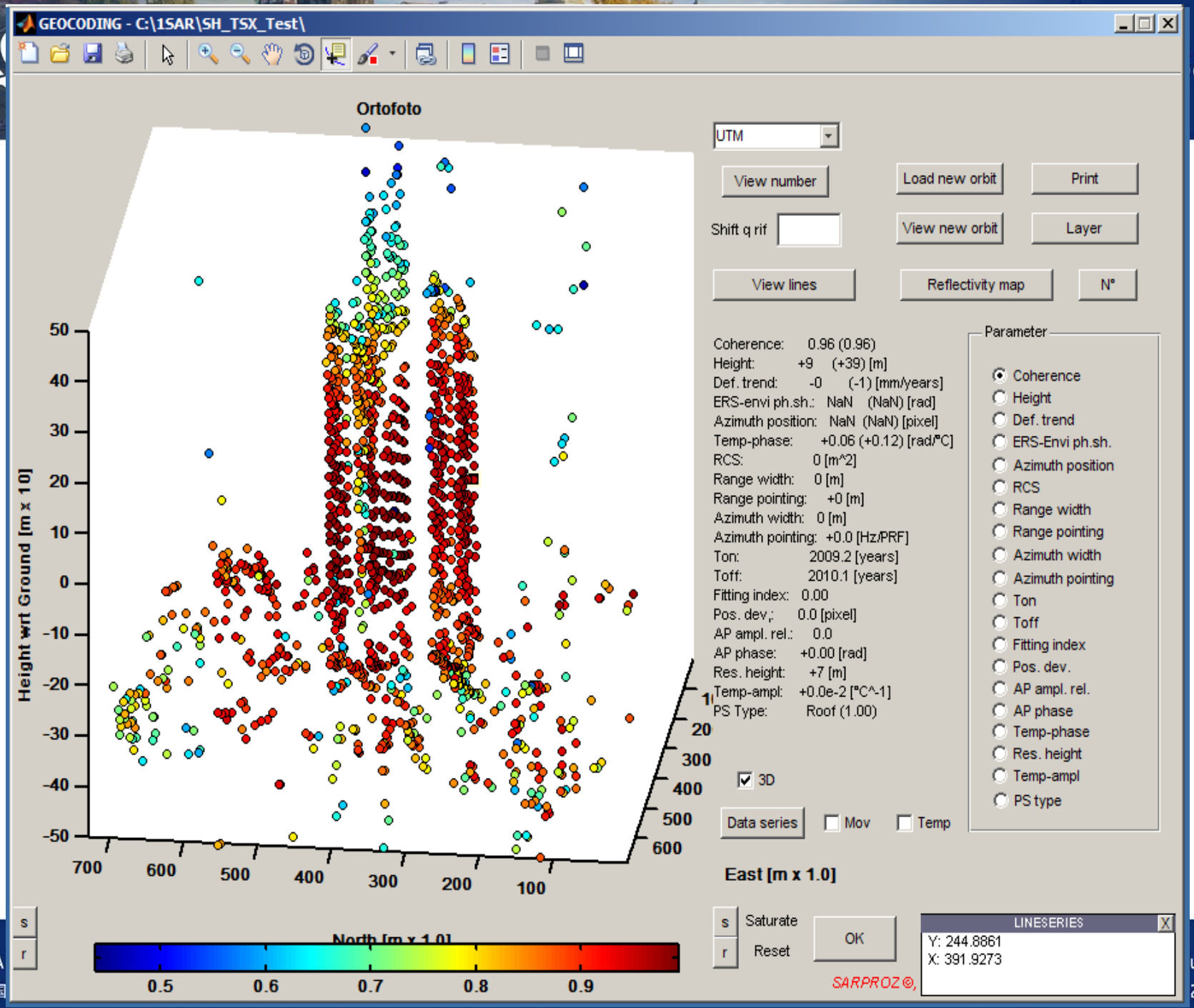


By SARPROZ

Studying the section of the deformation along the subway tunnels






GEOCODING - C:\1SAR\SH_TSX_Test\
Ortofoto
UTM
View number
Load new orbit
Print
Shift q rif
View new orbit
Layer
View lines
Reflectivity map
N°
Parameter
Coherence: 0.96 (0.96)
Height: +9 (+39) [m]
Def. trend: -0 (-1) [mm/years]
ERS-envi ph.sh.: NaN (NaN) [rad]
Azimuth position: NaN (NaN) [pixel]
Temp-phase: +0.06 (+0.12) [rad/°C]
RCS: 0 [m^2]
Range width: 0 [m]
Range pointing: +0 [m]
Azimuth width: 0 [m]
Azimuth pointing: +0.0 [Hz/PRF]
Ton: 2009.2 [years]
Toff: 2010.1 [years]
Fitting index: 0.00
Pos. dev,: 0.0 [pixel]
AP ampl. rel.: 0.0
AP phase: +0.00 [rad]
Res. height: +7 [m]
Temp-ampl: +0.0e-2 [°C^-1]
PS Type: Roof (1.00)
Coherence
Height
Def. trend
ERS-Envi ph.sh.
