

# 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)

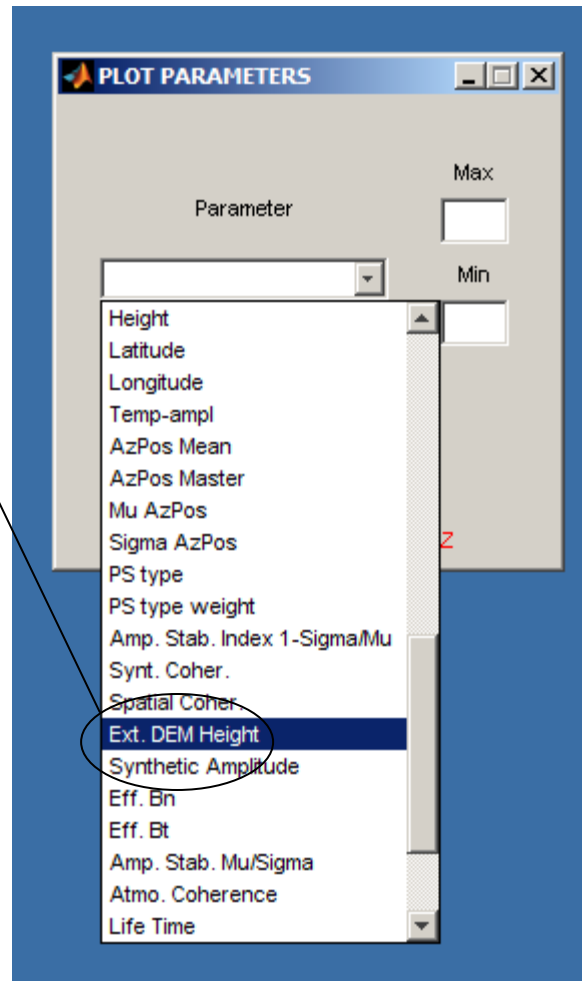
## Part II

Petronas University of Technology UTP

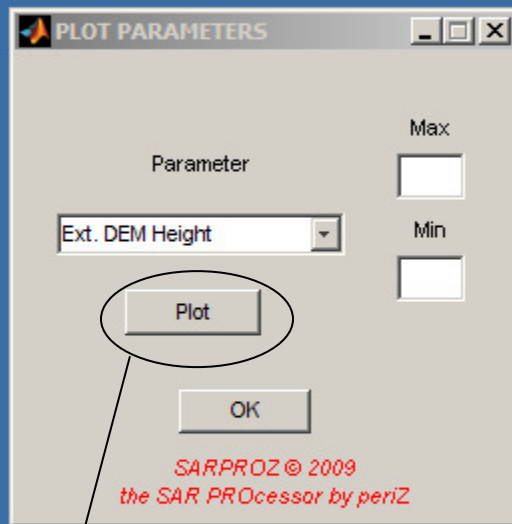
# DEM resampling in SAR coordinates

## View Parameters

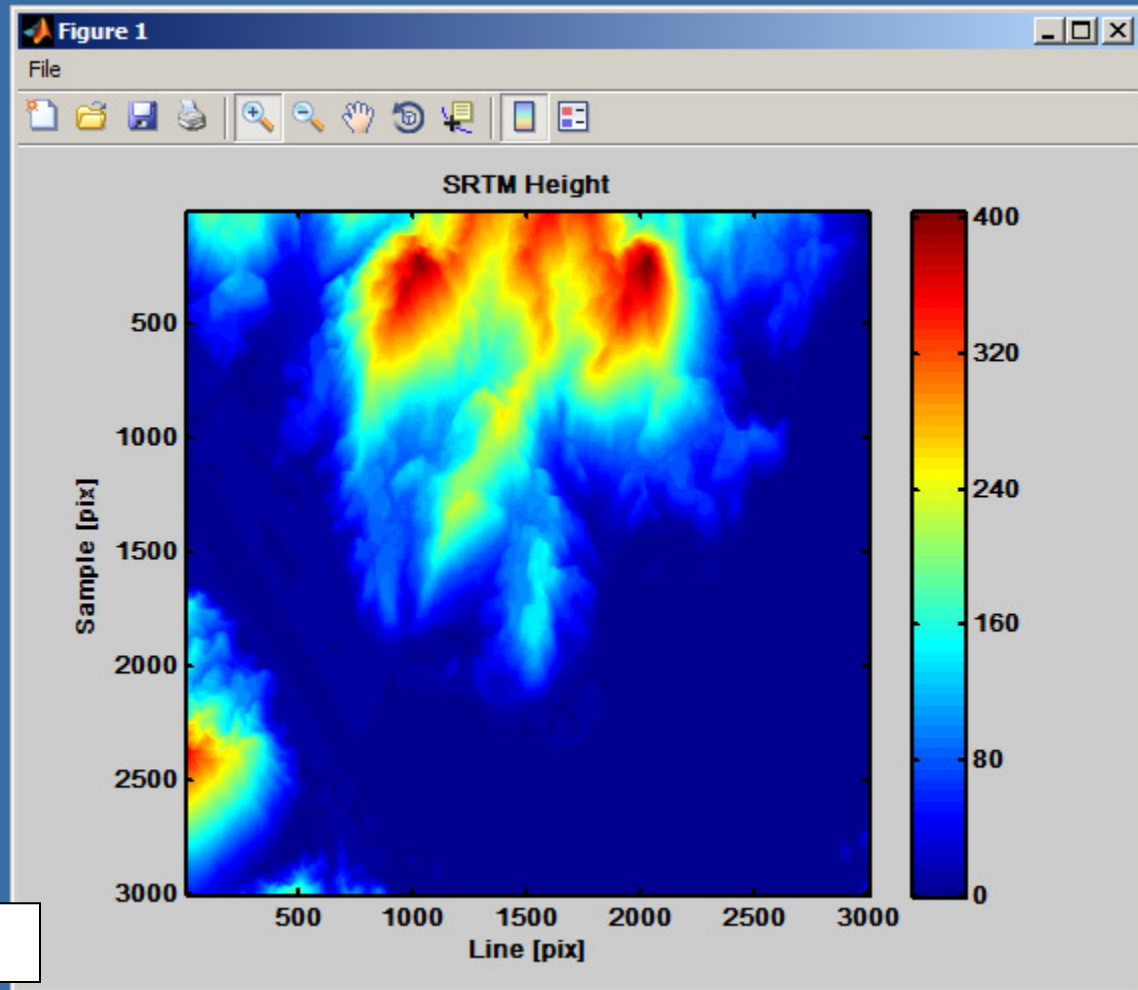
Select "External DEM Height" from the menu



