

Exercise 1: Change Detection of Recent Flood in Texas

Sarproz processing tutorial series

By Yuxiao QIN

Downloading Sample Data

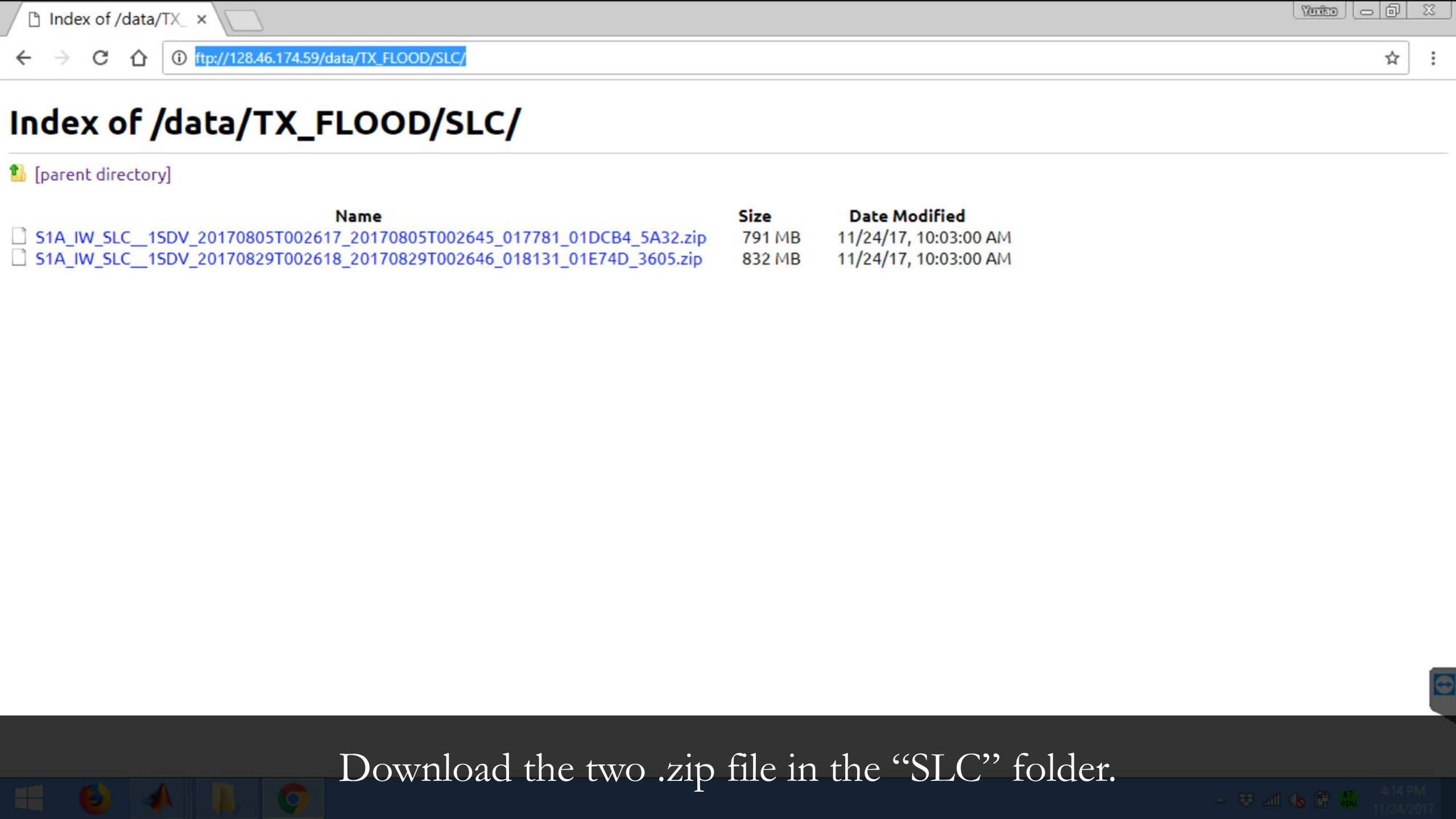
- Sample Data, Texas Houston, 2017 August Flood:
 - ~~ftp://johndoe:psinsar12138@128.46.174.159/data/TX_FLOOD/~~ SEE BELOW
 - To download, manually copy & paste this URL into Google Chrome's address bar.
 - Two data taken separately on 2017-Aug-05 and 2017-Aug-29 are included in the sample data.
 - Reference: https://www.wikiwand.com/en/Hurricane_Harvey
- Sample Data, Napa, California, 2014 August Earthquake:
 - ~~ftp://johndoe:psinsar12138@128.46.174.159/data/NAPA_EQ~~ SEE BELOW
 - Two data taken separately on 2014-Aug-07 and 2014-Aug-31 are included in the sample data.
 - Reference: http://www.wikiwand.com/en/2014_South_Napa_earthquake

!! the links above are no longer working

please find the data hereafter:

TEXAS FLOOD: <https://my.pcloud.com/publink/show?code=XZtlbE7ZvXKViLSdGrY6RIgY55UQ9uNXFRpk>

NAPA EARTHQUAKE: <https://my.pcloud.com/publink/show?code=XZ1DnU7ZtMAo6EHeMopShqpY5keOnS2z1lkk>

