

# Tutorial on SAR, InSAR, PSInSAR

## SARPROZ

### The SAR processing tool by Periz

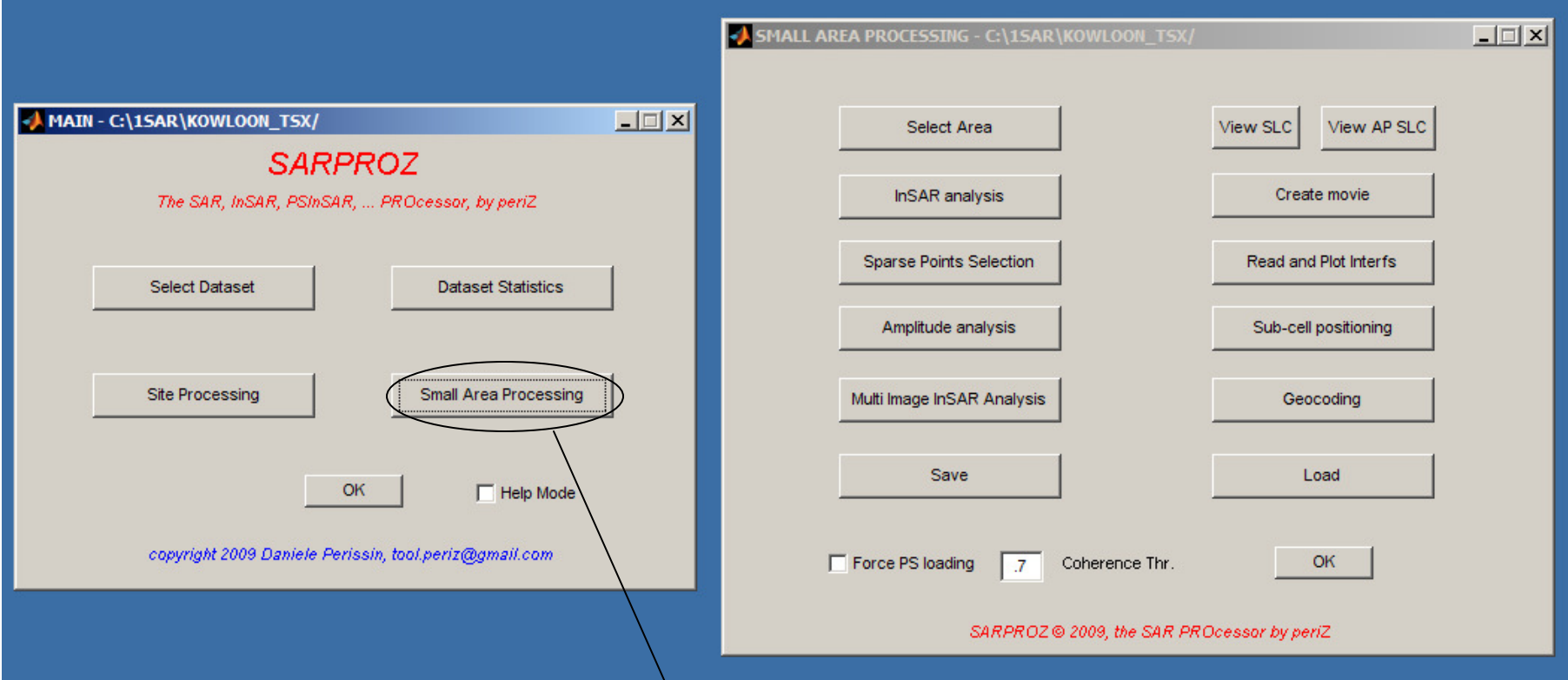
[http://ihome.cuhk.edu.hk/~b122066/index\\_files/download.htm](http://ihome.cuhk.edu.hk/~b122066/index_files/download.htm)

#### Part IV

Petronas University of Technology UTP

# Small area processing (I)

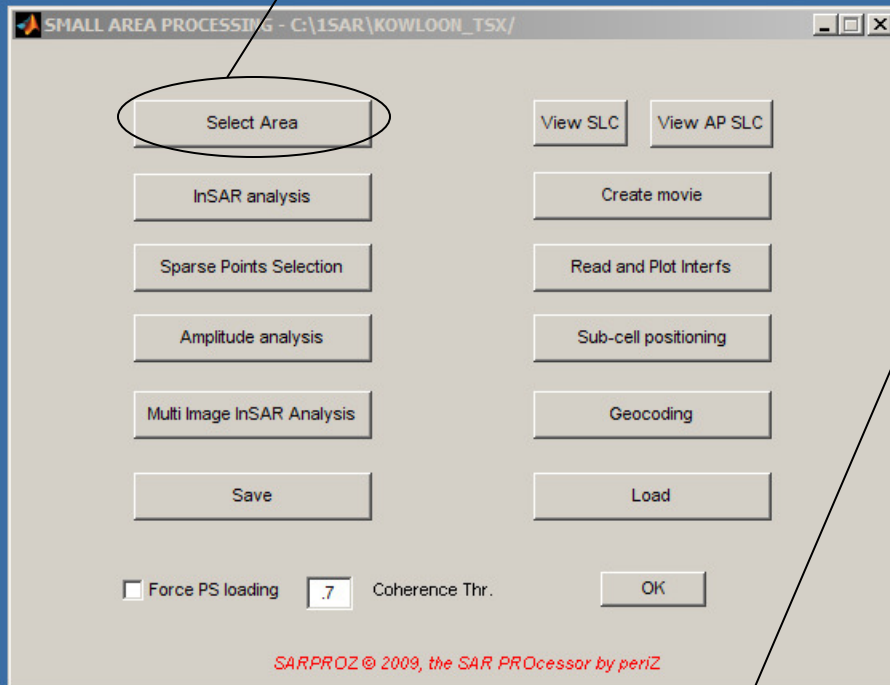
# Small Area Processing



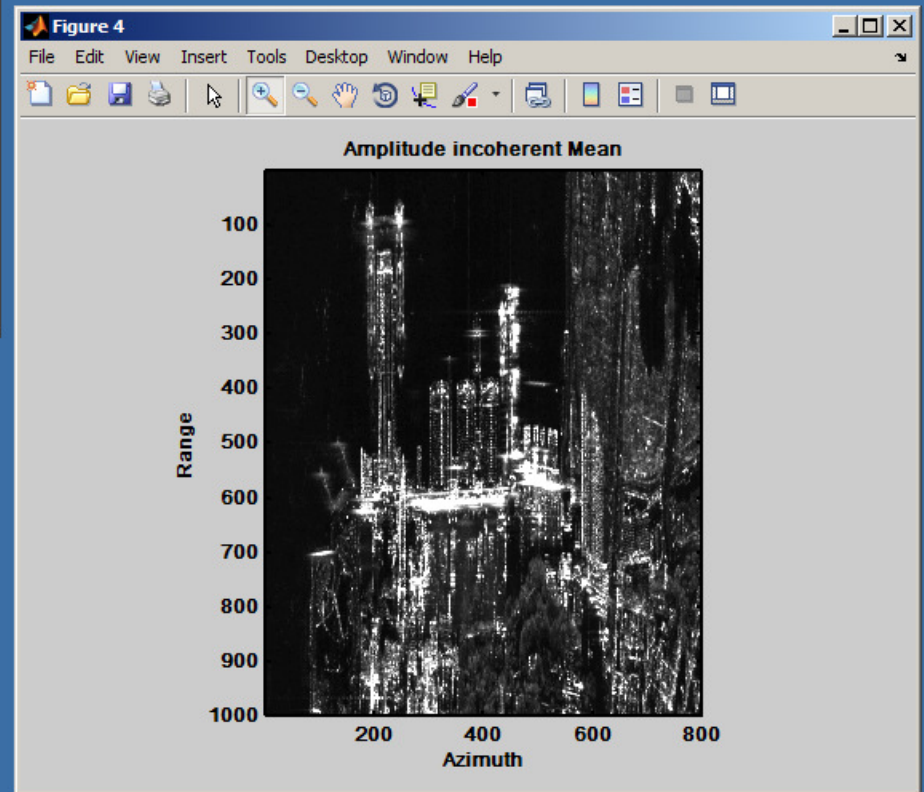
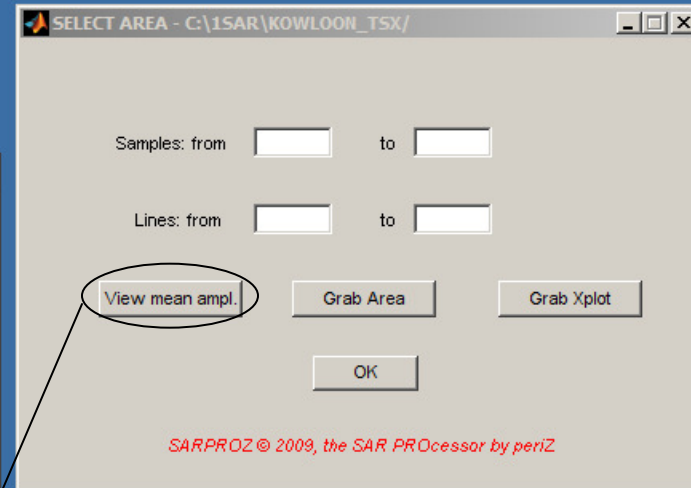
Press the corresponding button in the "Main" window