Azimuth position
RCS
Range width
Range pointing
Azimuth width
Azimuth pointing
Ton
Toff
Fitting index
Pos. dev.
AP ampl. rel.
AP phase
Temp-phase
Res. height
Temp-ampl
PS type
3D
Data series
Mov
Temp
East [m x 1.0]
Height wrt Ground [m x 10]
North [m x 1.0]
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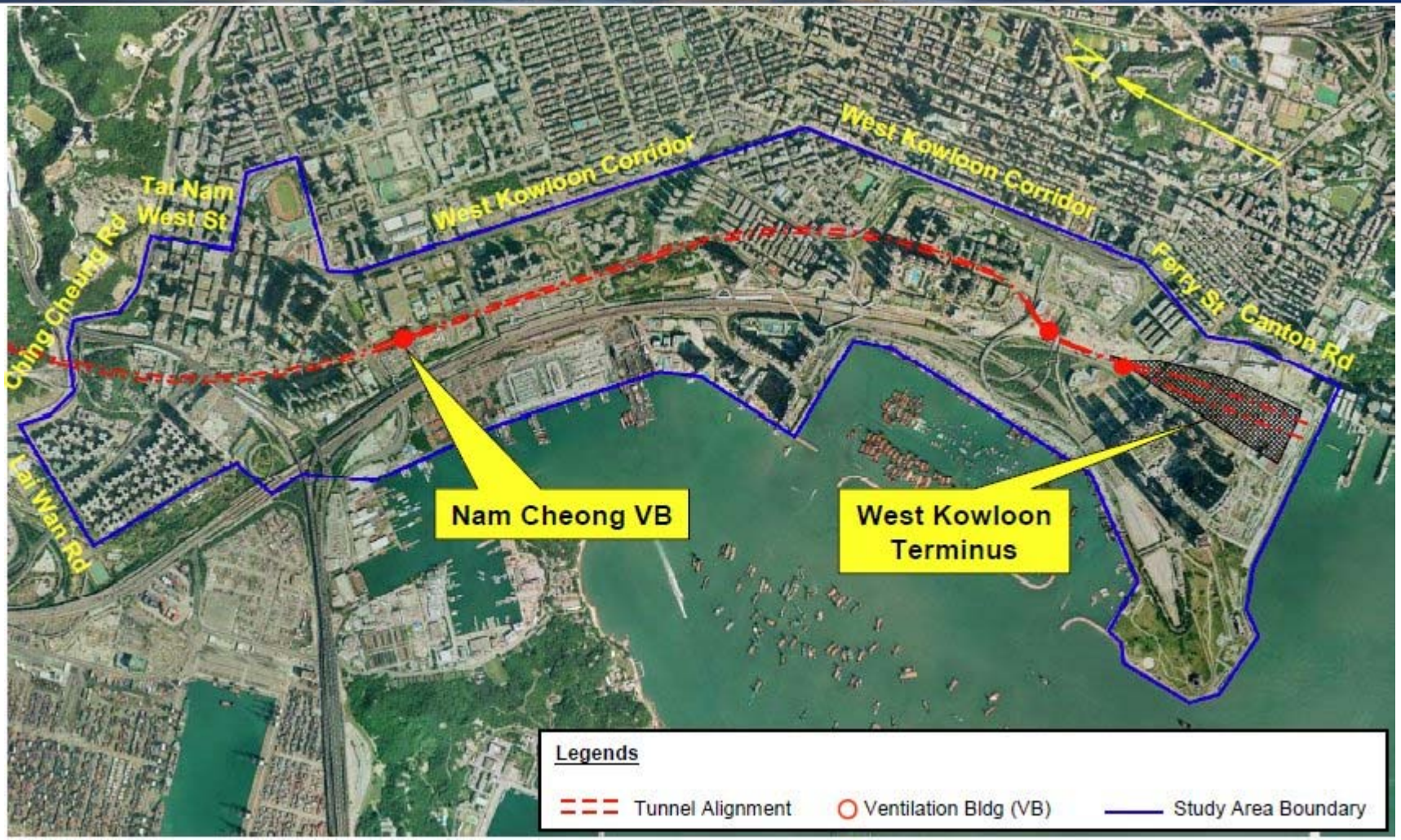
Reset
OK
LINESERIES
Y: 244.8861
X: 391.9273
SARPROZ©,

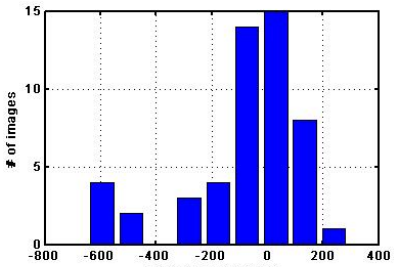
MONITORING TERRAIN SUBSIDENCE CAUSED BY TUNNEL EXCAVATION

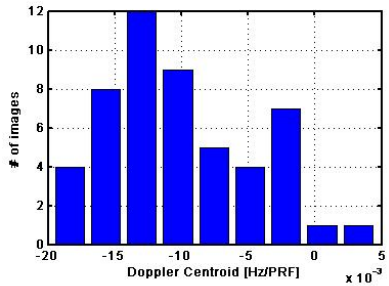
Case Study nr 2: Hong Kong

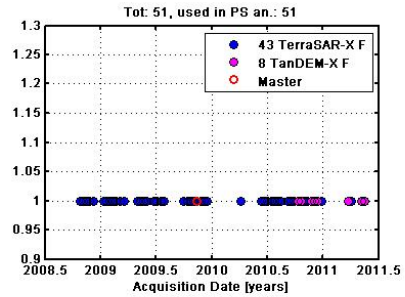
The study area: subway excavation site

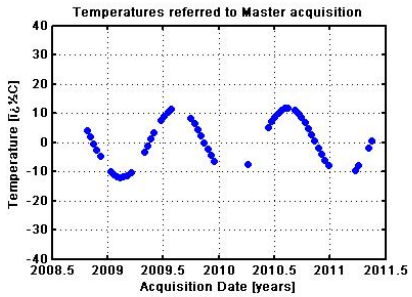


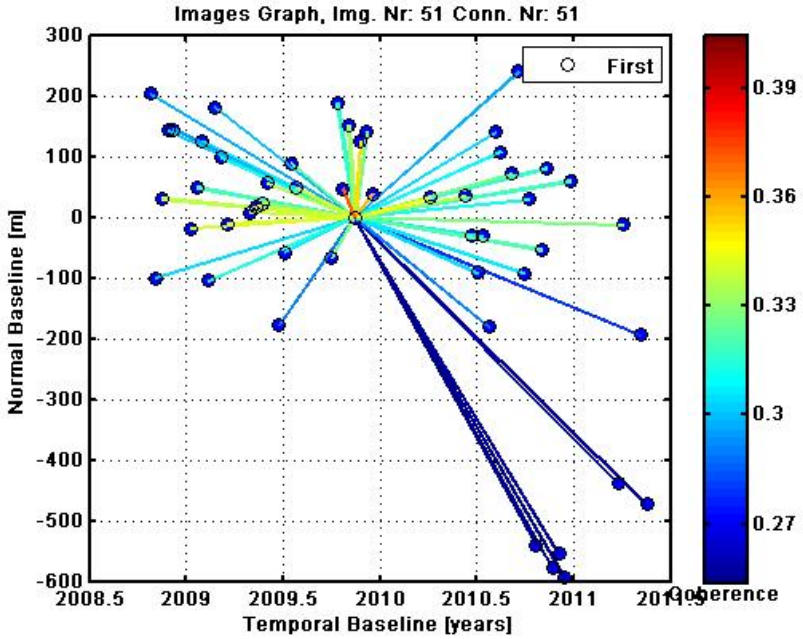
The dataset: 43 TerraSAR-X + 8 Tandem-X images