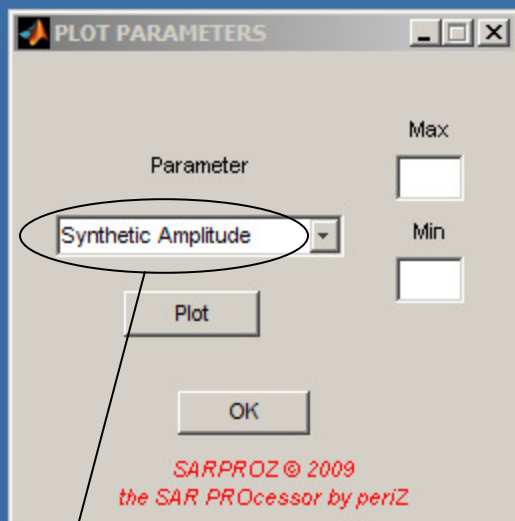
## View Parameters



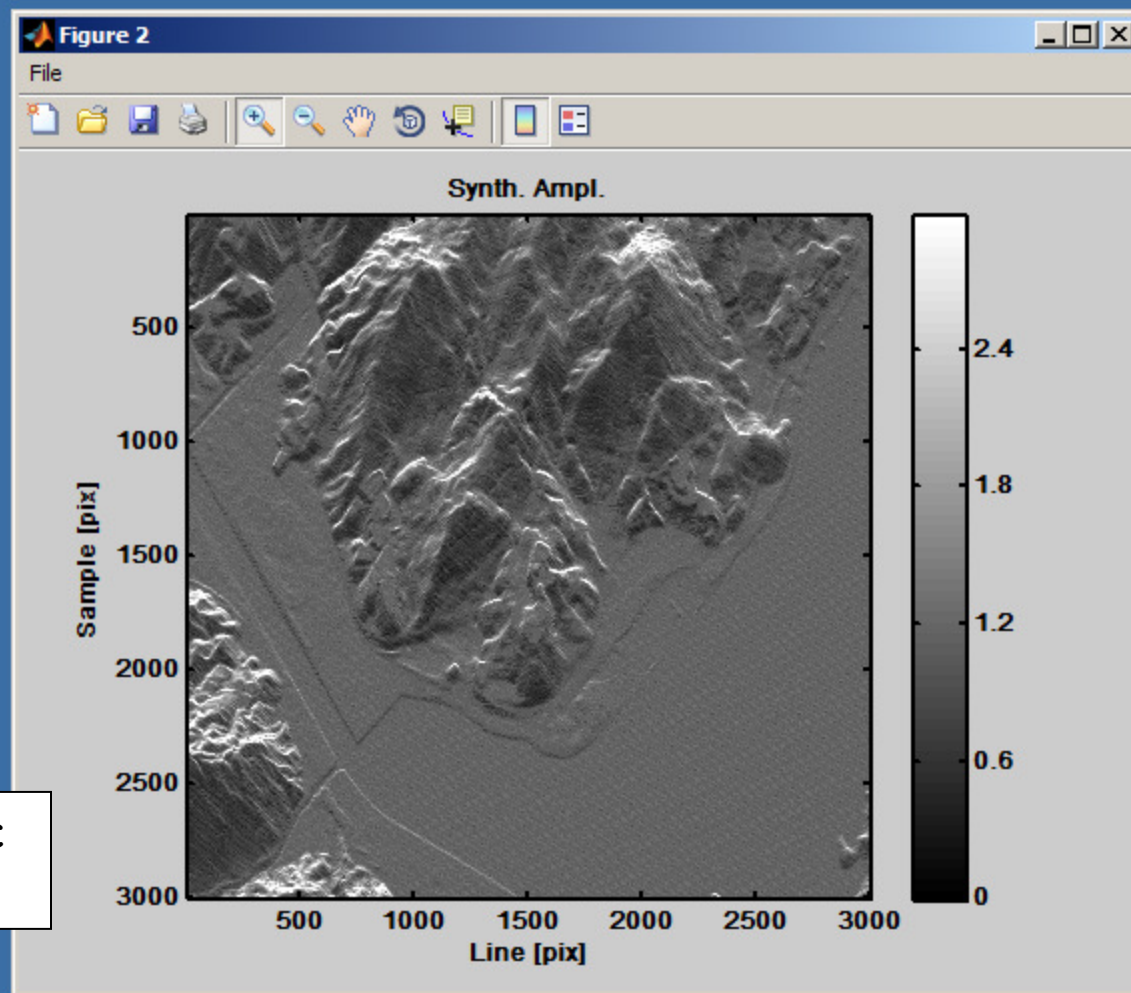
Press the button "Plot"



## View Parameters



Plotting the "Synthetic Amplitude"



Compare it with the Reflectivity Map to check the co-registration precision

# Precise geocoding and data exportation in GoogleEarth

# Site Processing

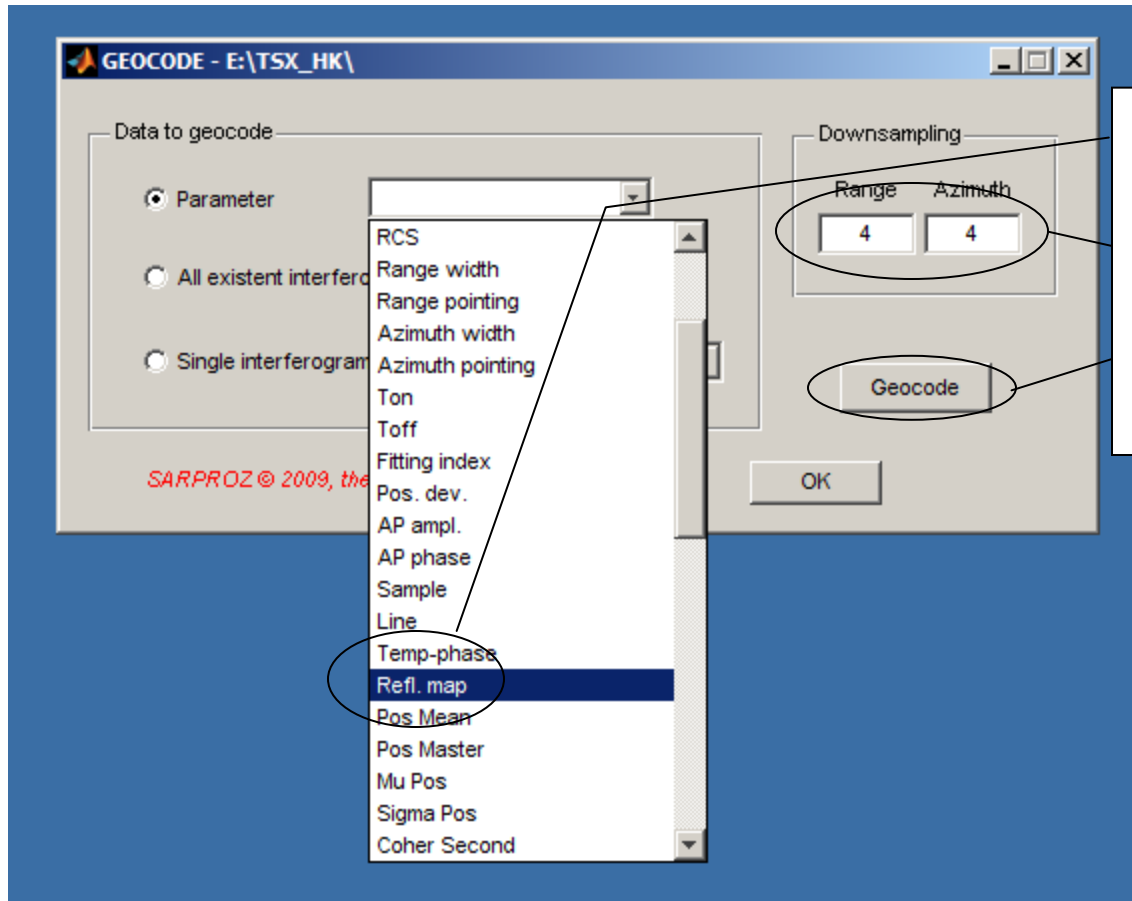
The screenshot shows the SARPROZ 2009 software interface with the following sections and buttons:

- Preliminary analysis:** Reflectivity map and amplitude stability index (Go), Mask for sparse points selection (Go).
- Preliminary geocoding:** External DEM selection (Current: User defined) (Go), DEM visualization (Go), Geocoding through external DEM (Go), Geocoding through manual GCP selection (Go), External DEM and synthetic amplitude in SAR coordinates (Go).
- Auxiliary analysis:** Change detection (Go), Image classification (Go).
- InSAR processing:** Update new images only (checkbox), Phase to height constants generation (Go), Amplitude processing (Go), Residual fringes estimation and removal (Go), Second order fringes removal (Go), Interferograms processing (Go), Coherence map generation (Go), Synthetic coherence map generation (Go), Single interferogram processing (Go), Sub-dataset extraction: Selection and extraction (Go).
- Sparse points selection:** Load mask (Go), Amplitude processing (Go), Series analysis: Sub-pixel positions analysis (Go), Flat Cartesian coordinates estimation (Go).
- Multi Image InSAR processing:** APS estimation (Go), Sparse Points processing (Go).
- Results exporting:** Extended geocoding (googleearth kml) (Go), Sparse geocoding (kml-dbf) (Go).
- Post-analysis:** Geographic coordinates estimation (Go), UTM coordinates estimation (Go), PS analysis (Go), PS classification (Go), Multi-sensor analysis (Go), Tests (Go).
- Visualization tools:** Histograms (Go), Scatter Plots (Go), View parameters (Go), View interferograms (Go).

A callout box contains the text: "To export a detailed map in GE, use 'Extended Geocoding'". An arrow points from this text to the "Extended geocoding (googleearth kml)" button, which is circled in the image.

*SARPROZ 2009, the SAR PROCessor by periz*  NO security prompt

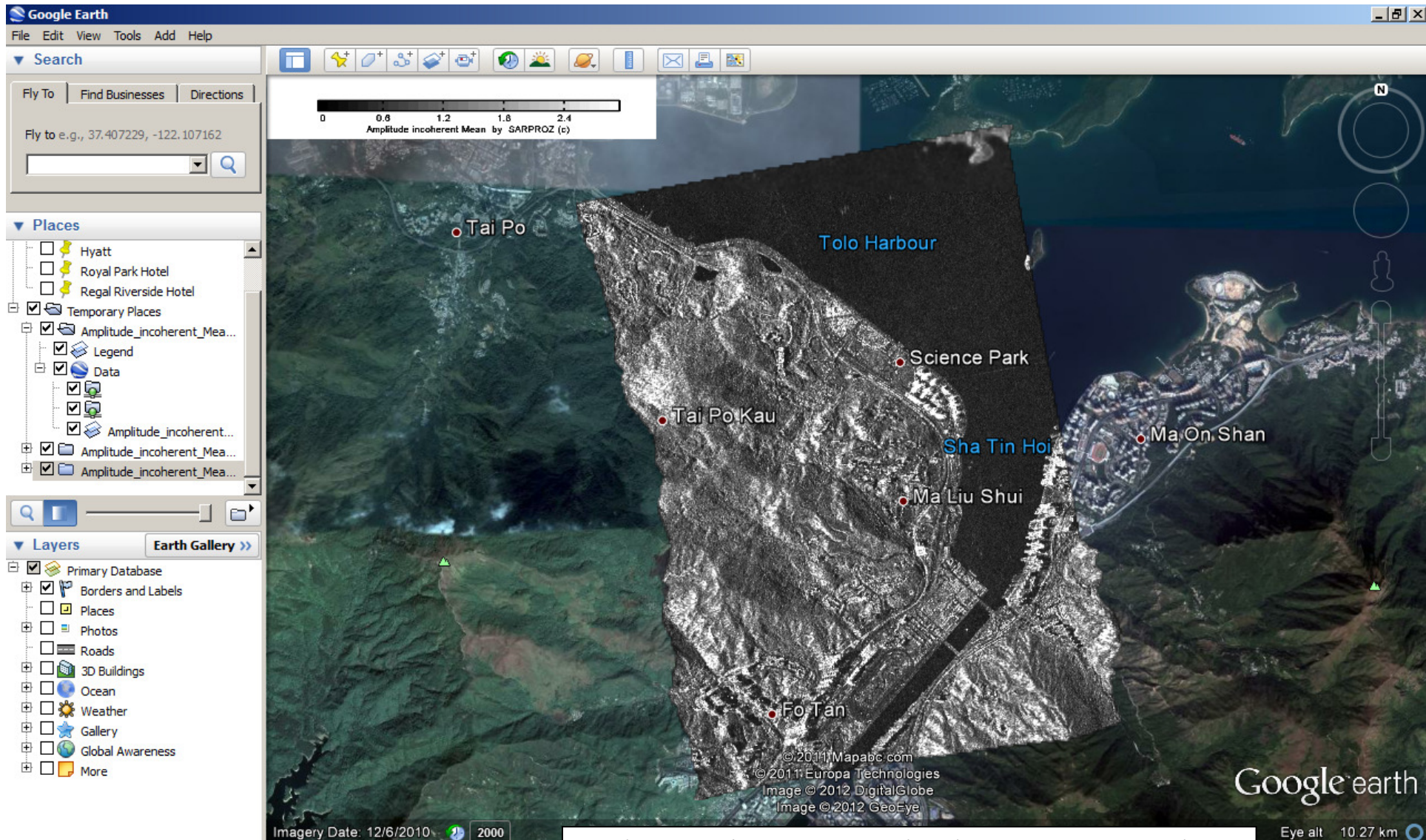
## Extended Geocoding



1. Select "Reflectivity map" from the menu
2. Choose the downsampling factor
3. Press the button "Geocode"



# The Reflectivity Map in GE



The quality now is higher because the DEM has been taken into account

# Change detection with pairs of images

# Site Processing

**SARPROZ 2009, the SAR PROCessor by periz**

NO security prompt

OK

**Preliminary analysis**

- Reflectivity map and amplitude stability index **Go**
- Mask for sparse points selection **Go**

**Preliminary geocoding**

- External DEM selection  
Current: User defined **Go**
- DEM visualization **Go**
- Geocoding through external DEM **Go**
- Geocoding through manual GCP selection **Go**
- External DEM and synthetic amplitude in SAR coordinates **Go**

**Auxiliary analysis**

- Change detection **Go**
- Image classification **Go**

**InSAR processing**

- Update new images only
- Phase to height constants generation **Go**
- Phase to flat constants generation **Go**
- MST estimation **Go**
- Residual fringes **Go**
- Interferograms processing **Go**
- Coherence map generation **Go**
- Synthetic coherence map generation **Go**
- Single interferogram processing **Go**
- Sub-dataset extraction