# Small Area Processing

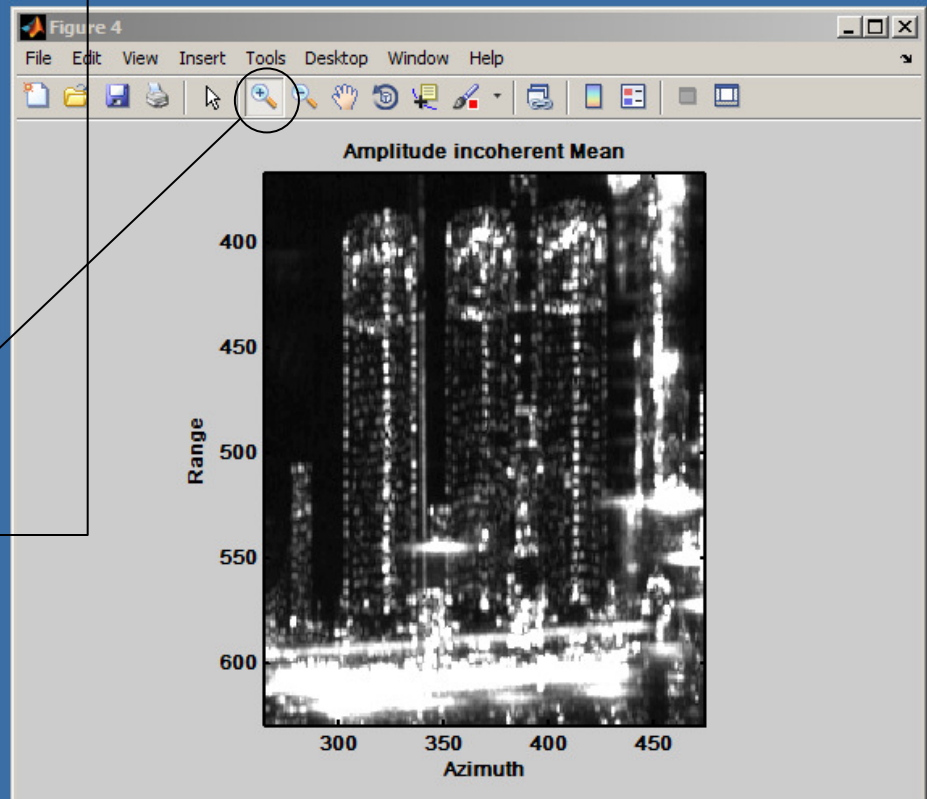
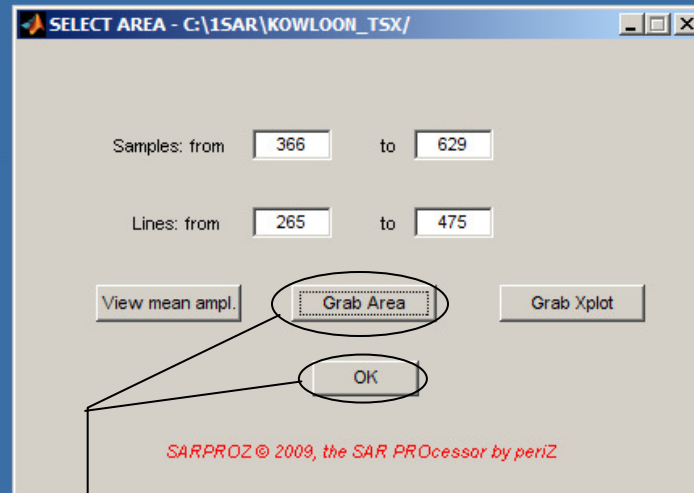
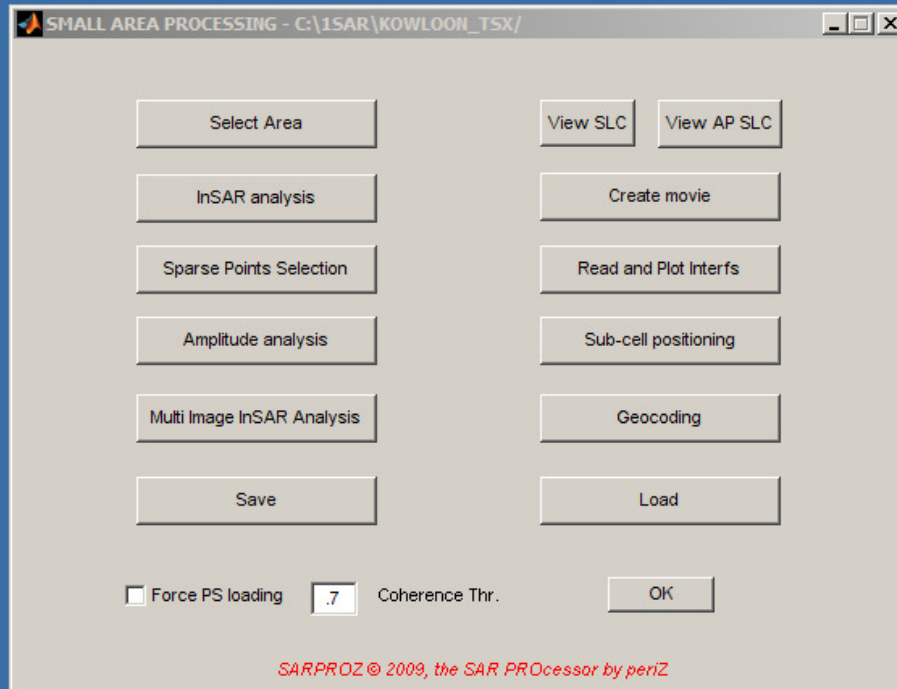
1. Press "Select Area"