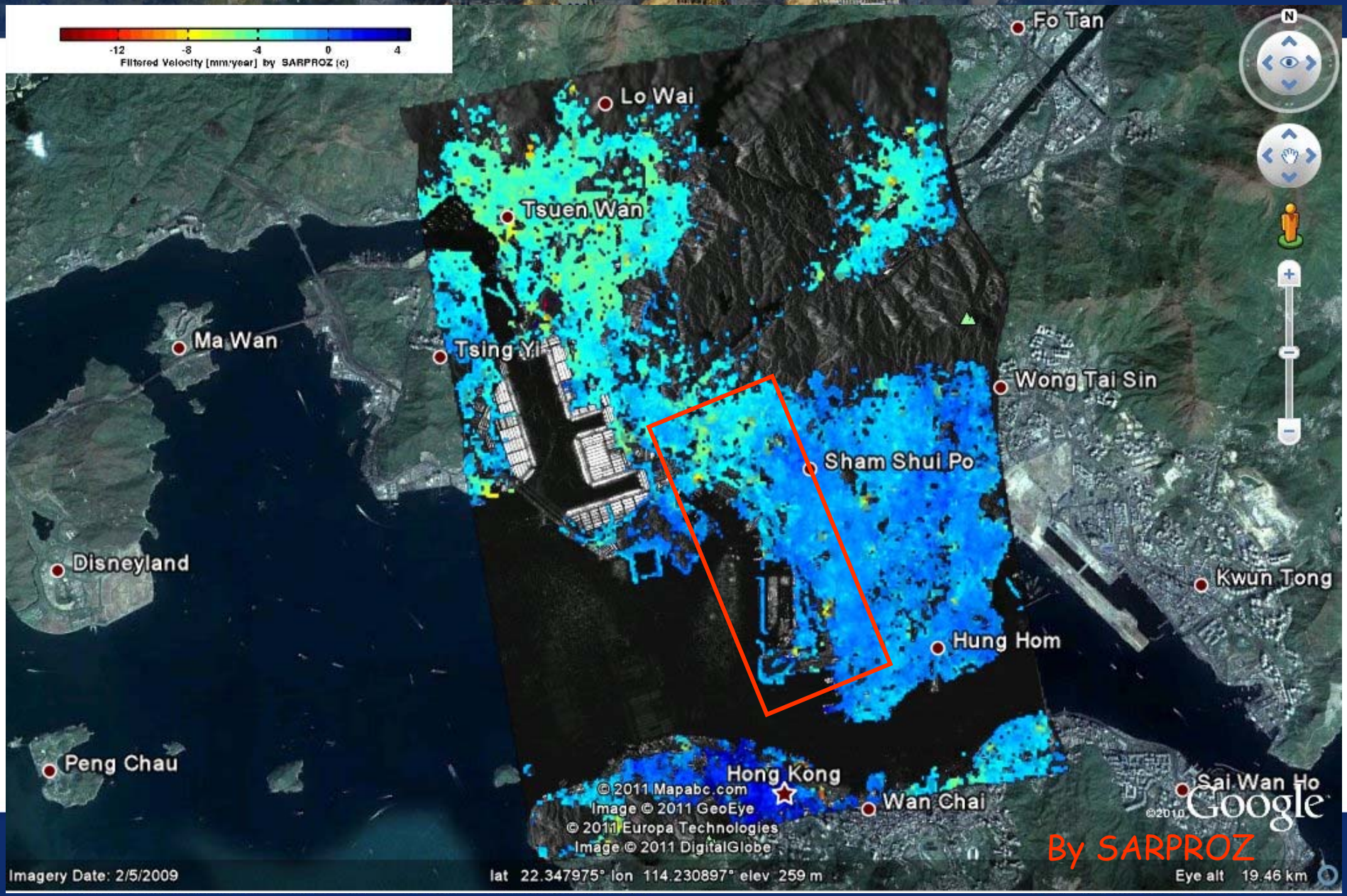






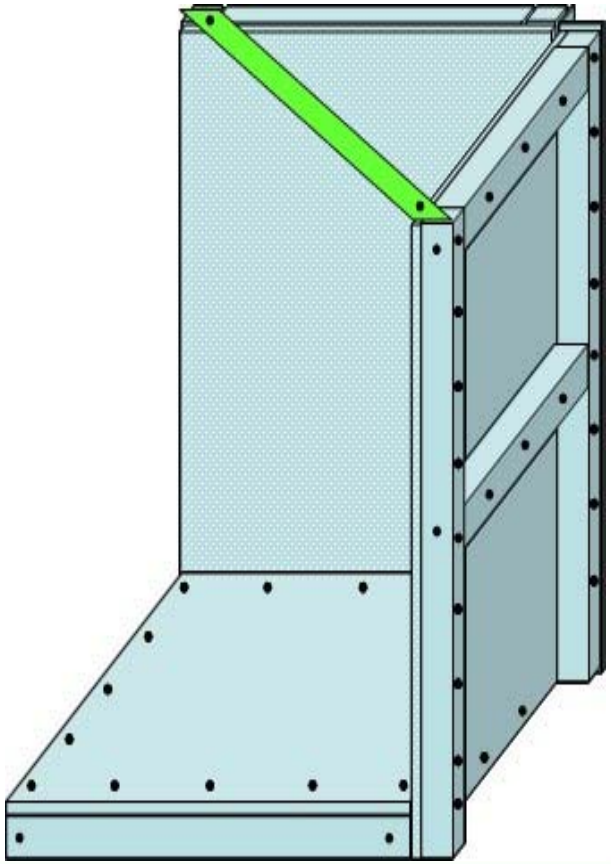


The preliminary result (pre-excavation)