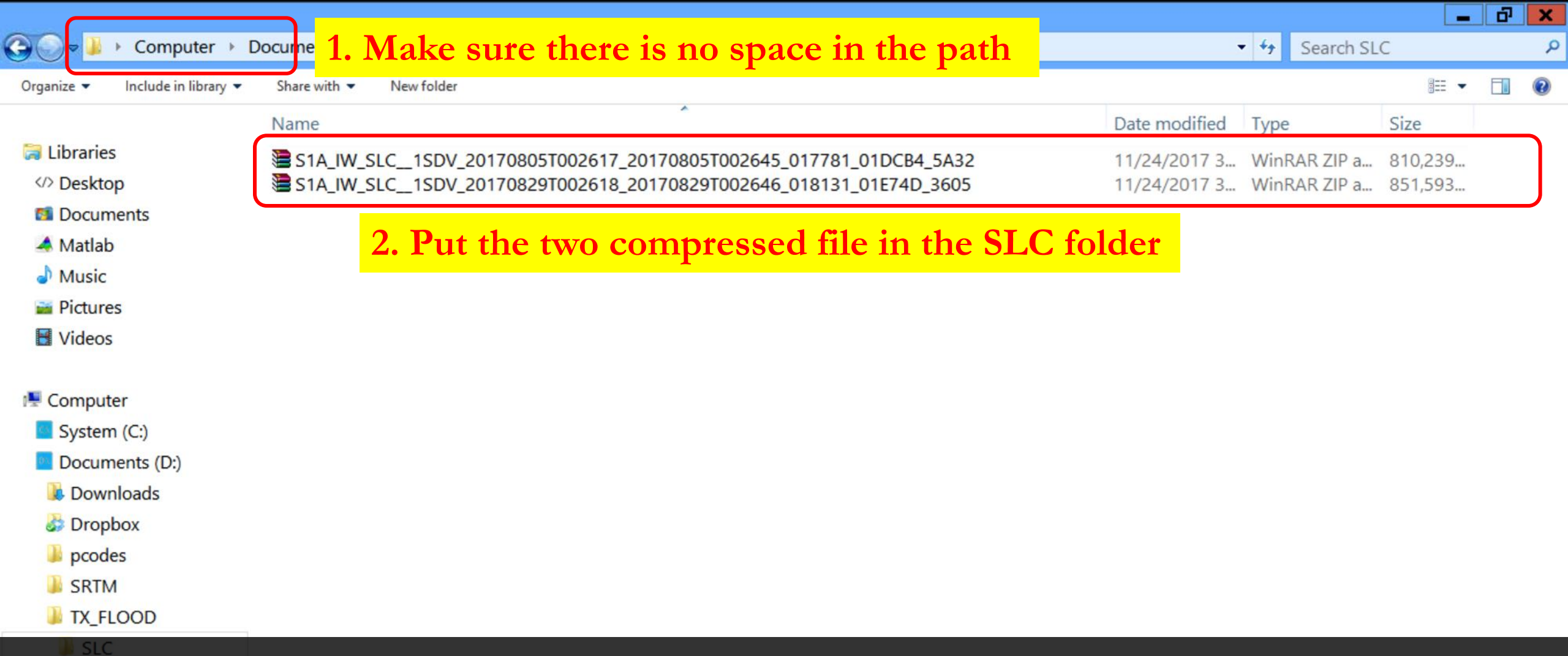


Index of /data/TX_FLOOD/SLC/

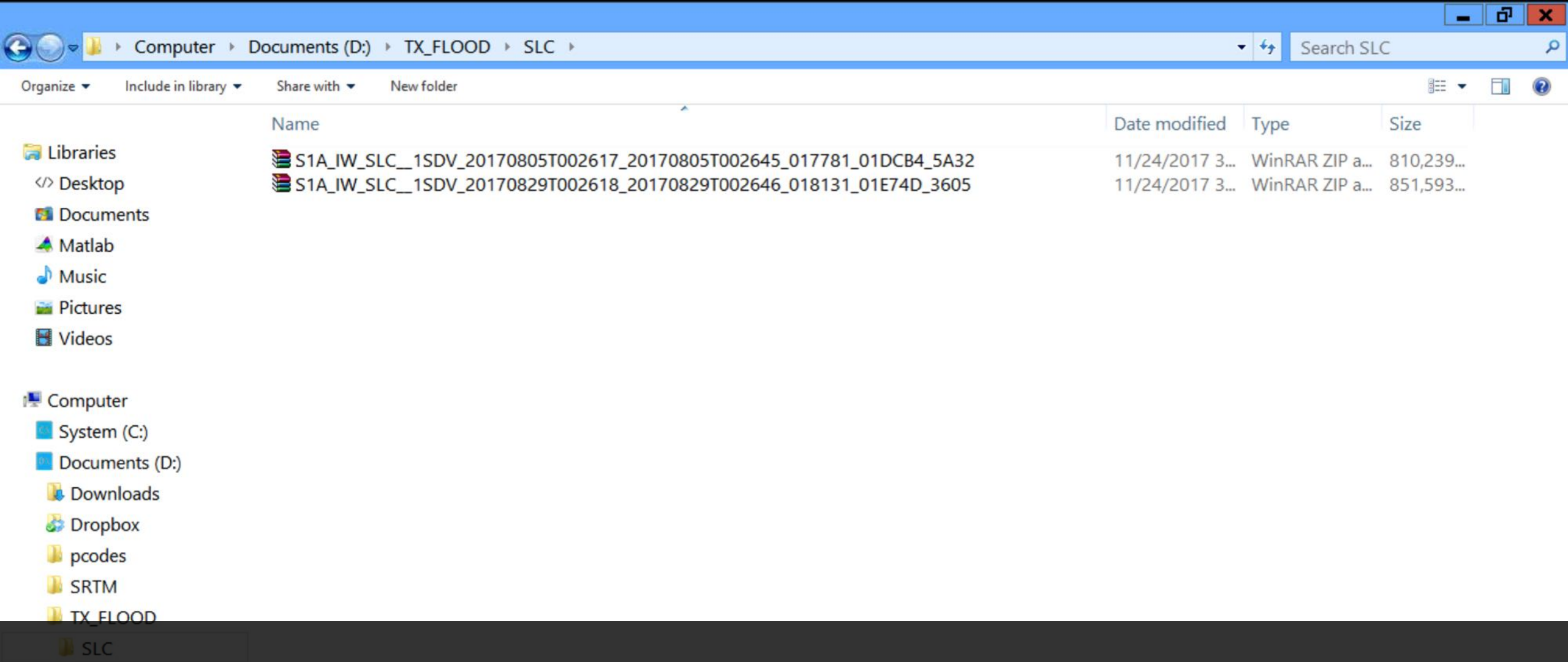
[parent directory]

	Name	Size	Date Modified
	S1A_IW_SLC__1SDV_20170805T002617_20170805T002645_017781_01DCB4_5A32.zip	791 MB	11/24/17, 10:03:00 AM
	S1A_IW_SLC__1SDV_20170829T002618_20170829T002646_018131_01E74D_3605.zip	832 MB	11/24/17, 10:03:00 AM