2. Press "View Mean Ampl"

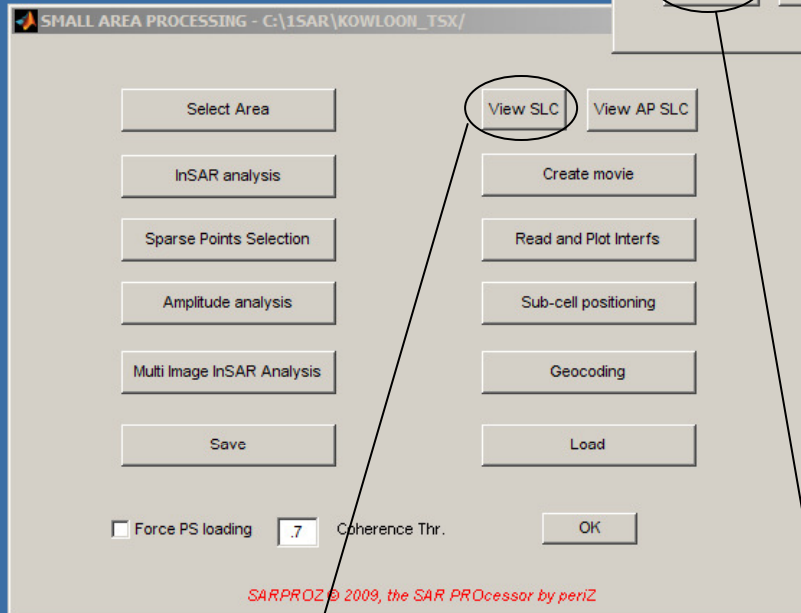


# Small Area Processing



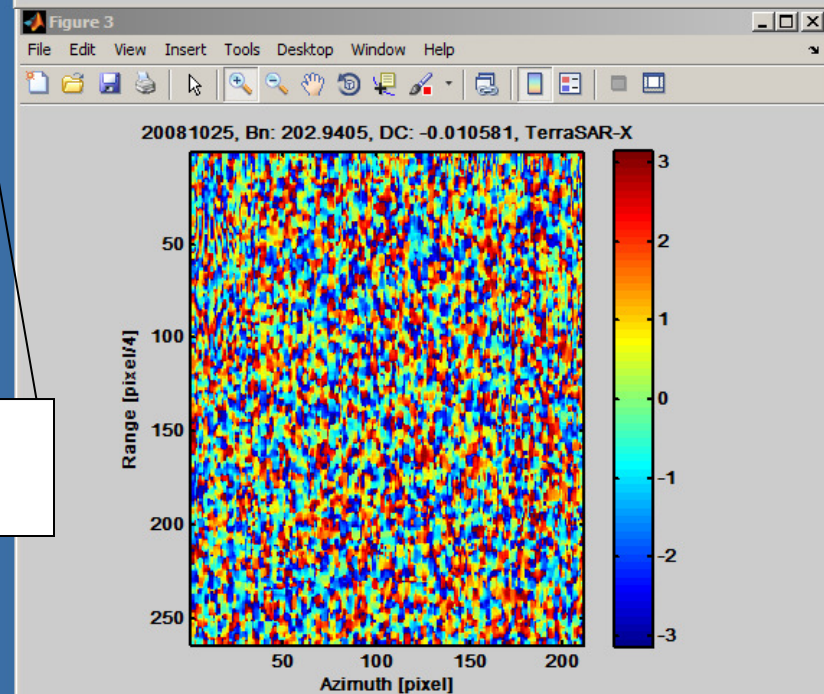
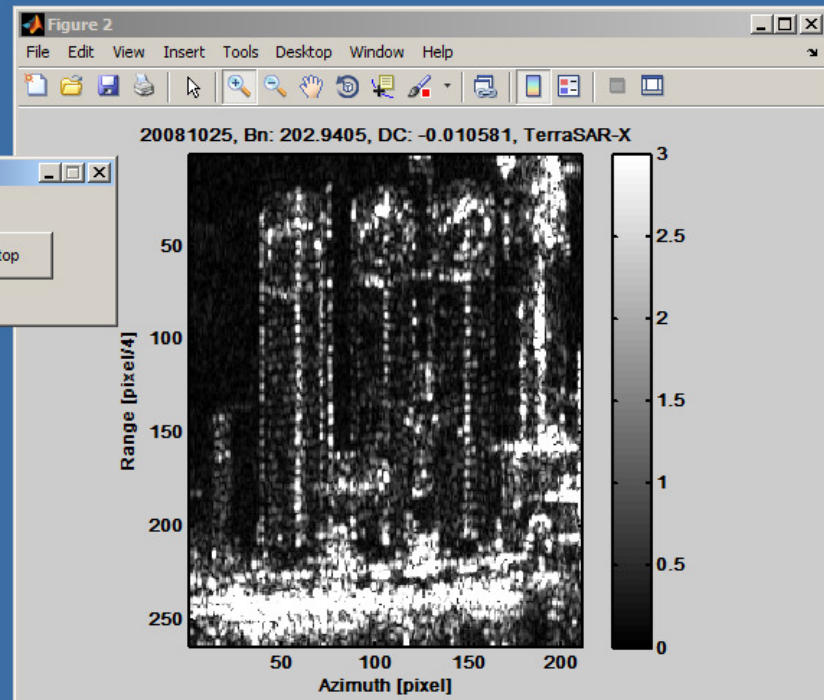
3. Use the Zoom tool to visualize the AOI
4. Press "Grab Area" and then "OK"

# Small Area Processing



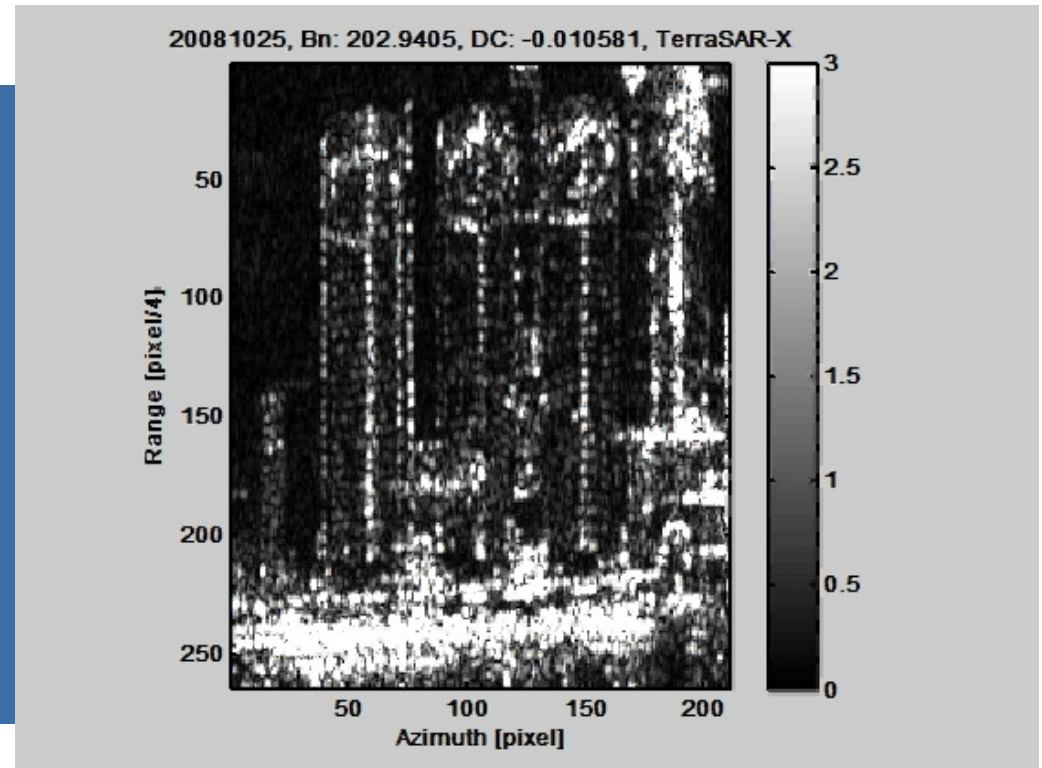
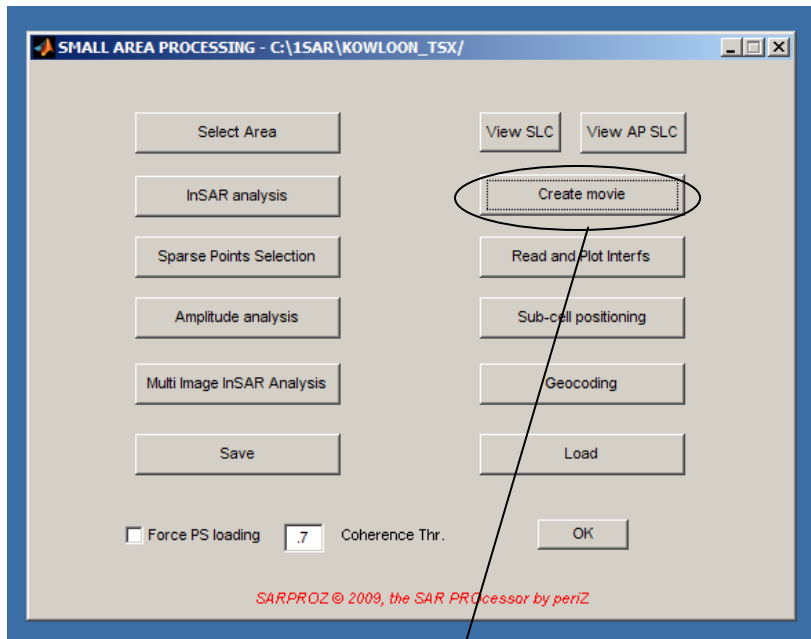
View "Single Look Complex" images