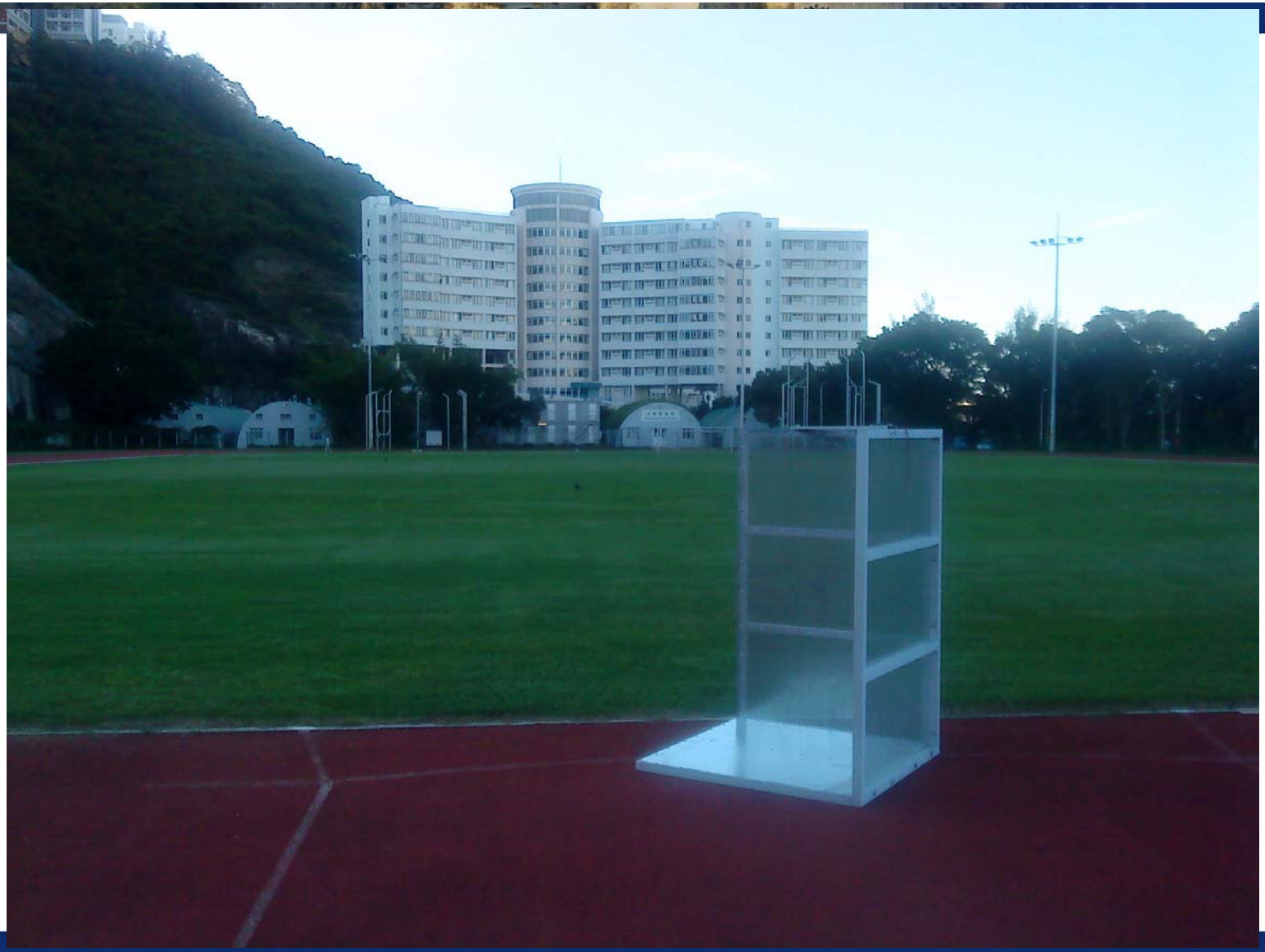


For the purpose of demonstration, we are installing CORNER REFLECTORS in the analyzed area

We designed a very simple but effective corner reflector using cheap materials available on the market



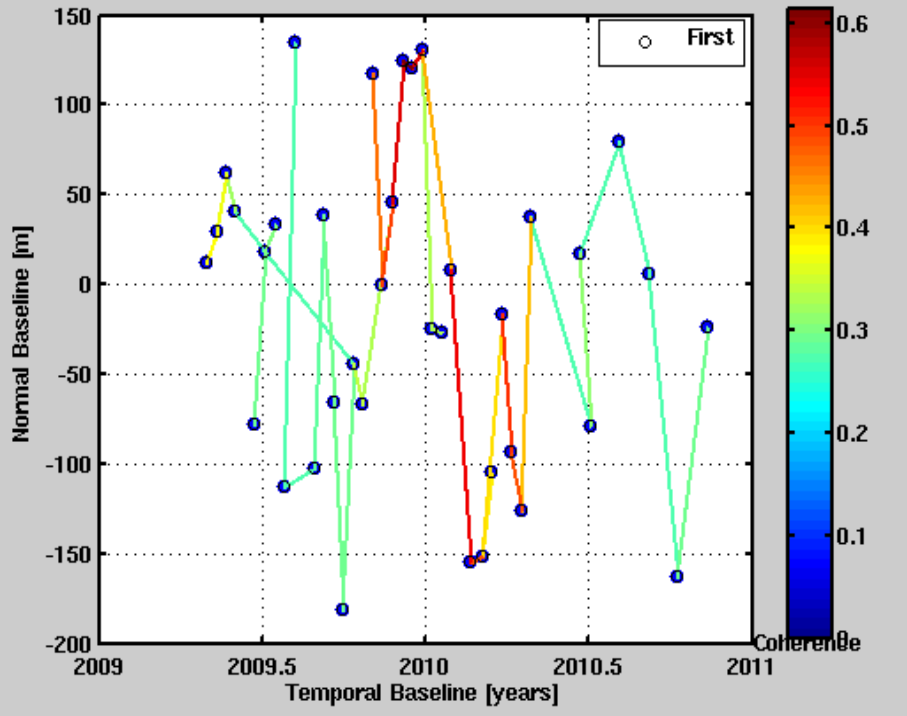
We carried out an experiment in CUHK 2 days ago