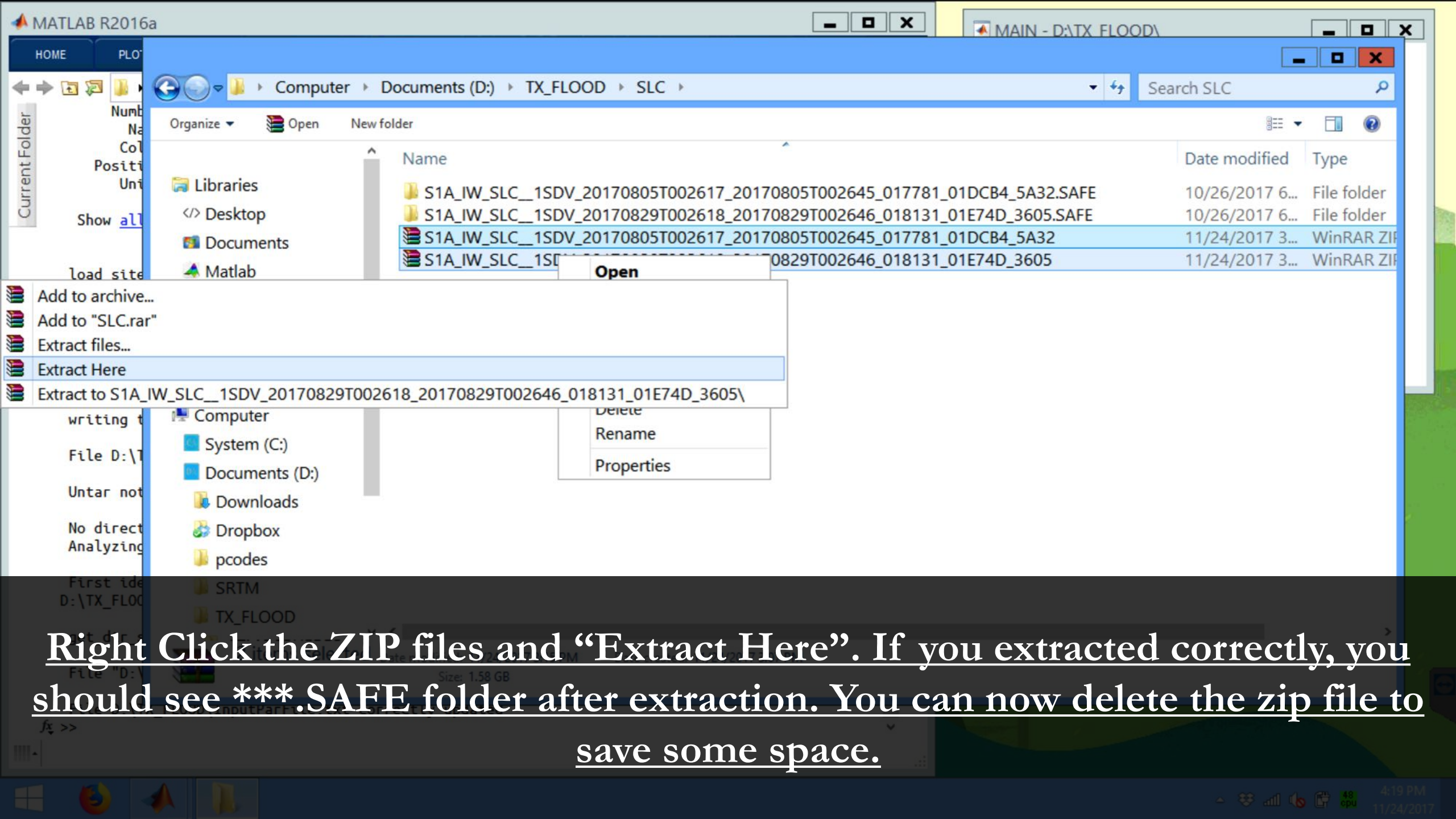
Download the two .zip file in the “SLC” folder.



Create a folder called “TX_FLOOD” on your PC. Inside that folder, create another folder called “SLC”. Put the two zip file inside the SLC folder. Again, DON’T HAVE ANY SPACE IN THE PATH NAME WHERE YOU PUT THE TX FLOOD FOLDER.

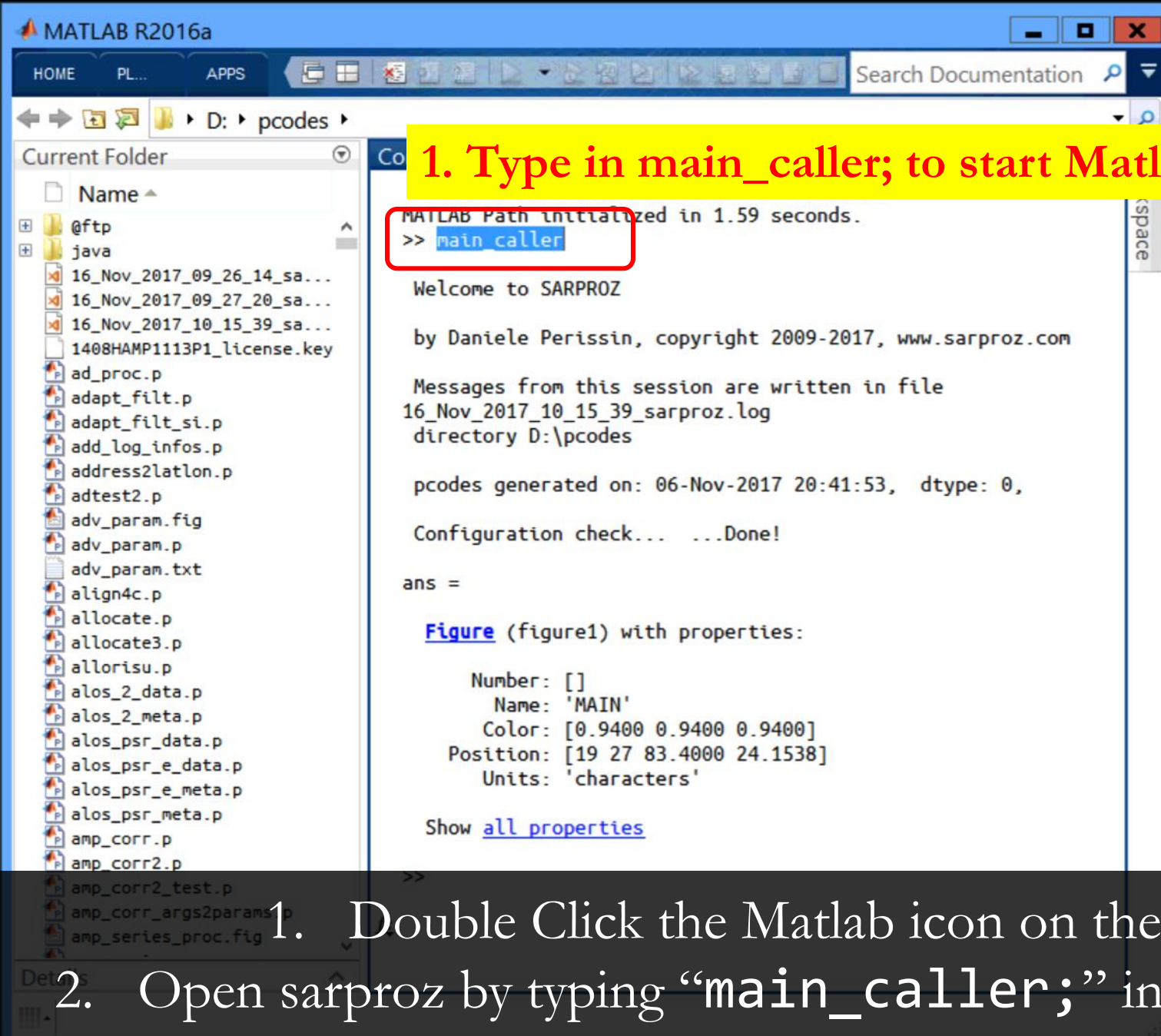


PLEASE LEAVE AT LEAST 3.5GB AVAILABLE FOR THIS LAB! (Later you will be instructed to delete unnecessary files during the process, but at one point you must have 3.5GB on disk to process all data!)