  - Selection and extraction **Go**

**Sparse points selection**

- Load mask **Go**

**Amplitude processing**

- Images fine equalization **Go**
- Amplitude time series analysis **Go**

**Multi Image InSAR processing**

- APS estimation **Go**
- Sparse Points processing **Go**

**Results exporting**

- Extended geocoding (googleearth kml) **Go**
- Sparse geocoding (kml-dbf) **Go**

**Post-analysis**

- Geographic coordinates estimation **Go**
- UTM coordinates estimation **Go**
- DEM post-analysis **Go**
- PS classification **Go**
- Multi-sensor analysis **Go**
- Tests **Go**

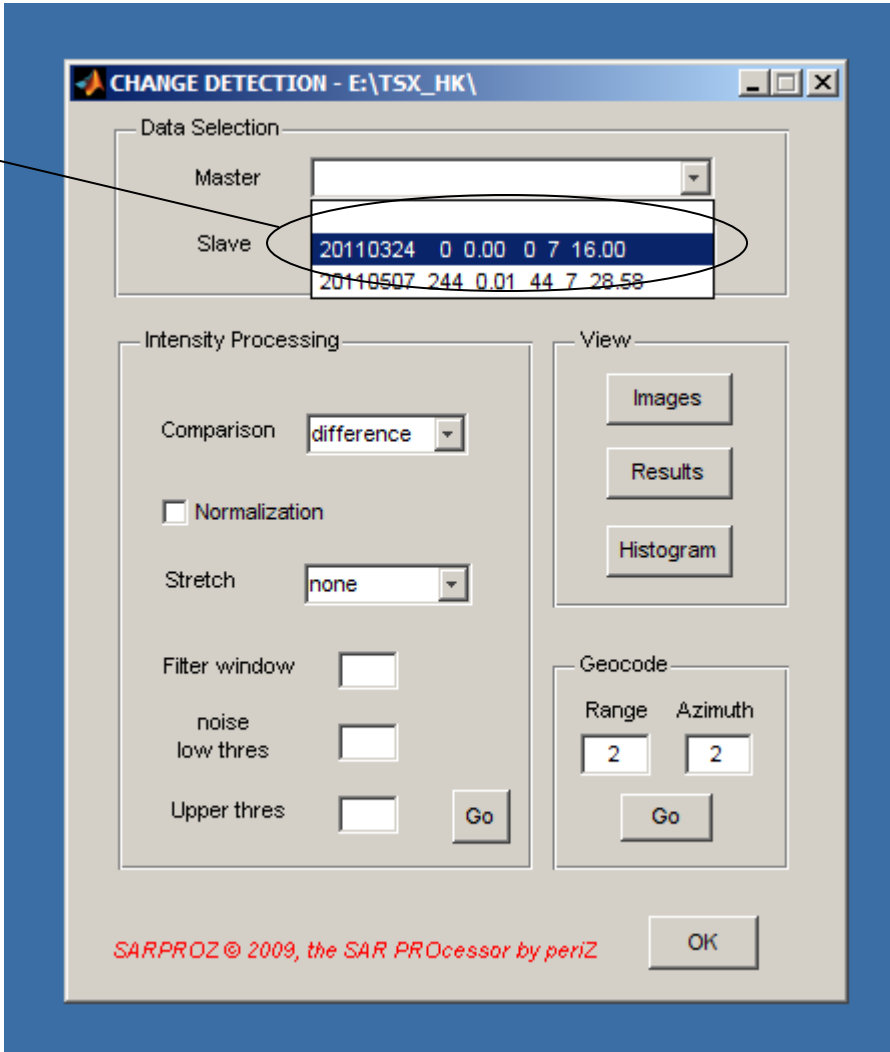
**Visualization tools**

- Histograms **Go**
- Scatter Plots **Go**
- View parameters **Go**
- View interferograms **Go**

**Change detection with a single pair of images**

Change detection

Select 2 different images as Master and Slave from the menu

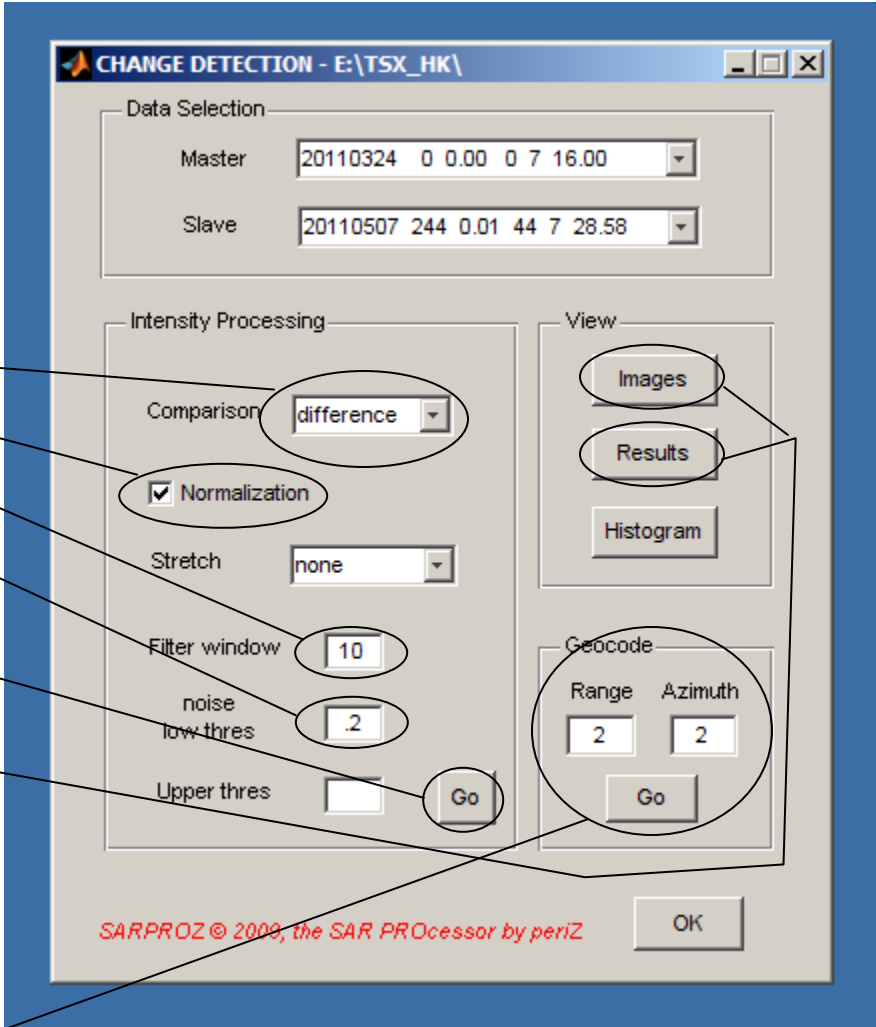


Change detection

Choose processing options:  
1. Difference  
2. Normalization  
3. Filter Window 10 pixels  
4. Noise threshold 0.2