…still waiting for the data
for checking the corner response…

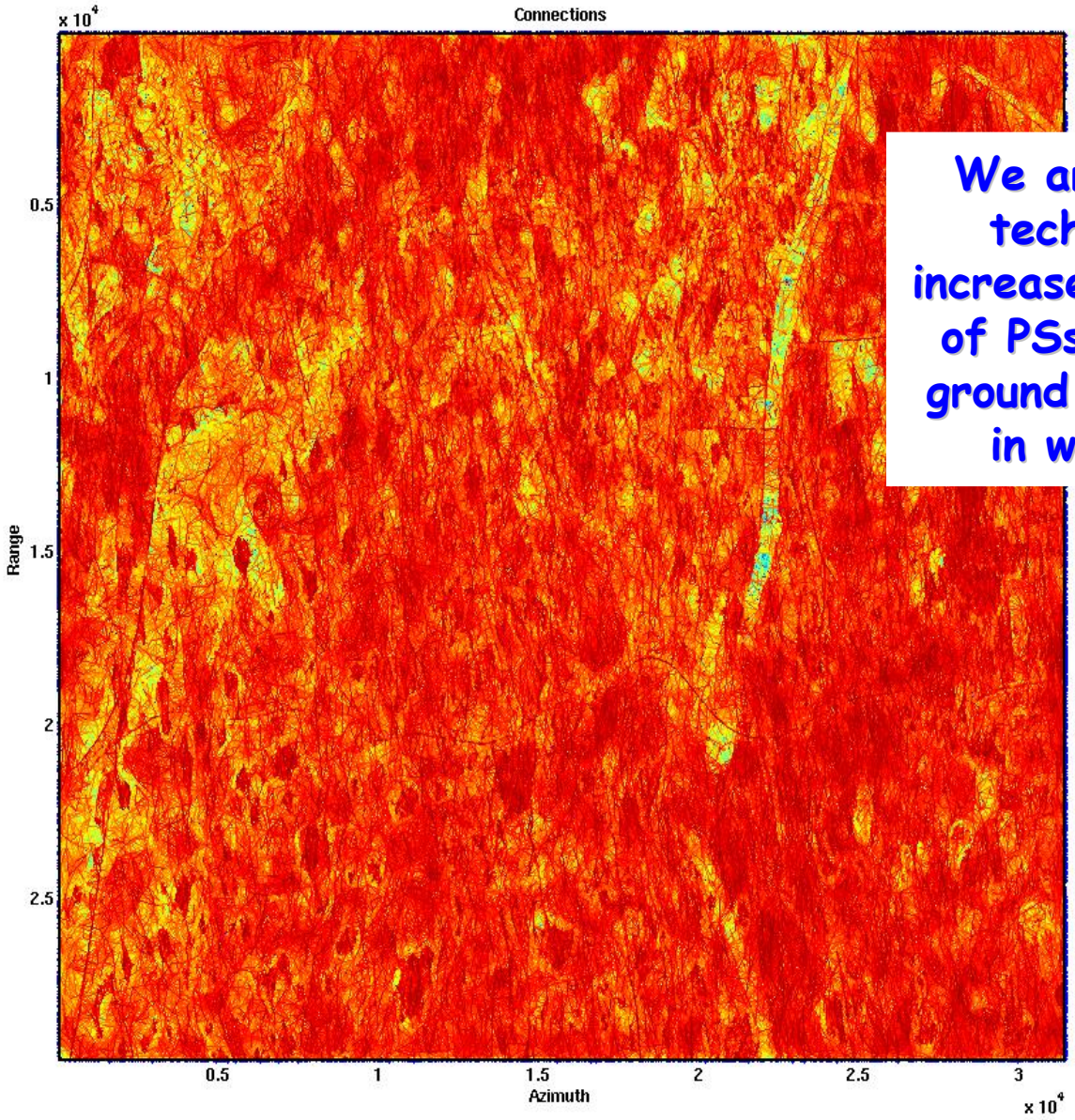
MONITORING TERRAIN SUBSIDENCE IN TIANJIN USING X and L BANDS

The dataset: 37 TerraSAR-X images



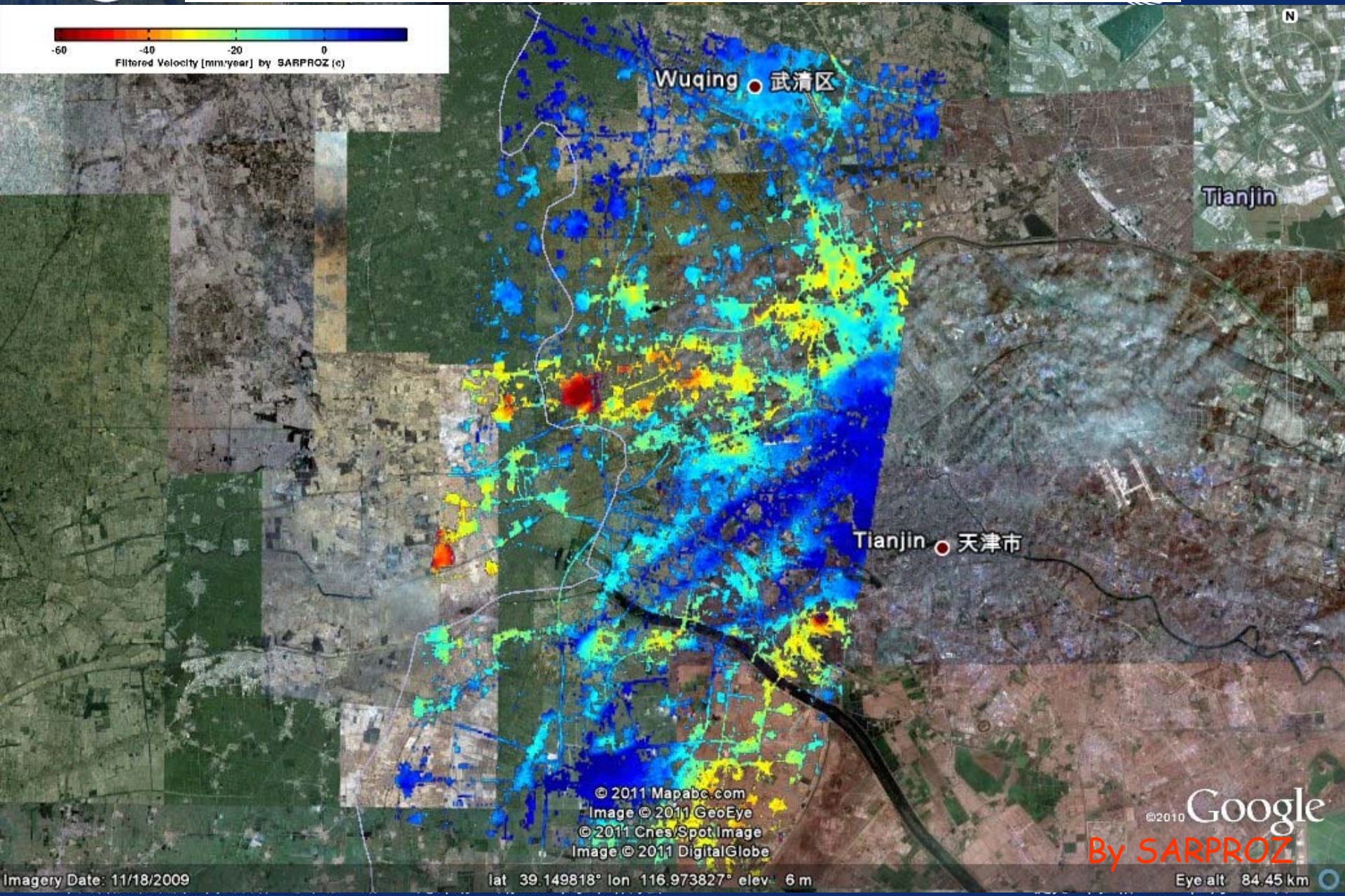
The Minimum Spanning Tree in the Dataset