View the next image by pressing "Go"



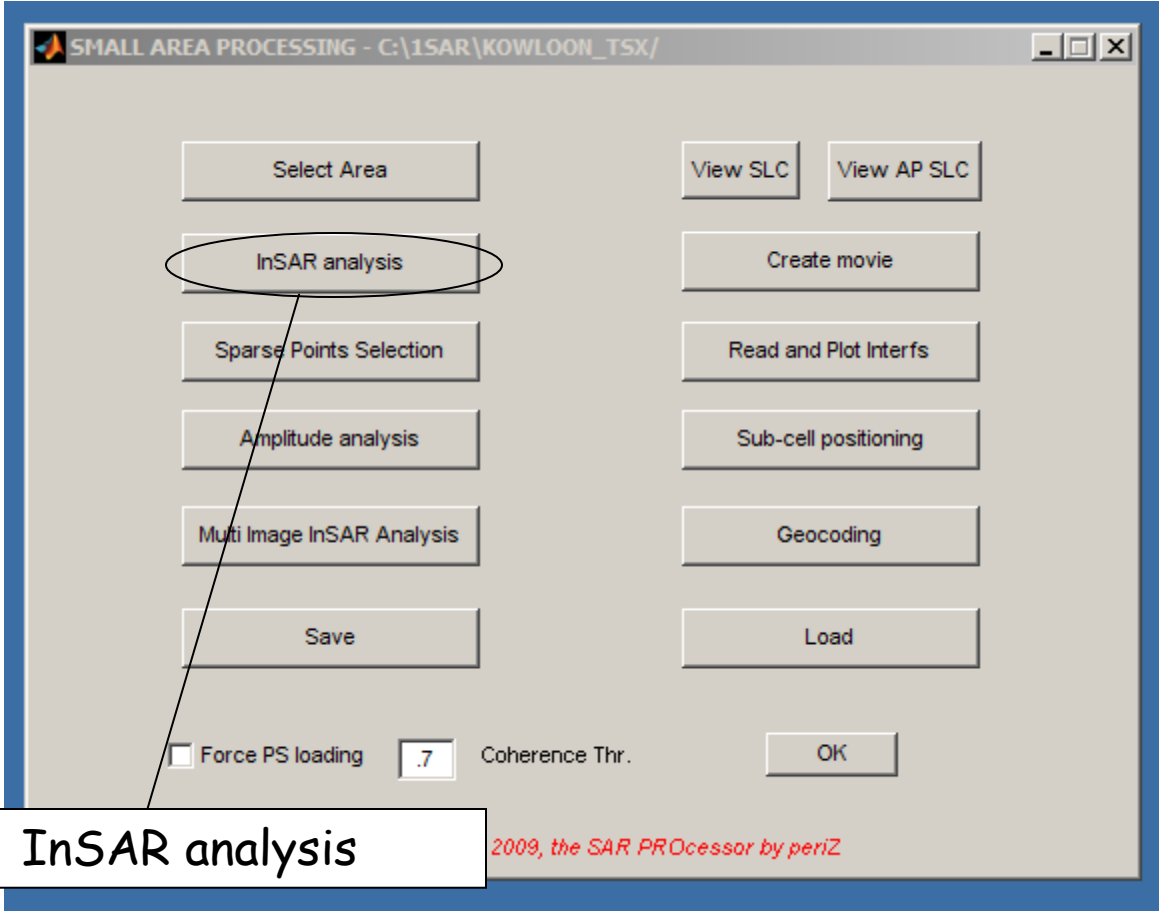


## Small Area Processing



Create a movie of the Images  
Amplitude

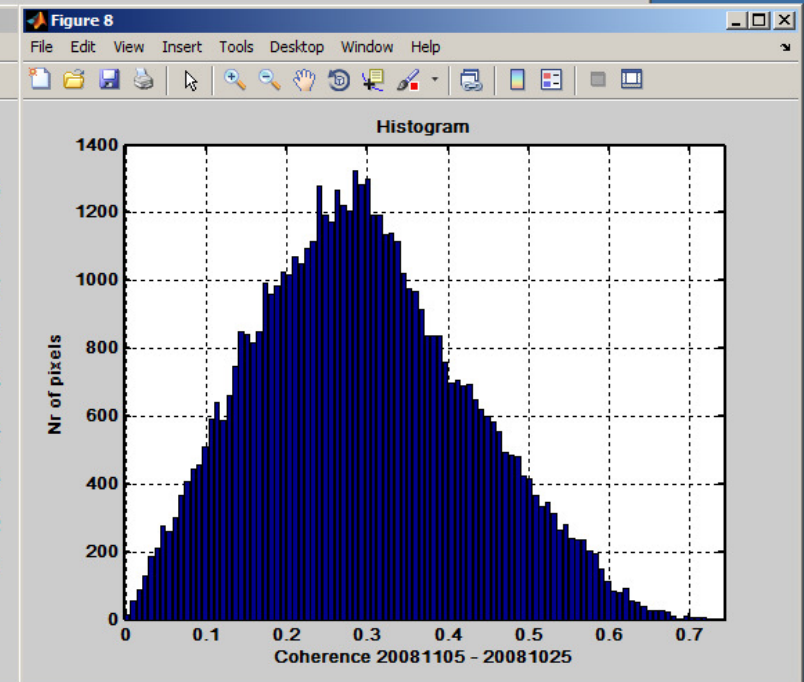
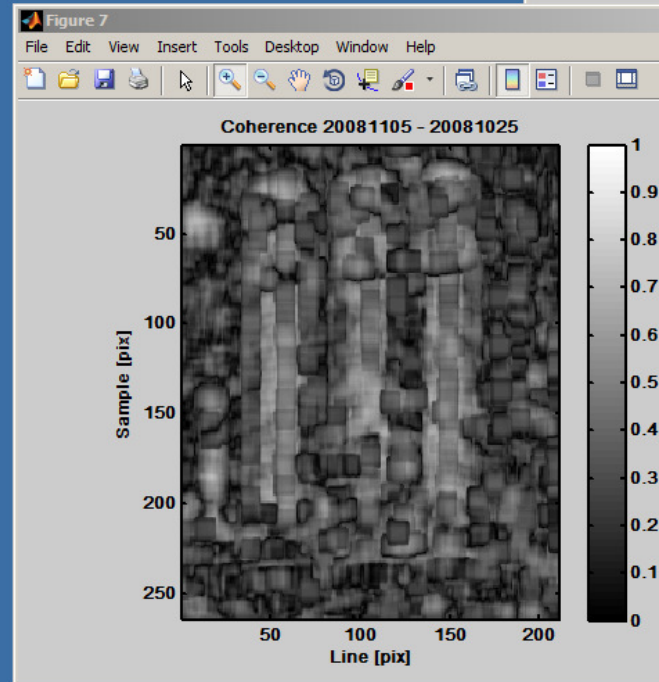
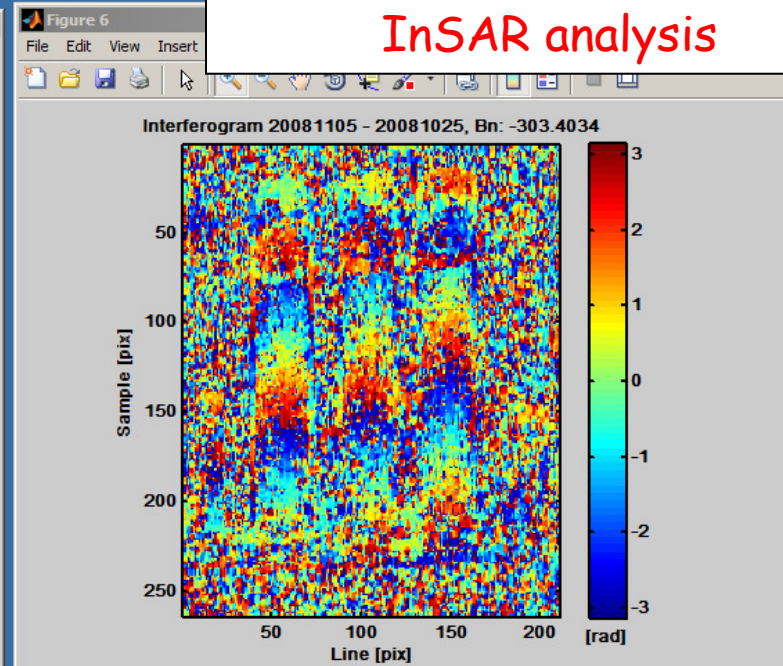
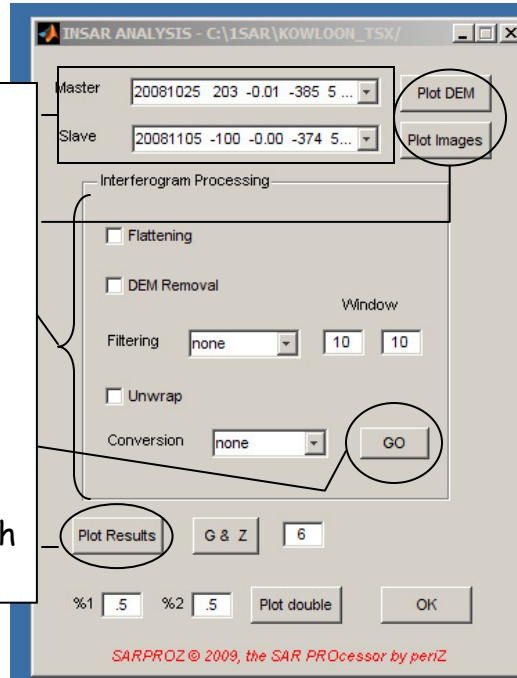
# Small Area Processing