Then press Go

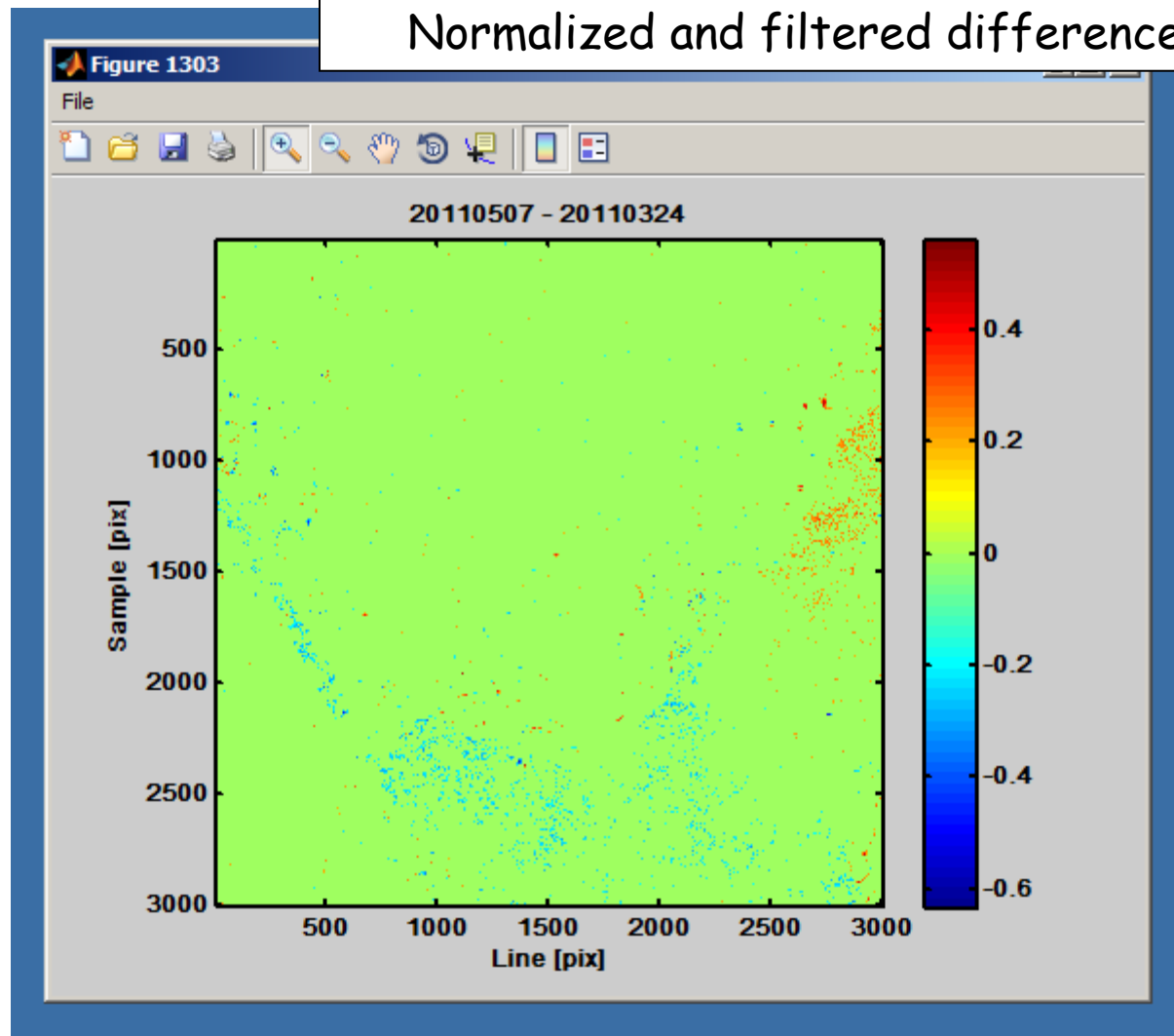
And plot images and results



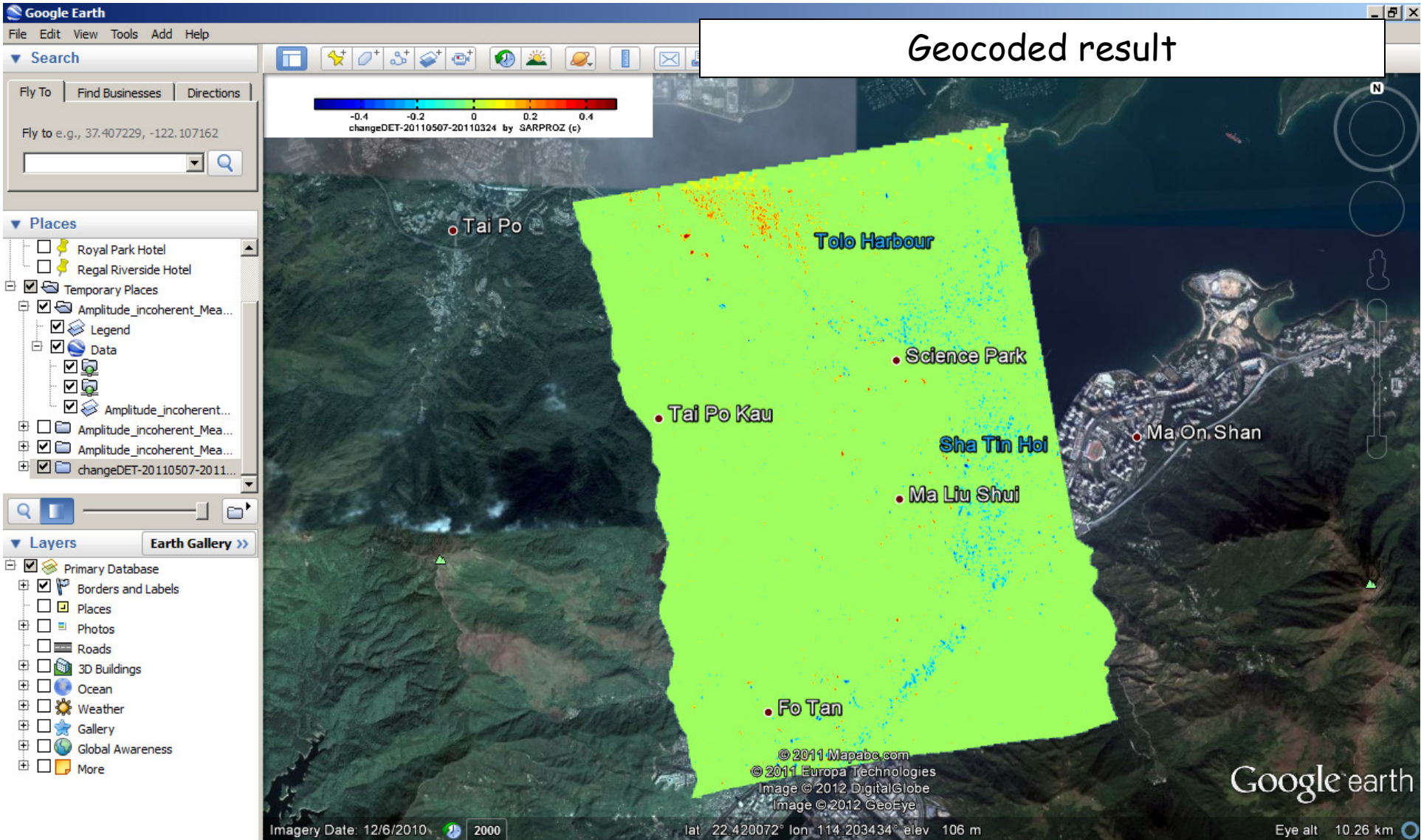
Geocoding module

## Change detection

### Normalized and filtered difference



# Change detection



# Interferometry processing



# Site Processing

The screenshot displays the SARPROZ software interface with the following sections and buttons:

- Preliminary analysis:** Reflectivity map and amplitude stability index (Go), Mask for sparse points selection (Go).
- Preliminary geocoding:** External DEM selection (Go), Current: User defined (Go), DEM visualization (Go), Geocoding through external DEM (Go), Geocoding through manual GCP selection (Go), External DEM and synthetic amplitude in SAR coordinates (Go).
- Auxiliary analysis:** Change detection (Go), Image classification (Go).
- InSAR processing:** Update new images only (checkbox), Phase to height constants generation (Go), Phase to flat constants generation (Go), MST estimation (Go), Residual fringes estimation and removal (Go), Second order fringes removal (Go), Interferograms processing (Go), Coherence map generation (Go), Synthetic coherence map generation (Go), Single interferogram processing (Go).
- Sub-dataset extraction:** Selection and extraction (Go).
- Sparse points selection:** Least mask (Go), Amplitude (Go), Image eq (Go), Amplitude series analysis (Go), Sub-pixel positions analysis (Go), Flat Cartesian coordinates estimation (Go).
- Multi Image InSAR processing:** APS estimation (Go), Sparse Points processing (Go).
- Results exporting:** Extended geocoding (googleearth kml) (Go), Sparse geocoding (kml-dbf) (Go).
- Post-analysis:** Geographic coordinates (Go), PS classification (Go), Multi-sensor analysis (Go), Tests (Go).
- Visualization tools:** Histograms (Go), Scatter Plots (Go), View parameters (Go), View interferograms (Go).

A callout box contains the text: "To prepare the data for interferometric processing, generate phase to flat and phase to height constants".

*SARPROZ 2009, the SAR PROCessor by periz*  NO security prompt

# Single Interferogram Processing

Select 2 different images as Master and Slave from the menu

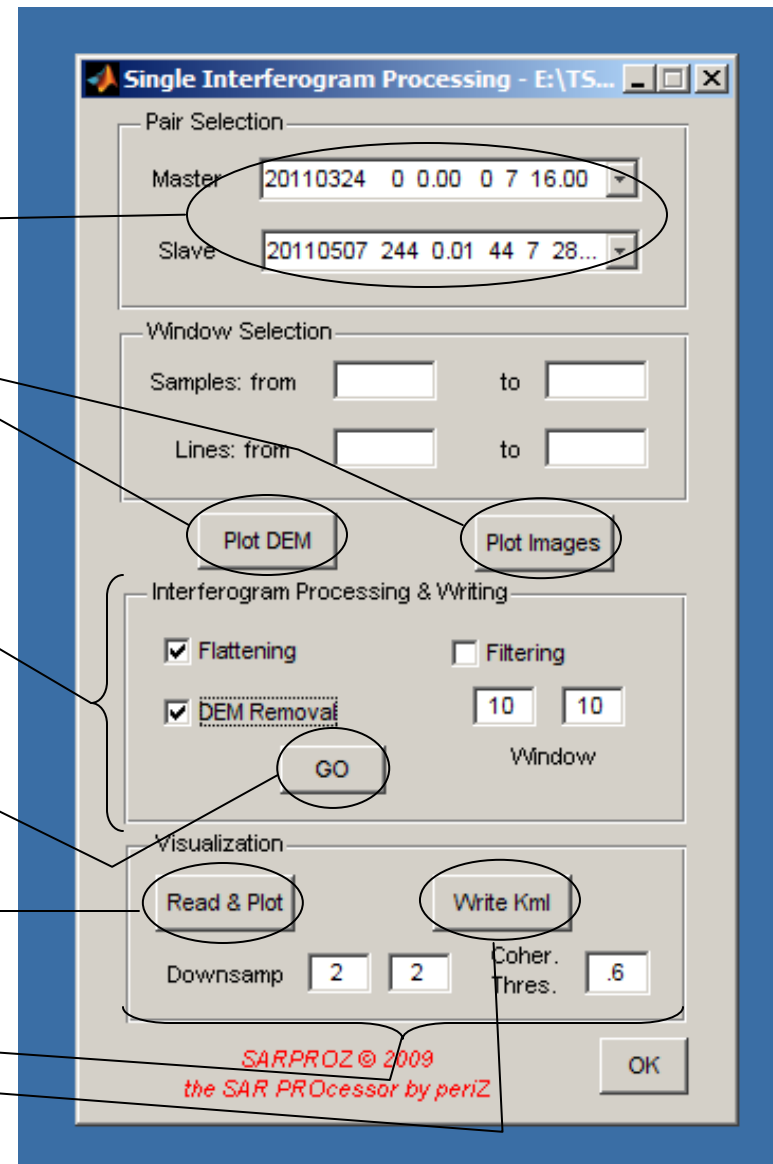
Plot DEM and Images

Choose the operations you want to perform (flattening, DEM removal, filtering -window size-)