Right Click the ZIP files and “Extract Here”. If you extracted correctly, you should see *****.SAFE** folder after extraction. You can now delete the zip file to save some space.

Part 1: Import
Synthetic **A**perture **R**adar (SAR)
Single-**L**ook **C**omplex (SLC) data

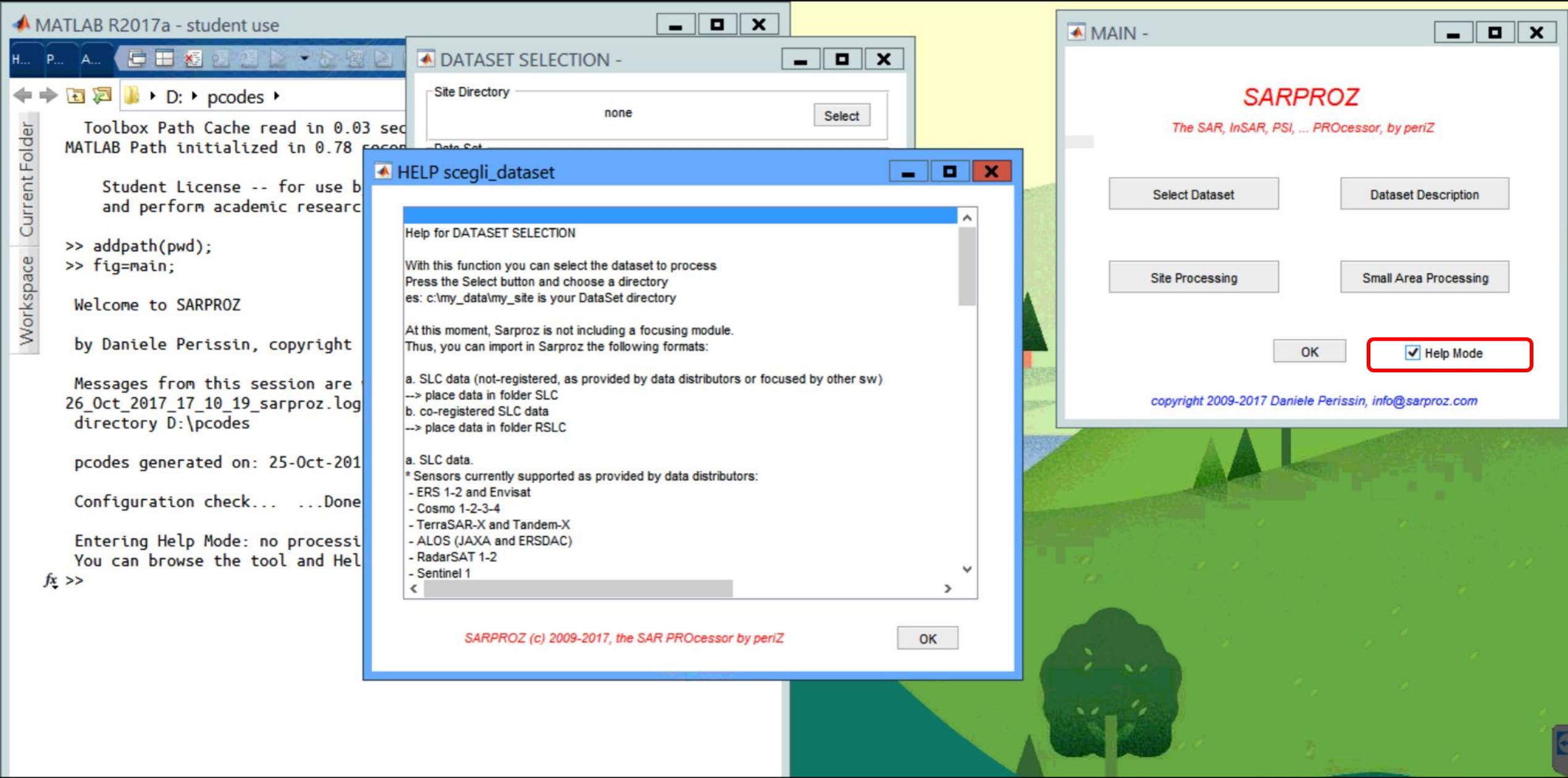


1. Type in main_caller; to start Matlab



2. If the main window pops out, SARPROZ starts successfully

1. Double Click the Matlab icon on the desktop to start Matlab.
2. Open sarproz by typing "main_caller;" in the command window of Matlab followed by the return key.



When the “Help Mode” is checked, a help window will pop out for different modules.

The help mode is a quick guide for you to understand how each module works.

MATLAB R2017a - student use

H... P... A... Search Documentation Yuxiao

D: \ pcodes

Current Folder

Toolbox Path Cache read in 0.03 seconds.
MATLAB Path initialized in 0.69 seconds.

Student License -- for use by students to meet course requirements
and perform academic research at degree granting institutions only.

```
>> fig=main;
```