# InSAR analysis

1. Choose Master and Slave images
2. Plot DEM and Images
3. Choose the operations to apply
4. Process the data by pressing "GO"
5. Plot the results through "Plot Results"



# InSAR analysis

Removing Flat Terrain

INSAR ANALYSIS - C:\SAR\KOWLOON\_TSX/

Master: 20081025 203 -0.01 -385 5 ... Plot DEM

Slave: 20081105 -100 -0.00 -374 5... Plot Images

Interferogram Processing

- Flattening
- DEM Removal

Window

Filtering: none 10 10

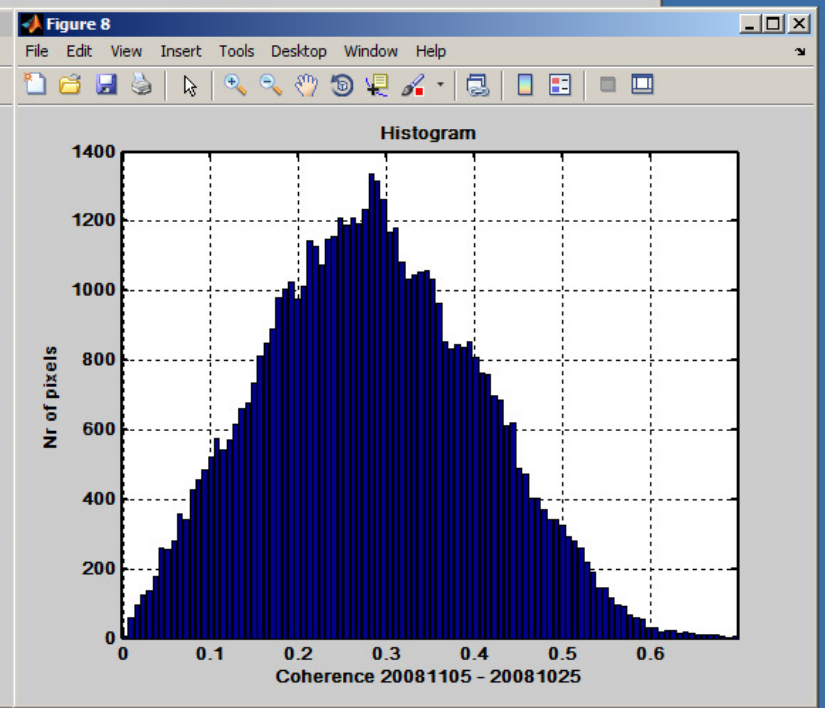
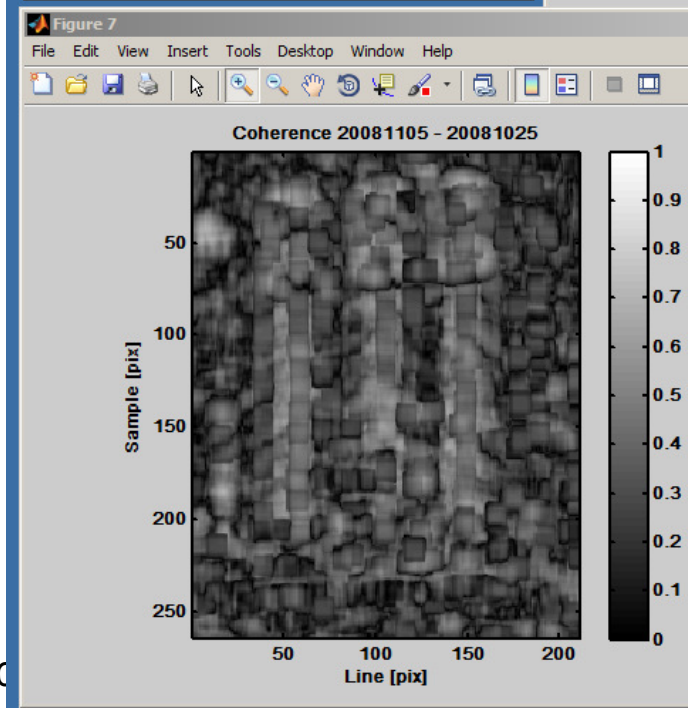
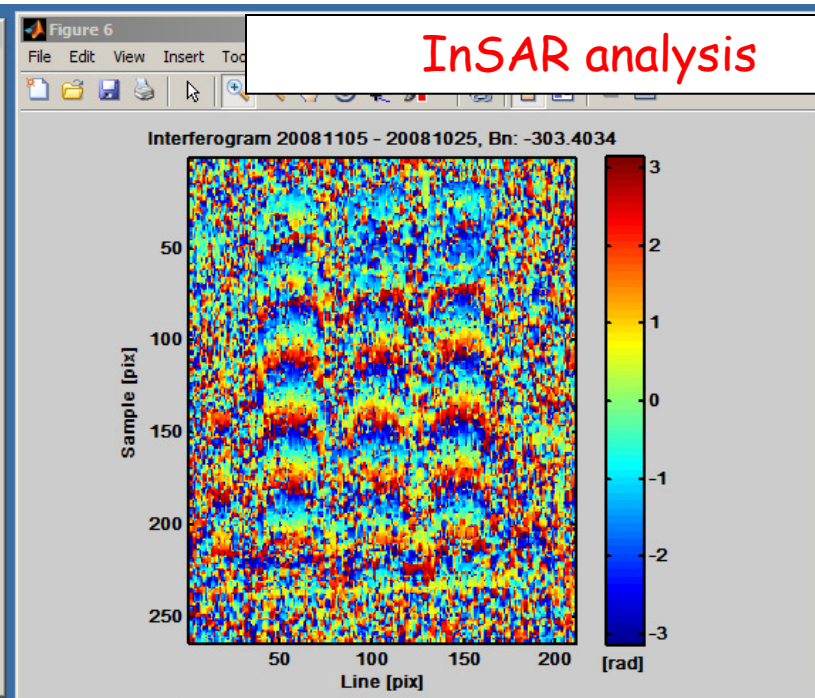
Unwrap