The PS graph in Tianjin in X band

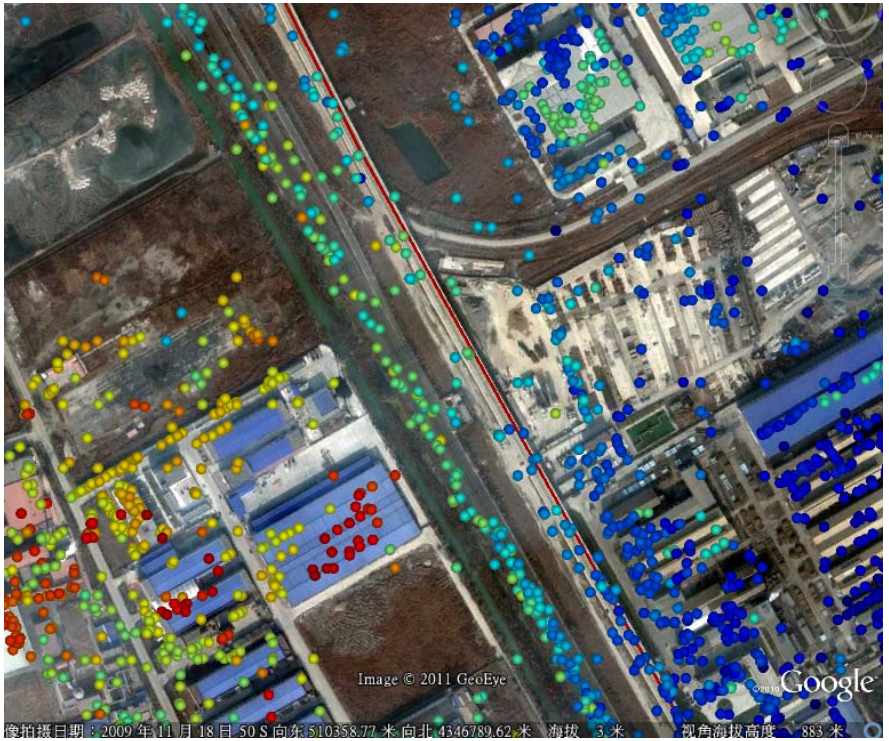


We are studying techniques to increase the density of PSs to analyze ground settlements in wide areas

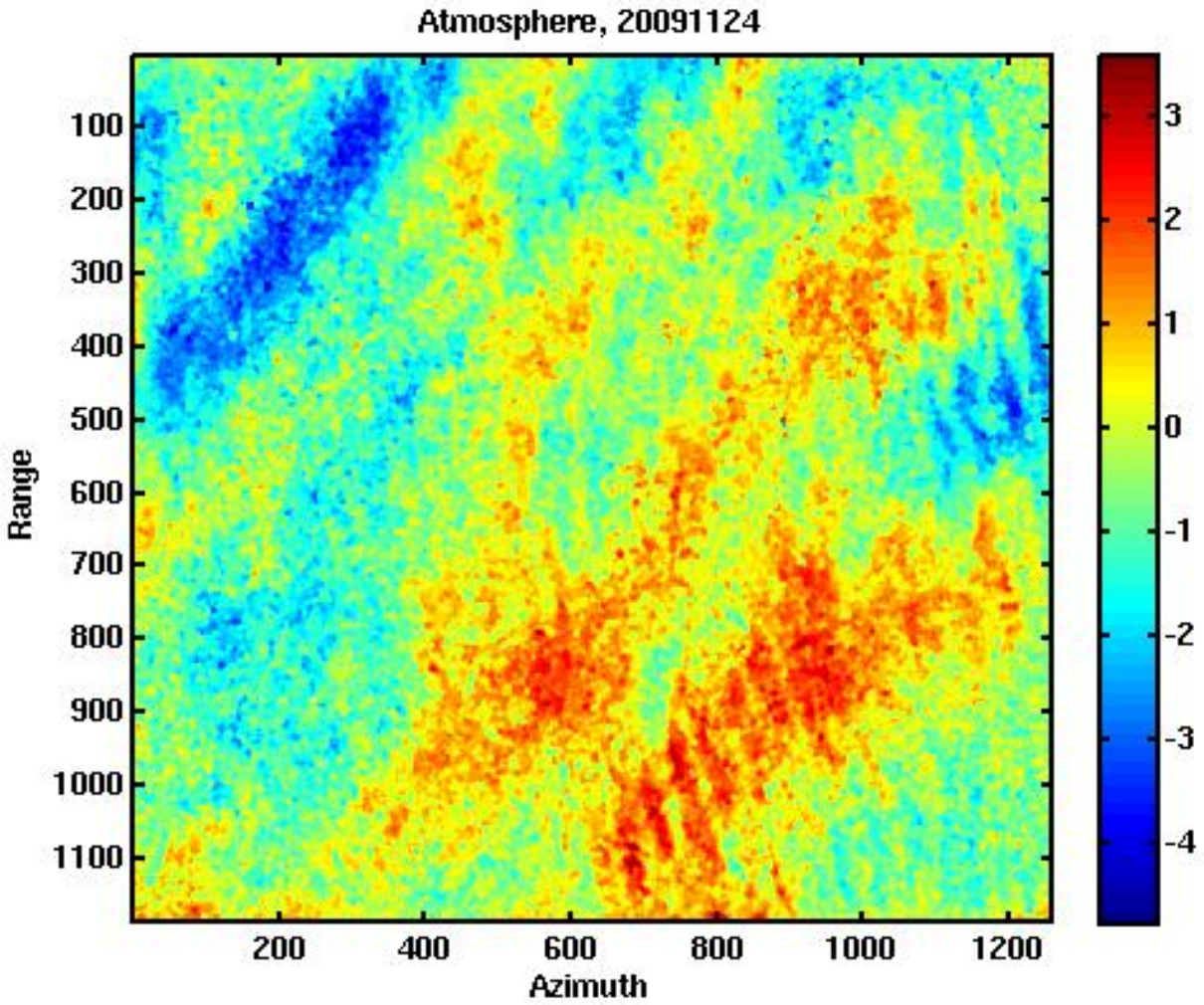
The X band result: linear deformation map