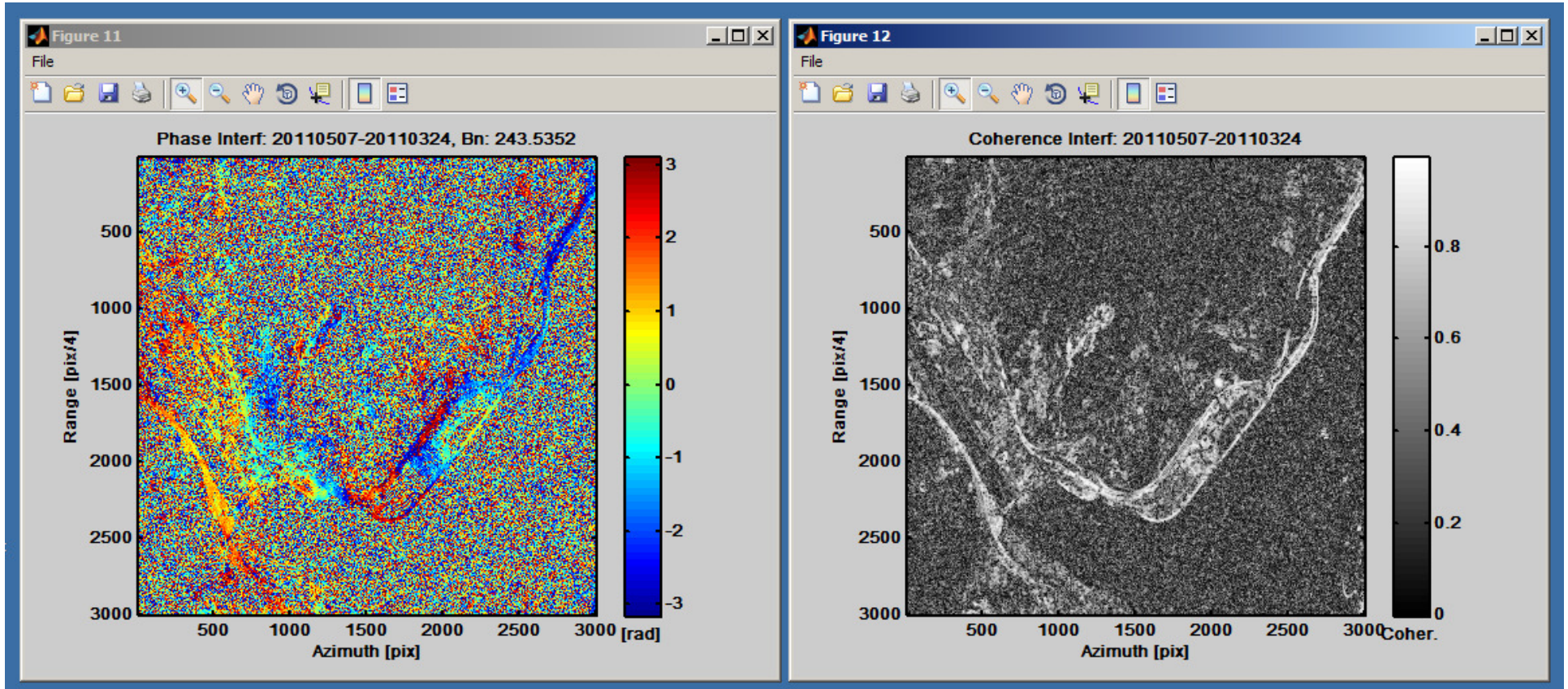
And press GO

Plot the results

Choose appropriate parameters and Geocode the results in GE

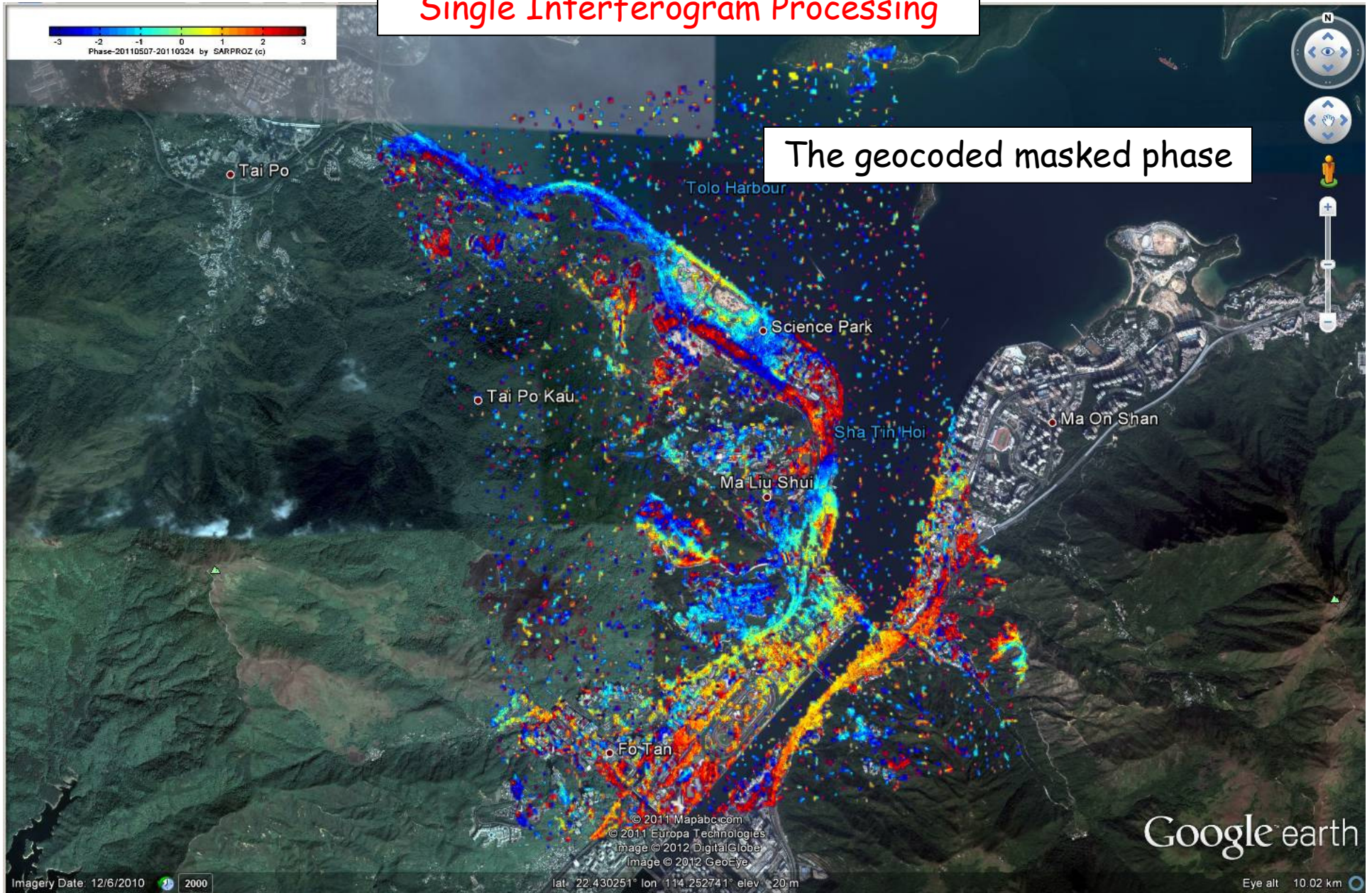


# Single Interferogram Processing



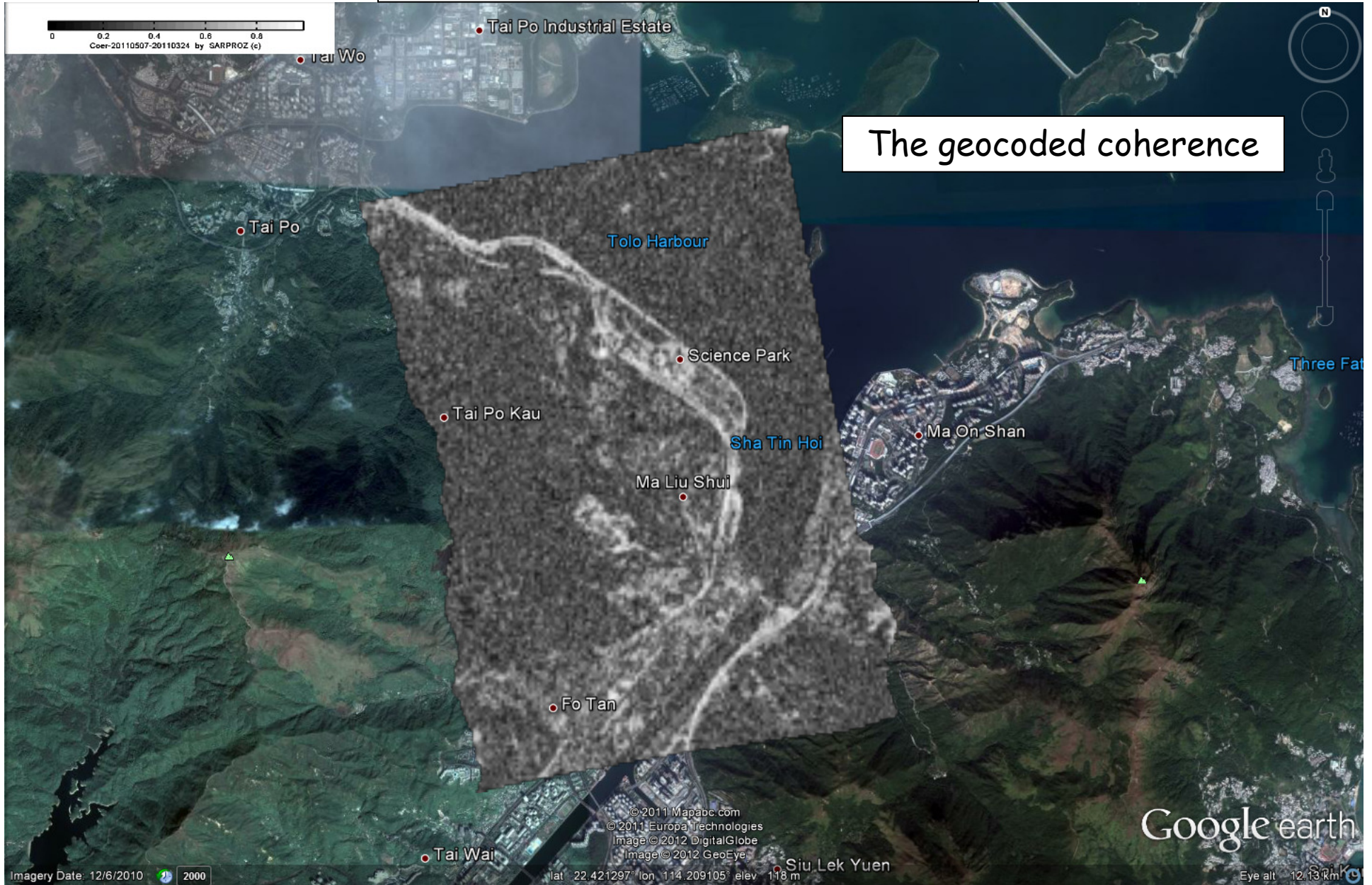
The results

# Single Interferogram Processing



The geocoded masked phase

# Single Interferogram Processing



# Sparse Points visualization

# Examples for