Conversion: none GO

Plot Results G & Z 6

%1 .5 %2 .5 Plot double OK

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# InSAR analysis

INSAR ANALYSIS - C:\SAR\KOWLOON\_TSX/

Master: 20081025 203 -0.01 -385 5 ... Plot DEM

Slave: 20081105 -100 -0.00 -374 5 ... Plot Images

Interferogram Processing

- Flattening
- DEM Removal
- Filtering: GoldStein [Window: 10 10]
- Unwrap
- Conversion: none [GO]

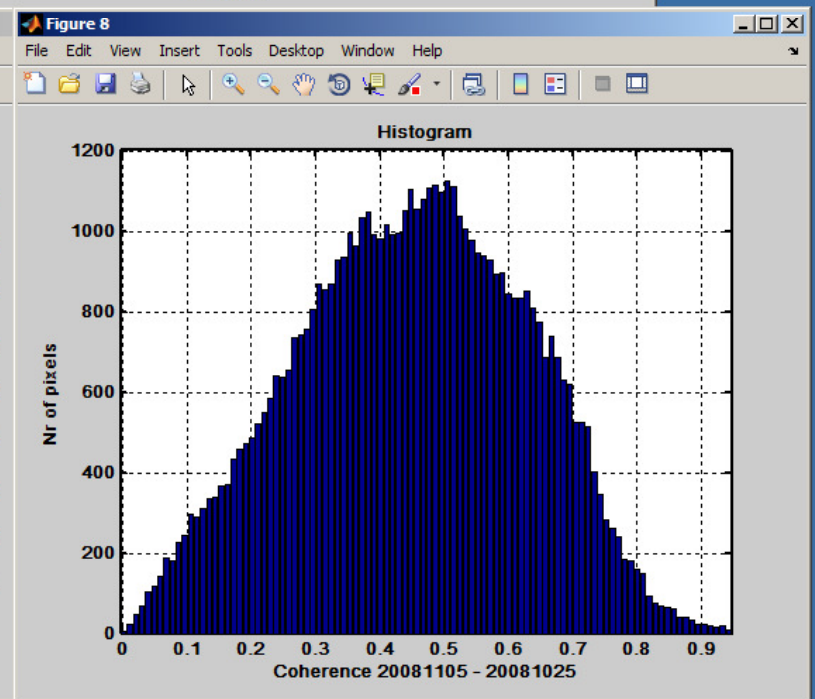
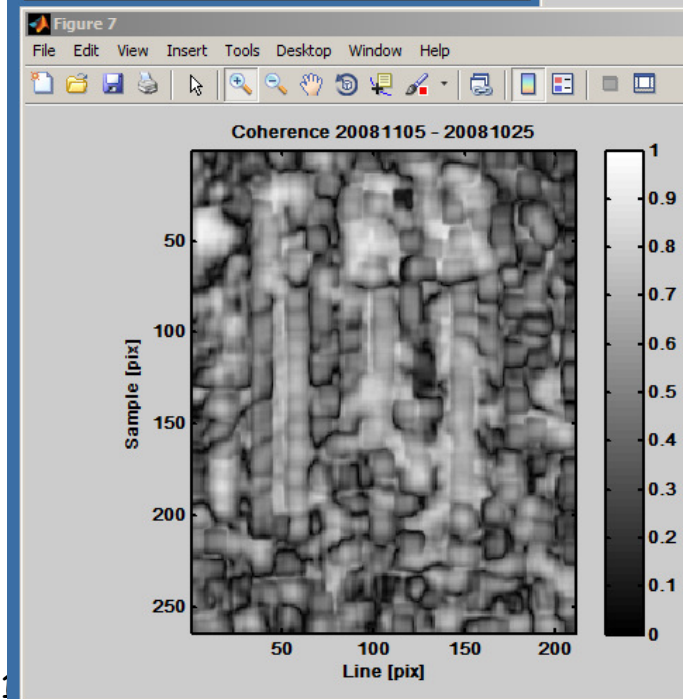
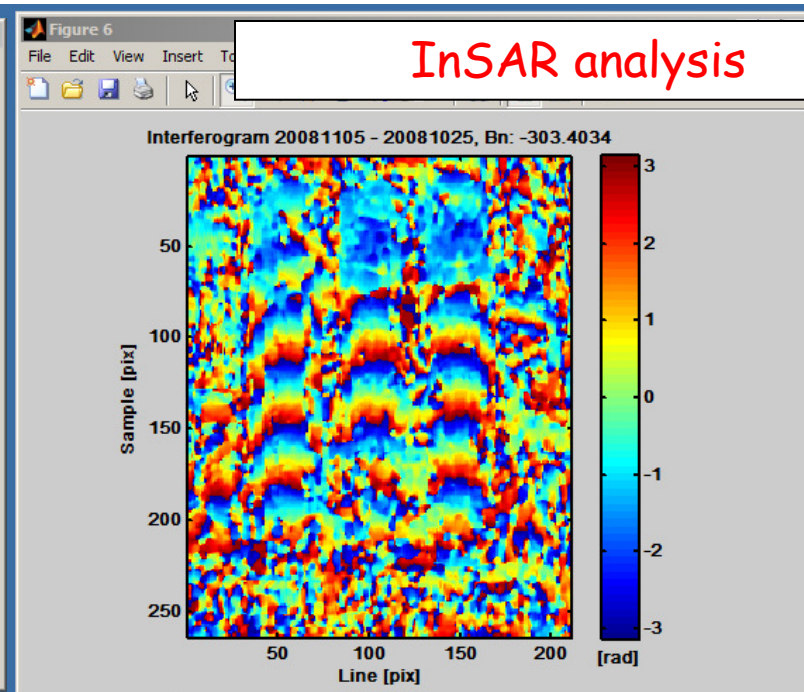
Plot Results G & Z 6

%1 .5 %2 .5 Plot double OK

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Removing the DEM

Applying Goldstein Filter





# InSAR analysis

The image shows two windows from the SARPROZ software. The left window, titled "INSAR ANALYSIS - C:\1SAR\KOWLOON\_TSX/", contains the following settings:

- Master: 20081025 203 -0.01 -385 5 ...
- Slave: 20081105 -100 -0.00 -374 5...
- Interferogram Processing:
  - Flattening
  - DEM Removal
  - Filtering: GoldStein, Window: 10, 10
  - Unwrap
  - Conversion: none
- Buttons: Plot DEM, Plot Images, Plot Results, G & Z, 6, Plot double (circled), OK
- Percentage settings: %1 .5, %2 .5
- Copyright: SARPROZ © 2009, the SAR PROCessor by periz

The right window, titled "Figure 9", displays an interferogram plot titled "Interferogram 20081105 - 20081025". The plot shows a color-coded interference pattern with axes labeled "Sample [pix]" (0 to 250) and "Line [pix]" (0 to 200).

Plot Amplitude and Phase together

# Sparse Points Selection in Small Area processing

The image shows two windows from the SARPROZ software. The left window, titled 'SMALL AREA PROCESSING - C:\1SAR\KOWLOON\_TSX/', contains a grid of buttons for various processing steps: 'Select Area', 'View SLC', 'View AP SLC', 'InSAR analysis', 'Create movie', 'Sparse Points Selection' (circled in red), 'Read and Plot Interfs', 'Amplitude analysis', 'Sub-cell positioning', 'Multi Image InSAR Analysis', 'Geocoding', 'Save', and 'Load'. At the bottom, there is a 'Force PS loading' checkbox, a 'Coherence Thr.' field set to '.7', and an 'OK' button. The right window, titled 'Sparse Points Selection', has a 'Parameter Thresholding' section with a dropdown menu set to 'Amp. Stab. Index ...' and a value of '.7'. Below this is an 'Amplitude Extraction' section with radio buttons for 'Local Maxima' and 'Lobes suppression', and checkboxes for 'Sref', 'Lref', 'Pend', and 'Delta'. A 'Selected Points: 727' indicator is present. The main area of this window is a plot of 'Samples' (y-axis, 0 to 250) versus 'Lines' (x-axis, 0 to 200). The plot shows a grayscale image with red diamond markers indicating selected points. A vertical color bar on the right of the plot ranges from 0 to 3. A 'Mouse Click on Plotted Data...' tooltip is visible at the bottom right of the plot area. Both windows have a copyright notice at the bottom: 'SARPROZ © 2009, the SAR PROcessor by perIZ'.