Close up's on Highways and High Speed Railways



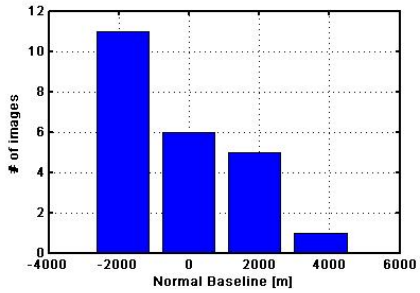
Mitigation of the Atmospheric delay on InSAR

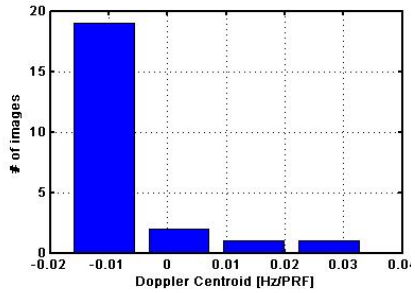


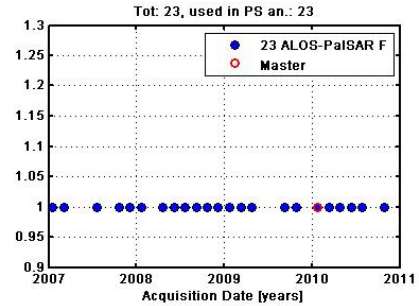
PSInSAR can detect spatial WV features shorter than 1km Providing HR inputs for NWP models

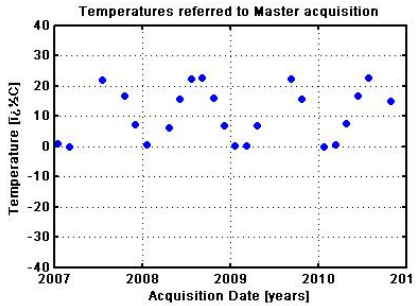
Atmospheric Phase Screen in Tianjin estimated by SARPROZ

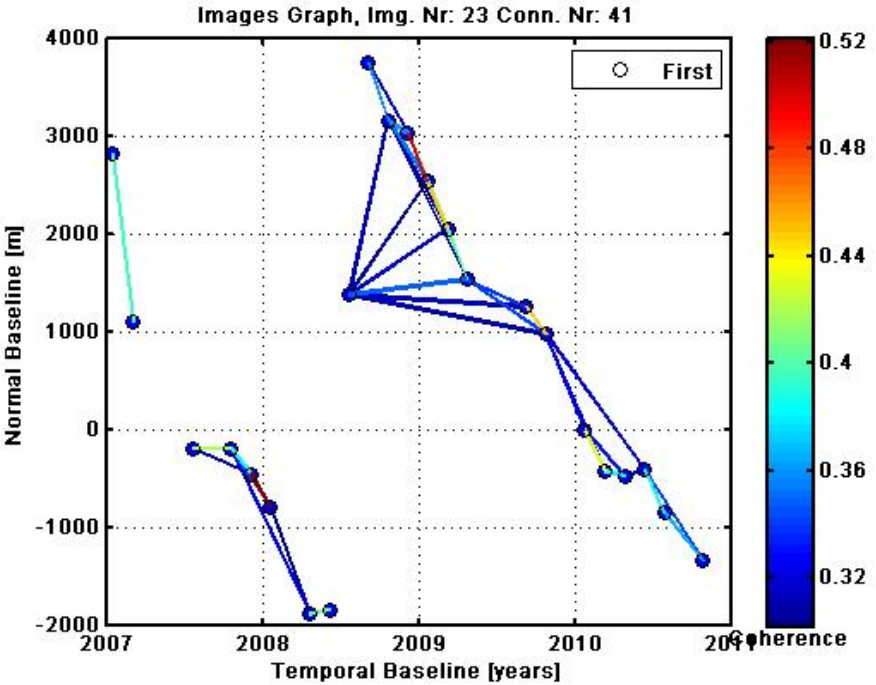
The L band dataset: 23 ALOS images Processed with the QPS technique (41 interfs.)