Welcome to SARPROZ

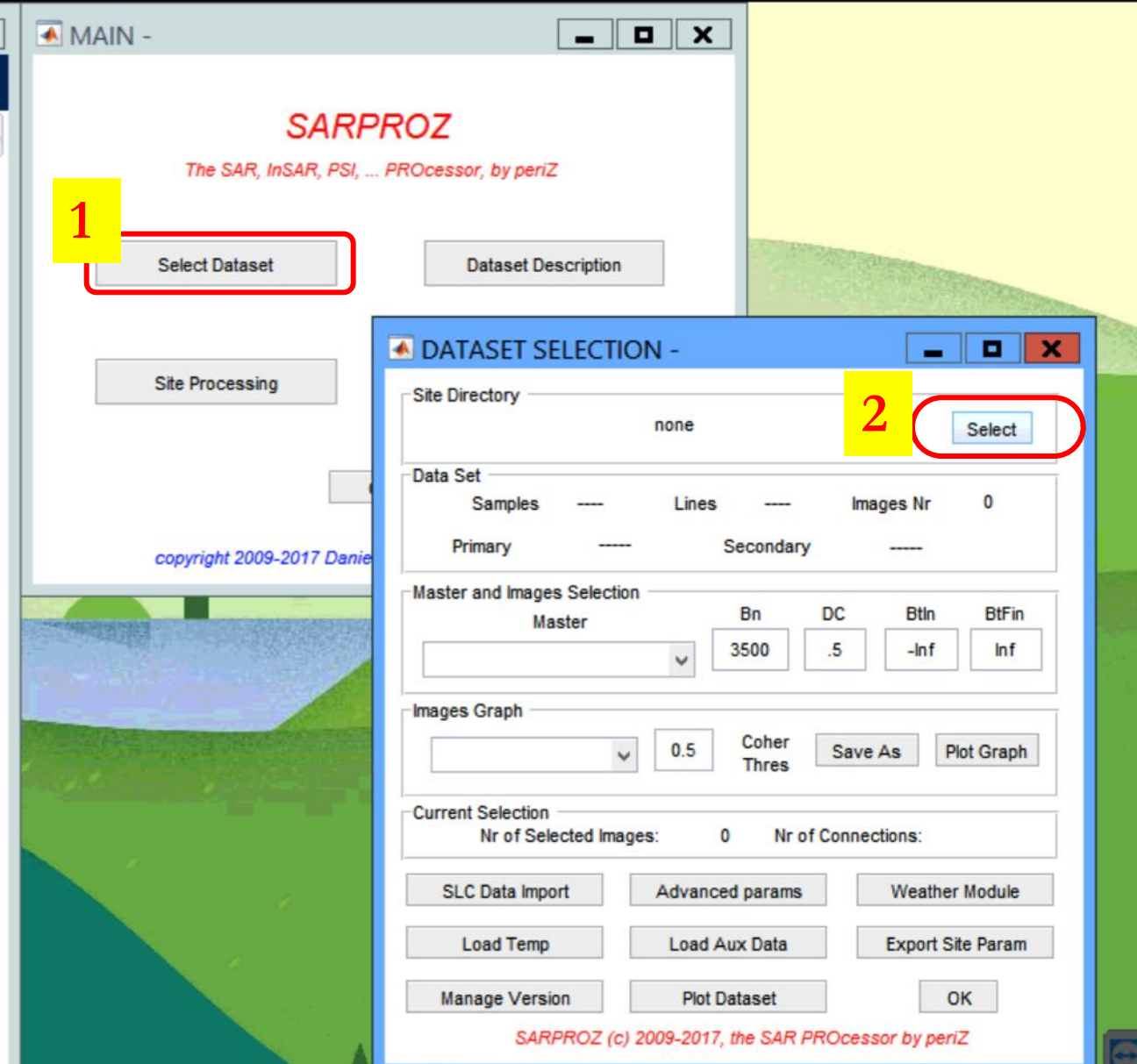
by Daniele Perissin, copyright 2009-2017, www.sarproz.com

Messages from this session are written in file
21_Oct_2017_01_15_58_sarproz.log
directory D:\pcodes

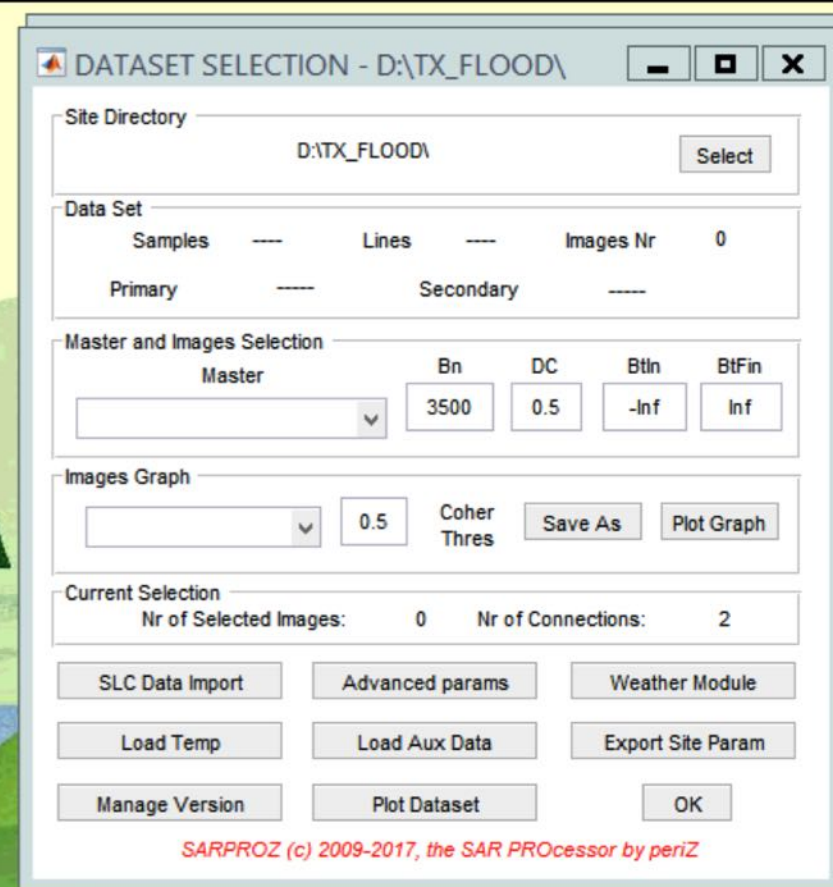
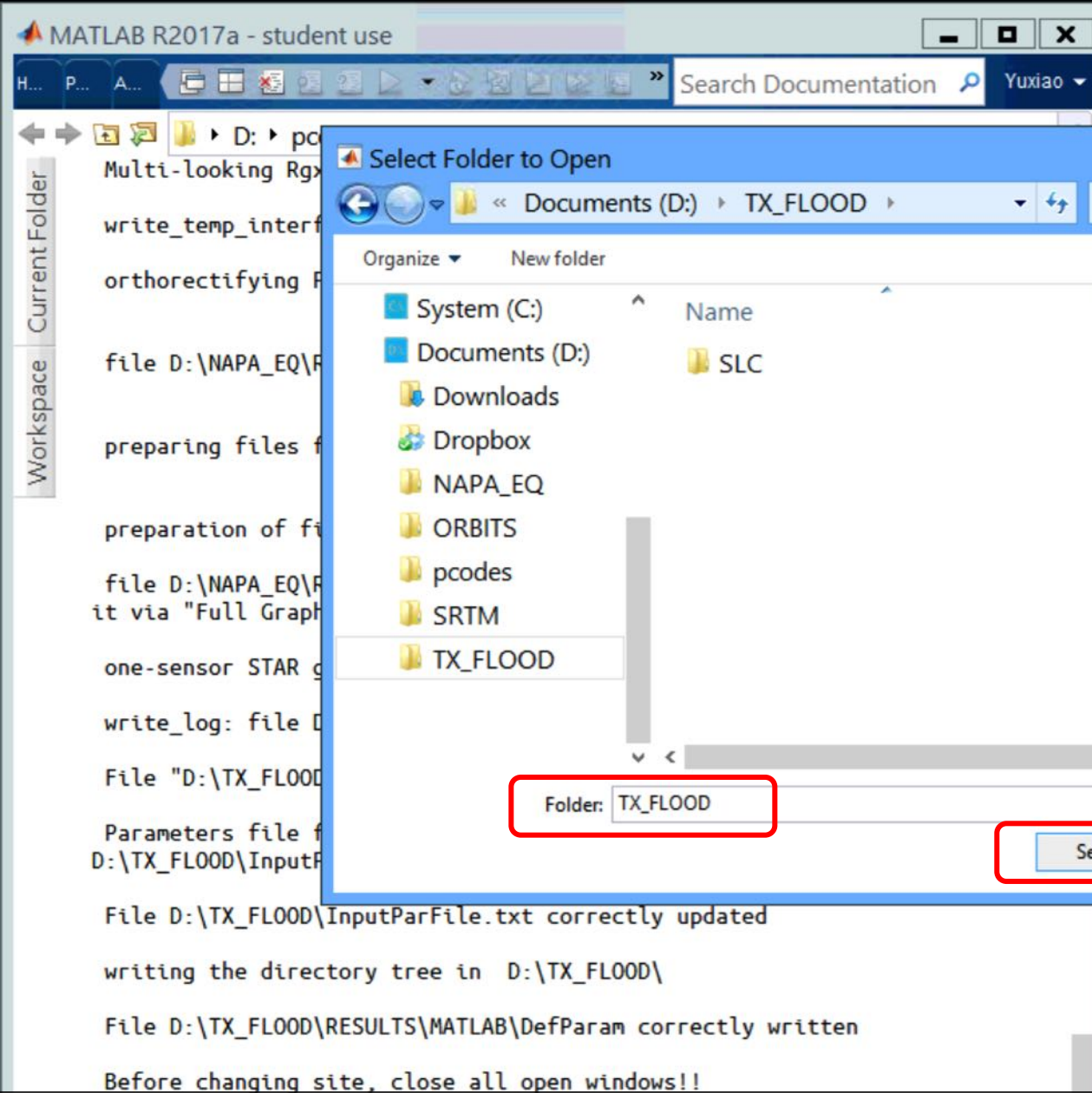
pcodes generated on: 18-Oct-2017 09:40:27,