Sparse Points Selection

Parameter and threshold for points selection. Press Tab for applying the choice

# Amplitude Time Series Analysis in Small Area processing

The screenshot displays the SARPROZ software interface, divided into two main windows: "SMALL AREA PROCESSING" and "AMPLITUDE ANALYSIS".

**SMALL AREA PROCESSING - C:\1SAR\KOWLOON\_TSX/**

- Buttons: Select Area, InSAR analysis, Sparse Points Selection, Amplitude analysis (circled), Multi Image InSAR Analysis, Save, View SLC, View AP SLC, Create movie, Read and Plot Interfs, Sub-cell positioning, Geocoding, Load, OK.
- Force PS loading:  Coherence Thr.:
- Copyright: SARPROZ © 2009, the SAR PROCessor by perIZ

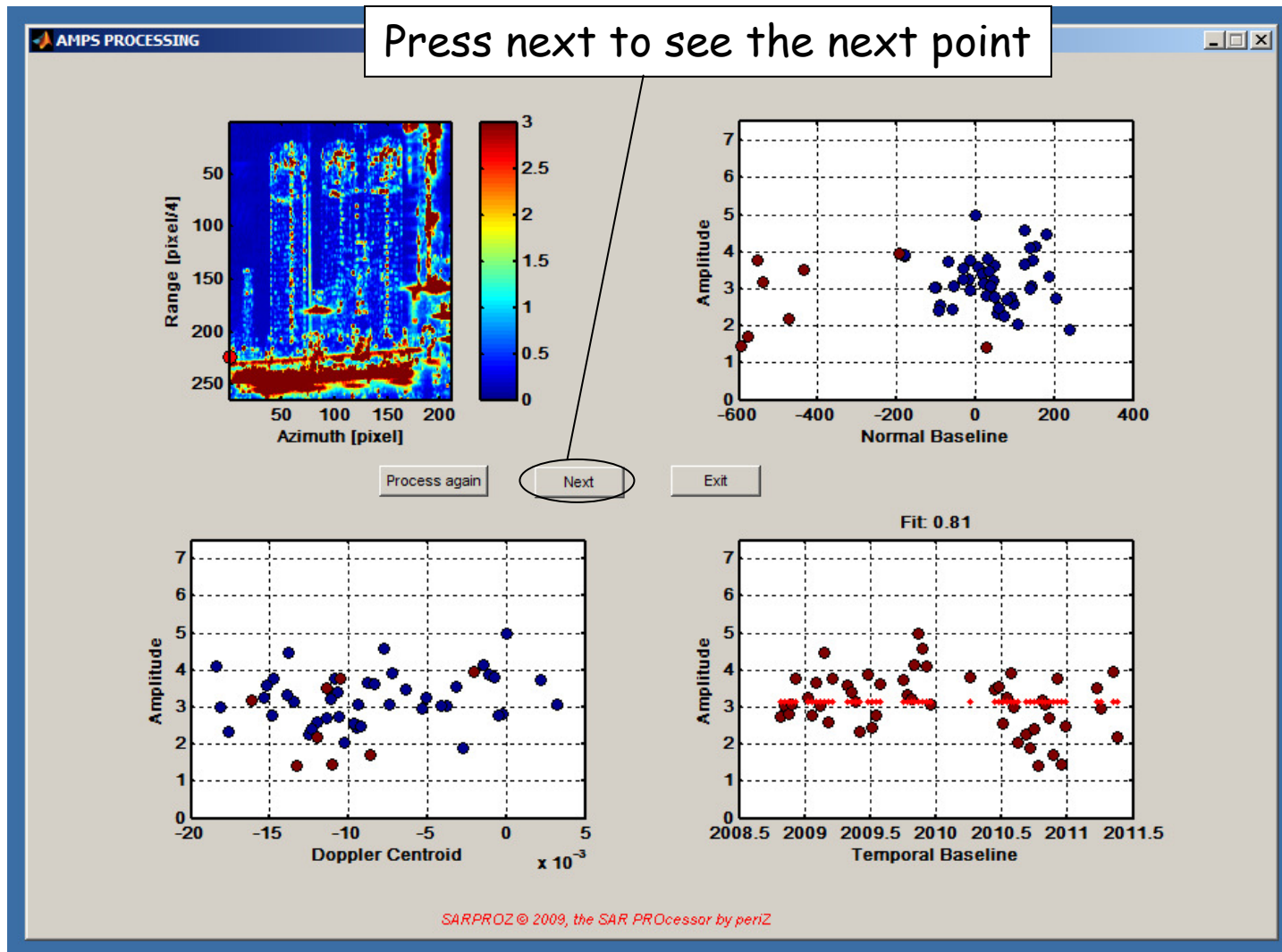
**AMPLITUDE ANALYSIS**

- Amp Model:
  - Physical Model
  - Change Detection
  - On-Off Model
- Processing:
  - Selected Points: 727
  - To be processed: 473
  - Process all
  - Go (circled)
  - Show Results
  - Data Series
- Plot: A 2D plot with "Samples" on the y-axis (0 to 250) and "Lines" on the x-axis (0 to 200). The plot shows a grayscale image with red diamond markers overlaid on two vertical structures. A color scale on the right ranges from 0 to 3.
- Buttons: OK, Mouse Click on Plotted Data...
- Copyright: SARPROZ © 2009, the SAR PROCessor by perIZ

Amplitude Analysis

1. Choose the Model for Time Series analysis
2. Press "Go"

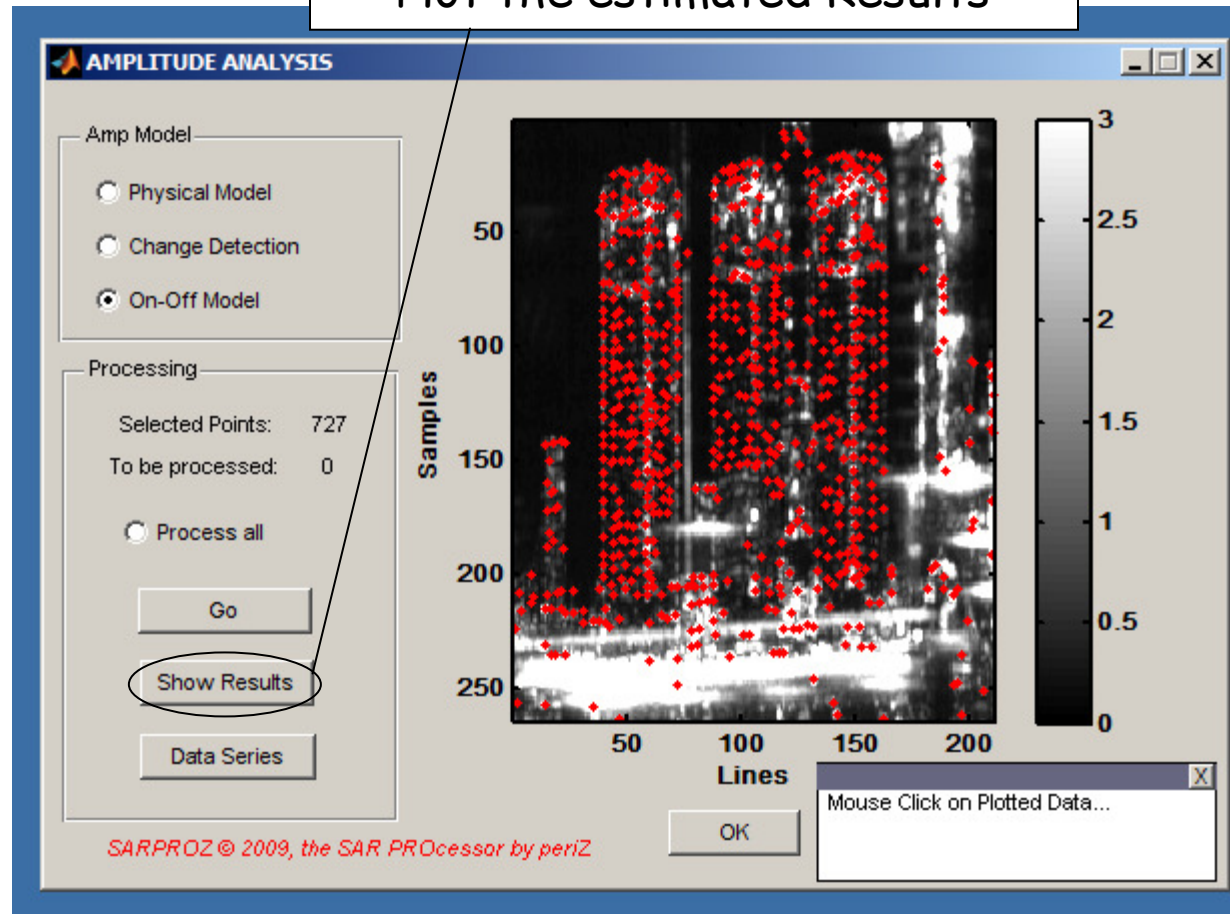
# Amplitude Time Series Analysis in Small Area processing