Interferometry

## SARPROZ main window

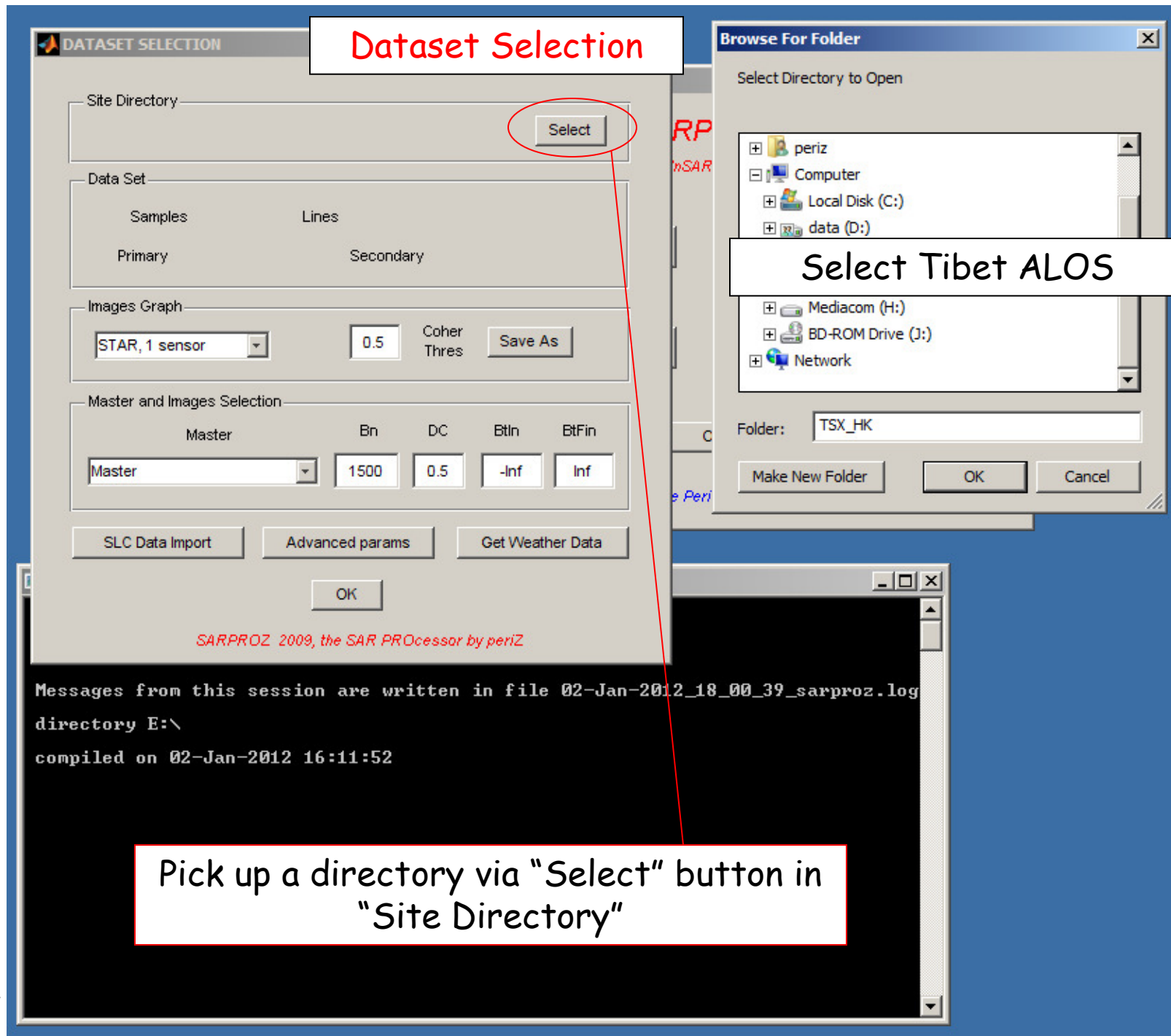
Load data with "Select Dataset"



```
E:\main.exe

Welcome to SARPROZ
by Daniele Perissin, copyright 2009
Messages from this session are written in file 02-Jan-2012_18_00_39_sarproz.log
directory E:\
compiled on 02-Jan-2012 16:11:52
```





Dataset Selection

Select Tibet ALOS

Pick up a directory via "Select" button in "Site Directory"