Configuration check... ...Done!

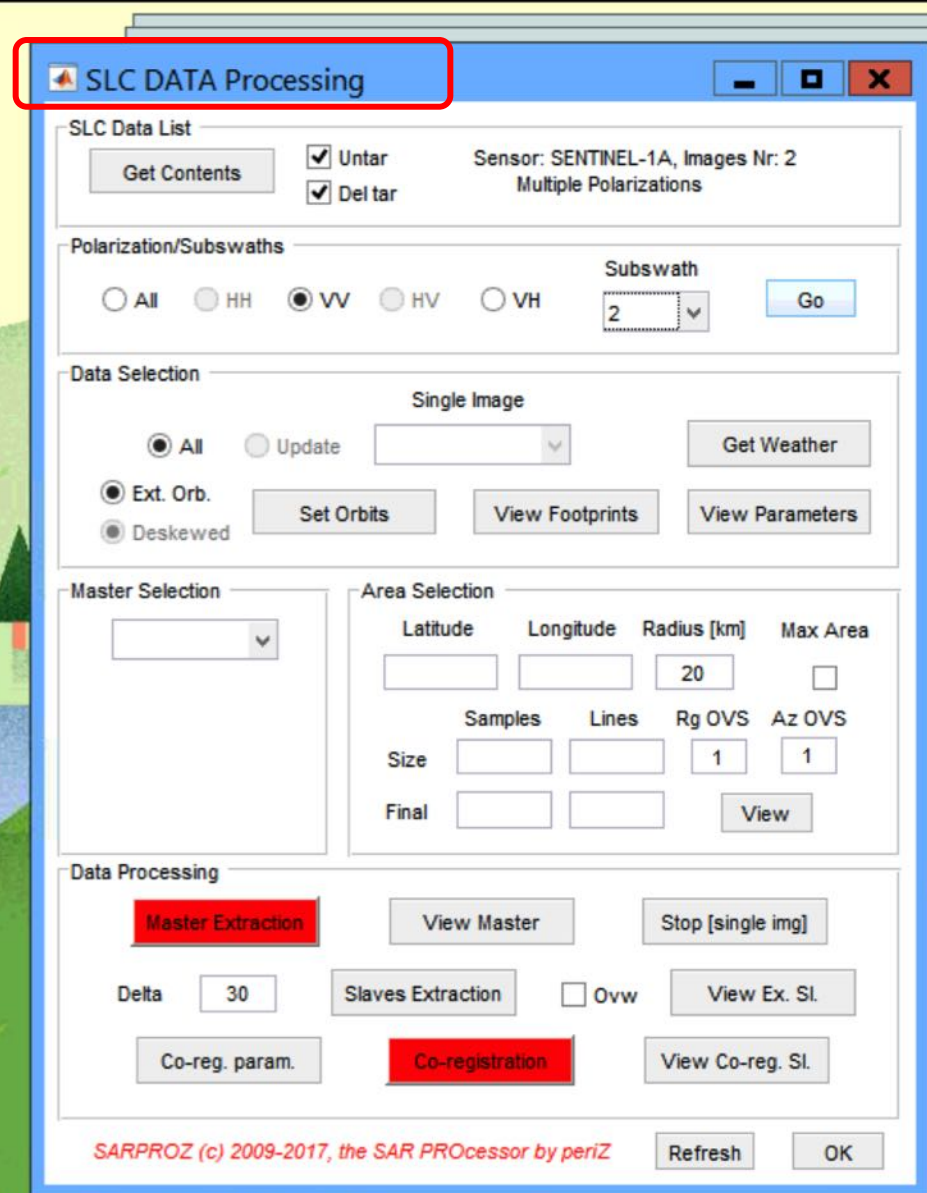
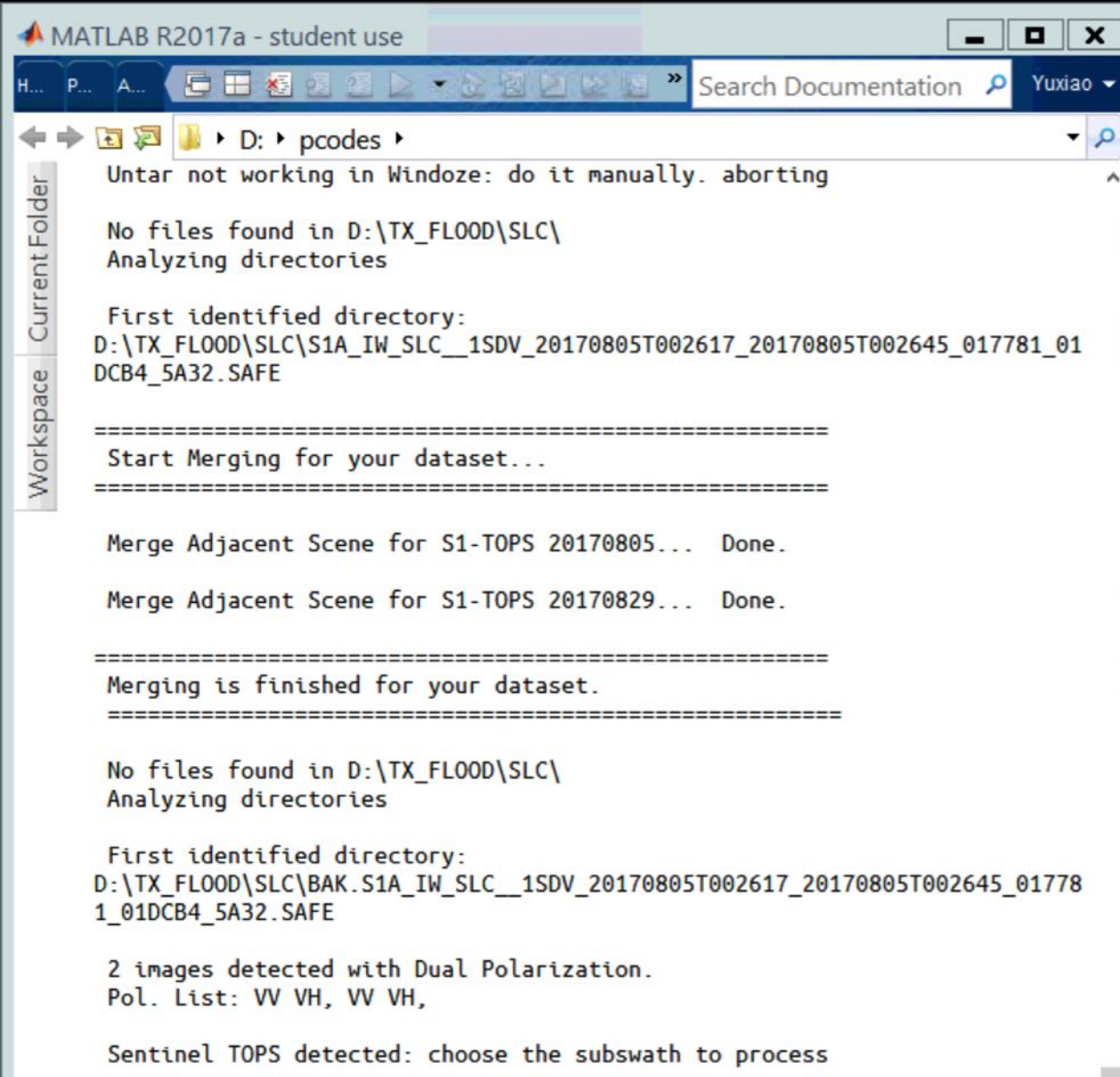
```
fx >>
```