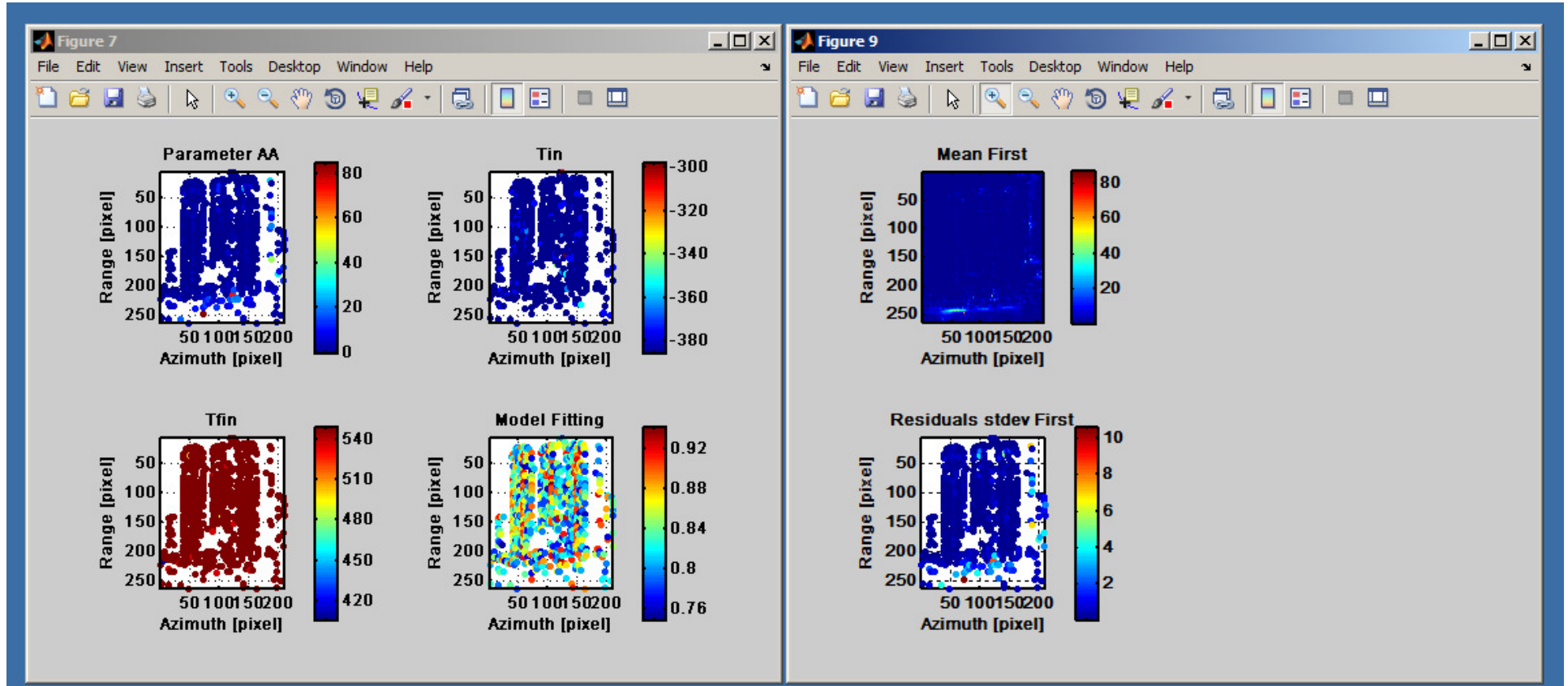


## Amplitude Time Series Analysis in Small Area processing

Plot the estimated Results



# Amplitude Time Series Analysis in Small Area processing



PSInSAR Analysis in Small Area processing

Reference Point Selection

Select Area      View SLC    View AP SLC

InSAR analysis      Create movie

Sparse Points Selection      Read and Plot Interfs

Amplitude analysis      Sub-cell positioning

**Multi Image InSAR Analysis**      Geocoding

Save      Load

Press the button "Multi Image InSAR Analysis"

**Sparse Points Multi-Image InSAR Analysis**

Reference Point  
Parameter: Refl. map      Coher: 0.91333  
 Manual Selection      Go      APS: none

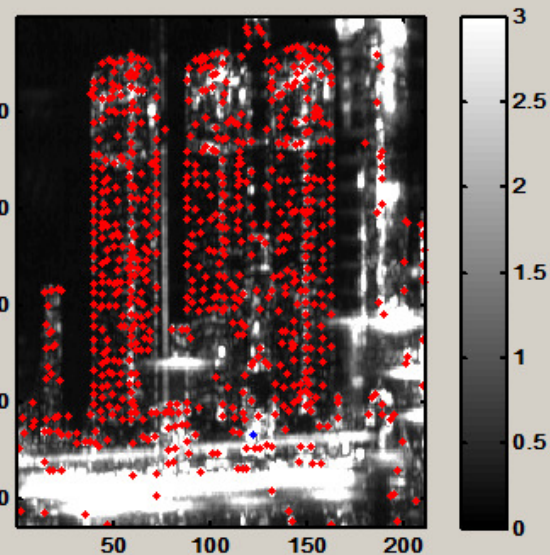
PS Processing

	Estimate	Read	Neglect	Parameters range	
Linear Trend	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	-100	100
Height	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	-100	100
Az. Pos.	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	-1	1
Phase Gap	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	-pi	pi
Seasonal trend	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	-4	4

Ext. DEM     Weights    Nmin Iter.: 50

Scattering centers: 1      Polynomial order: 1

Matr. Coher. Win: 15 15      Amps processing:  Go  Ask  Skip



Go      Show Results      Phase Series

Write Results      OK

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# PSInSAR Analysis in Small Area processing

1. Choice of the parameters to process

2. Atmospheric Phase Screen

Reference Point

Parameter: Refl. map    Coher: 0.91333

Manual Selection   

APS: none

PS Processing

	Estimate	Read	Neglect	Parameters range	
Linear Trend	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	-100	100
Height	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	-100	100
Az. Pos.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>		
Phase Gap	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	-pi	pi
Seasonal trend	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	-4	.4

Ext. DEM     Weights    Nmin iter.: 50

Scattering centers: 1    Polynomial order: 1

Matr. Coher. WIn: 15    15    Amps processing:  Go     Ask     Skip

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4. Process and wait...

3. Amplitude Analysis



# PSInSAR Analysis in Small Area processing