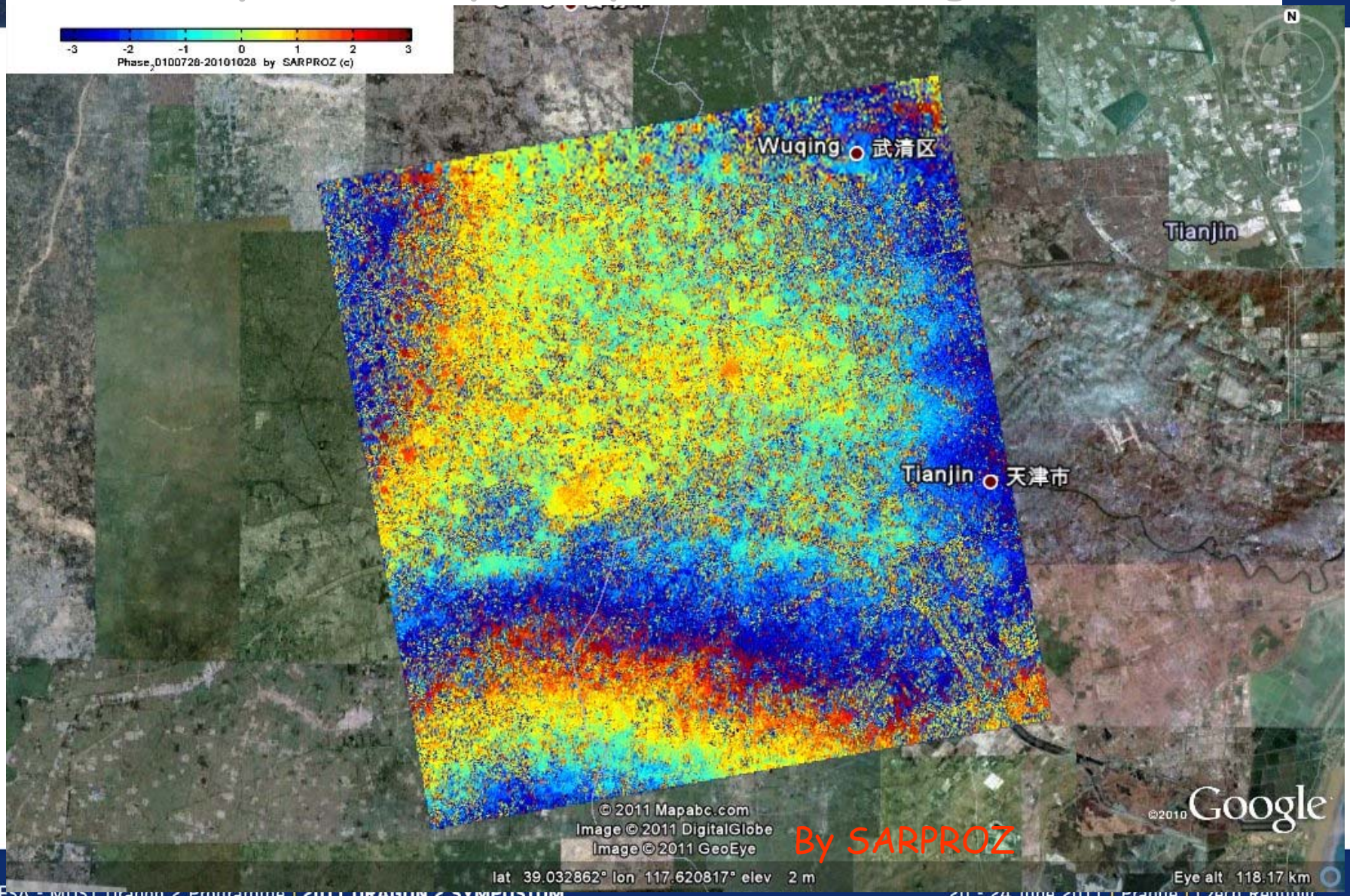






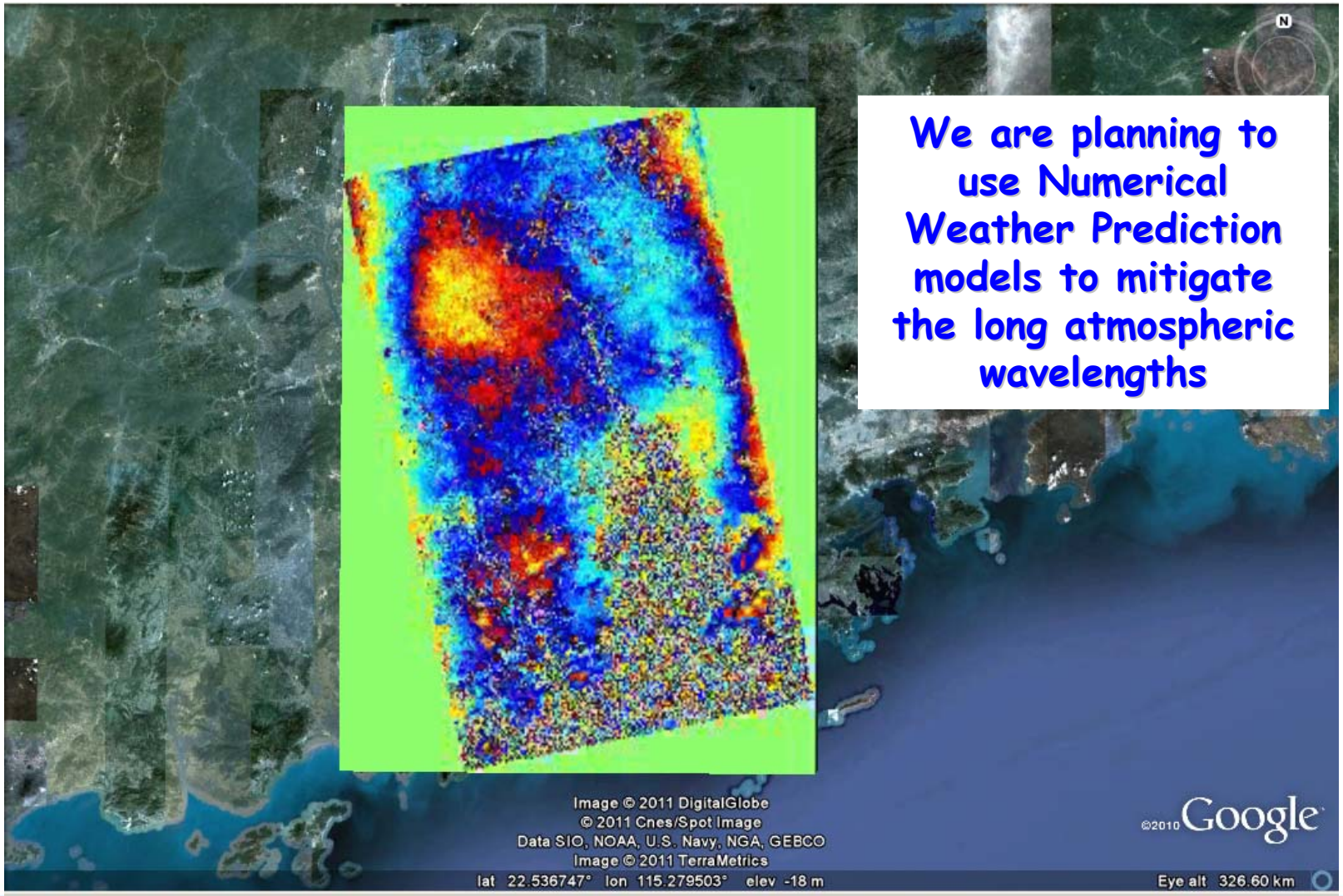


L band preliminary analysis: interferogram sample



MONITORING TERRAIN SUBSIDENCE IN THE PRD REGION

Envisat preliminary analysis: interferogram sample



We are planning to use Numerical Weather Prediction models to mitigate the long atmospheric wavelengths

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webpage
http://ihome.cuhk.edu.hk/~b122066/index.htm

SARPROZ
http://ihome.cuhk.edu.hk/~b122066/index_files/download.htm