2. Click “Select Dataset” from the main window.
Then click “Select” to select your data.



3. Select the folder "TX_FLOOD". There should be one "SLC" folder in it. Click "Select Folder".



4. A module called “SLC Data Import” should automatically pop out. If not, you can click “SLC Data Import” in “Dataset Selection” module after you select the data.

MATLAB R2017a - student use

File D:\NAPA_EQ\RESULTS\MATLAB\DefParam correctly written

Untar not working in Windoze: do it manually. aborting

No files found in D:\NAPA_EQ\SLC\
Analyzing directories

First identified directory:
D:\NAPA_EQ\SLC\S1A_S1_SLC__1SSV_20140807T142342_20140807T142411_001835_001BC1_05AA.SAFE

No files found in D:\NAPA_EQ\SLC\
Analyzing directories

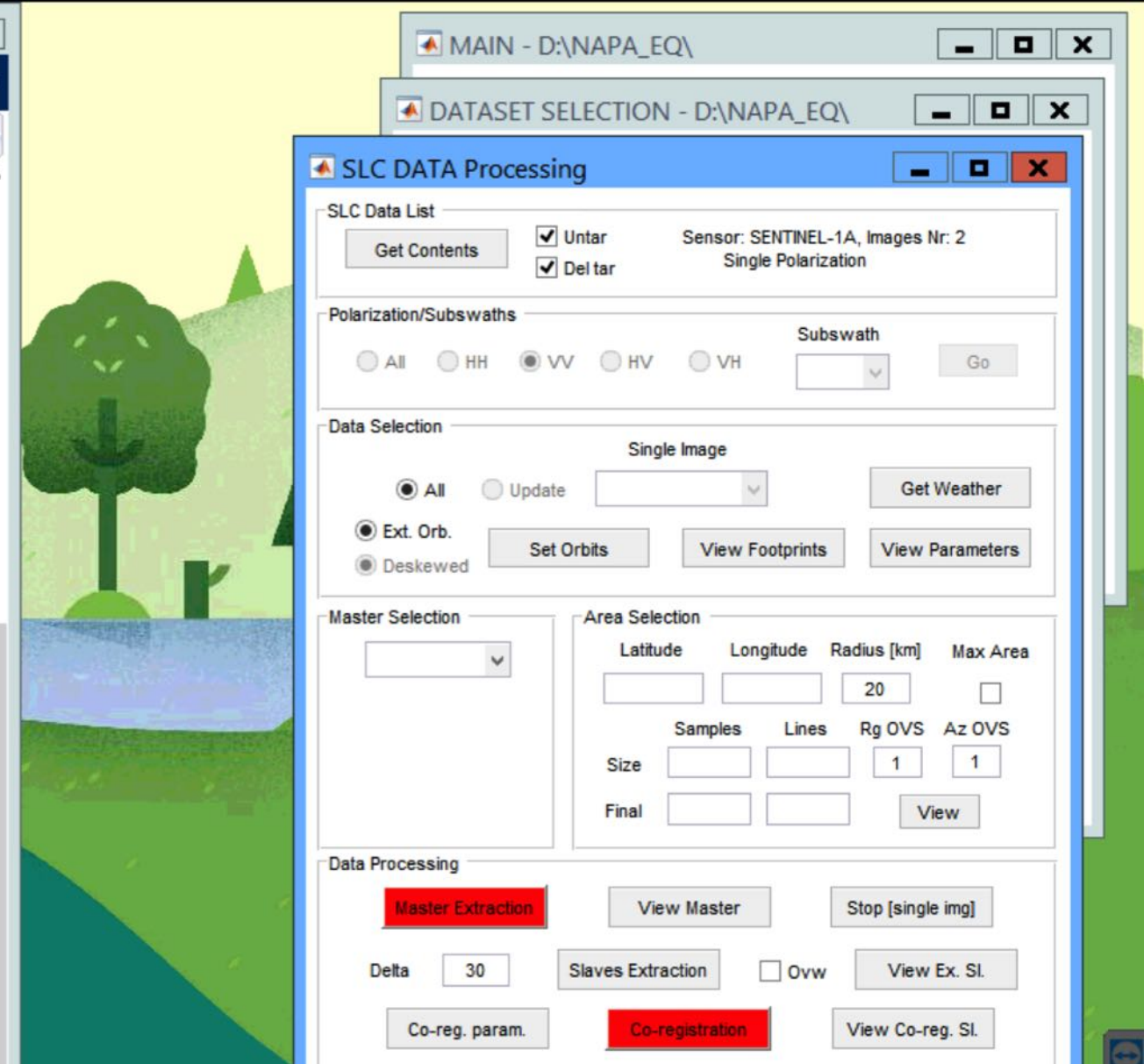
First identified directory:
D:\NAPA_EQ\SLC\S1A_S1_SLC__1SSV_20140807T142342_20140807T142411_001835_001BC1_05AA.SAFE

WARNING: image centers shifted more than 10km!!!!

here the list of images and corresponding relative distance w.r.t. the median:

20140807: 30.7 km
(D:\NAPA_EQ\SLC\S1A_S1_SLC__1SSV_20140807T142342_20140807T142411_001835_001BC1_05AA.SAFE)
20140831: 30.7 km
(D:\NAPA_EQ\SLC\S1A_S1_SLC__1SSV_20140831T142335_20140831T142403_002185_002356_C2E5.SAFE)

2 images detected with Single Polarization.
Pol. List: VV, VV,



Remember to ALWAYS KEEP THE COMMAND WINDOW OF MATLAB IN THE FRONT!!! The log contains key information regarding the process!!!

MATLAB R2017a - student use

H... P... A... | [Icons]

← → [Icons] | D: \> pcodes \>

Workspace | Current Folder

```
Untar not working in Windoze: do it
No files found in D:\TX_FLOOD\SLC\
Analyzing directories

First identified directory:
D:\TX_FLOOD\SLC\S1A_IW_SLC__1SDV_20170805T002617_20170805T002645_01778_1_01DCB4_5A32.SAFE

=====
Start Merging for your dataset...
=====

Merge Adjacent Scene for S1-TOPS 20170805... Done.
Merge Adjacent Scene for S1-TOPS 20170829... Done.

=====
Merging is finished for your dataset.
=====

No files found in D:\TX_FLOOD\SLC\
Analyzing directories

First identified directory:
D:\TX_FLOOD\SLC\BAK.S1A_IW_SLC__1SDV_20170805T002617_20170805T002645_01778_1_01DCB4_5A32.SAFE

2 images detected with Dual Polarization.
Pol. List: VV VH, VV VH,

Sentinel TOPS detected: choose the subswath to process

Selected Subswath: 2
```

1. Click “Get Contents”, make sure “untar” and “Del Tar” are checked.

2. You should see Info about Sensor and Image Number after “Get contents” is done.

SLC DATA Processing

SLC Data List

Get Contents ☒ Untar ☒ Del tar

Sensor: SENTINEL-1A, Images Nr: 2
Multiple Polarizations

Polarization/Subswath

☐ All ☐ HH ☒ VV ☐ HV ☐ VH

Subswath: 2 [Go]

Data Selection

☒ All ☐ Update

☒ Ext. Orb. ☐ Deskewed

Get Weather Set Orbits View Footprints View Parameters

Master Selection

Area Selection

Latitude	Longitude	Radius [km]	Max Area
<input type="text" value=""/>	<input type="text" value=""/>	20	<input type="checkbox"/>

Size	Samples	Lines	Rg OVS	Az OVS
<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	1	1

Final [View]

Data Processing

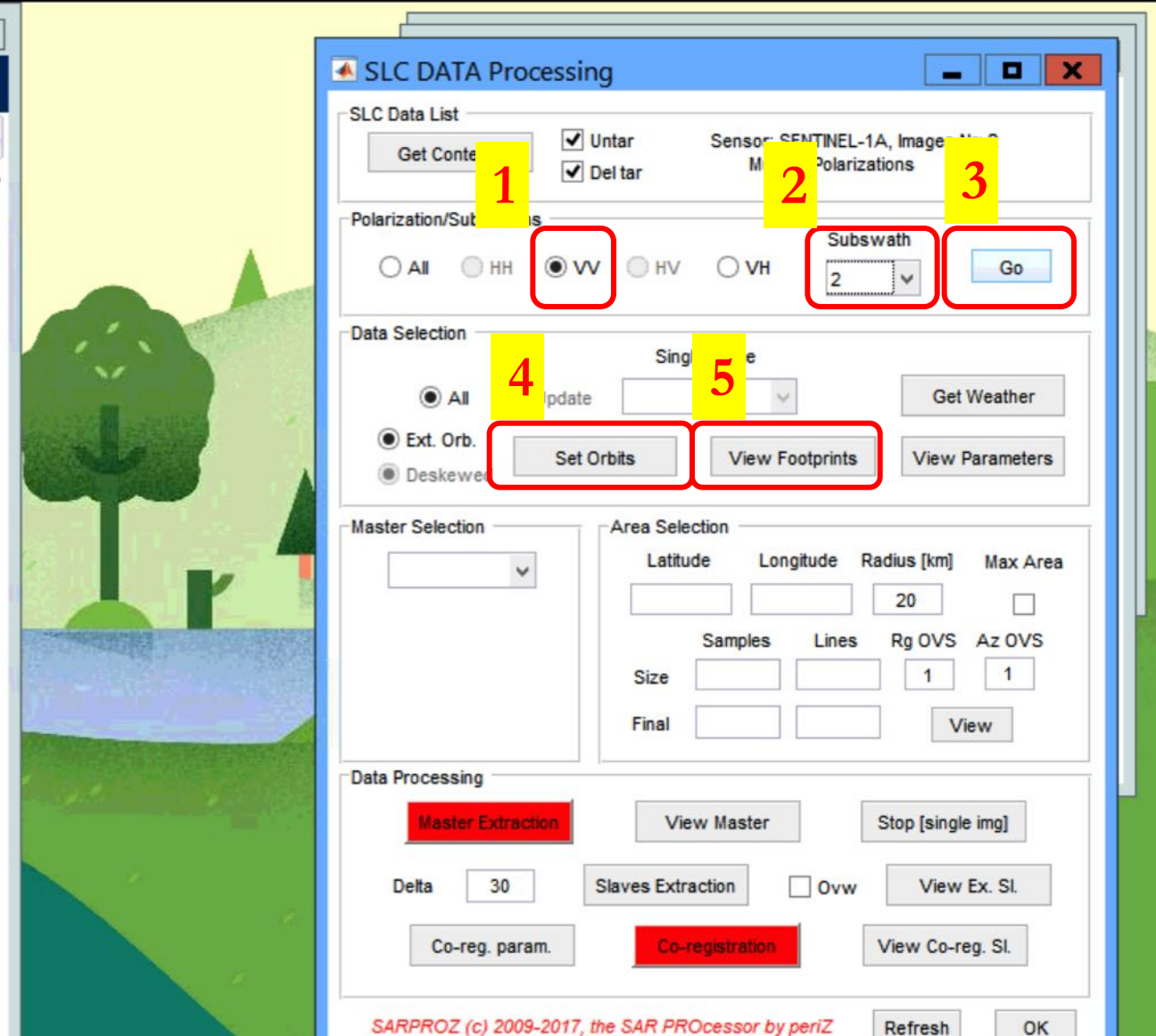
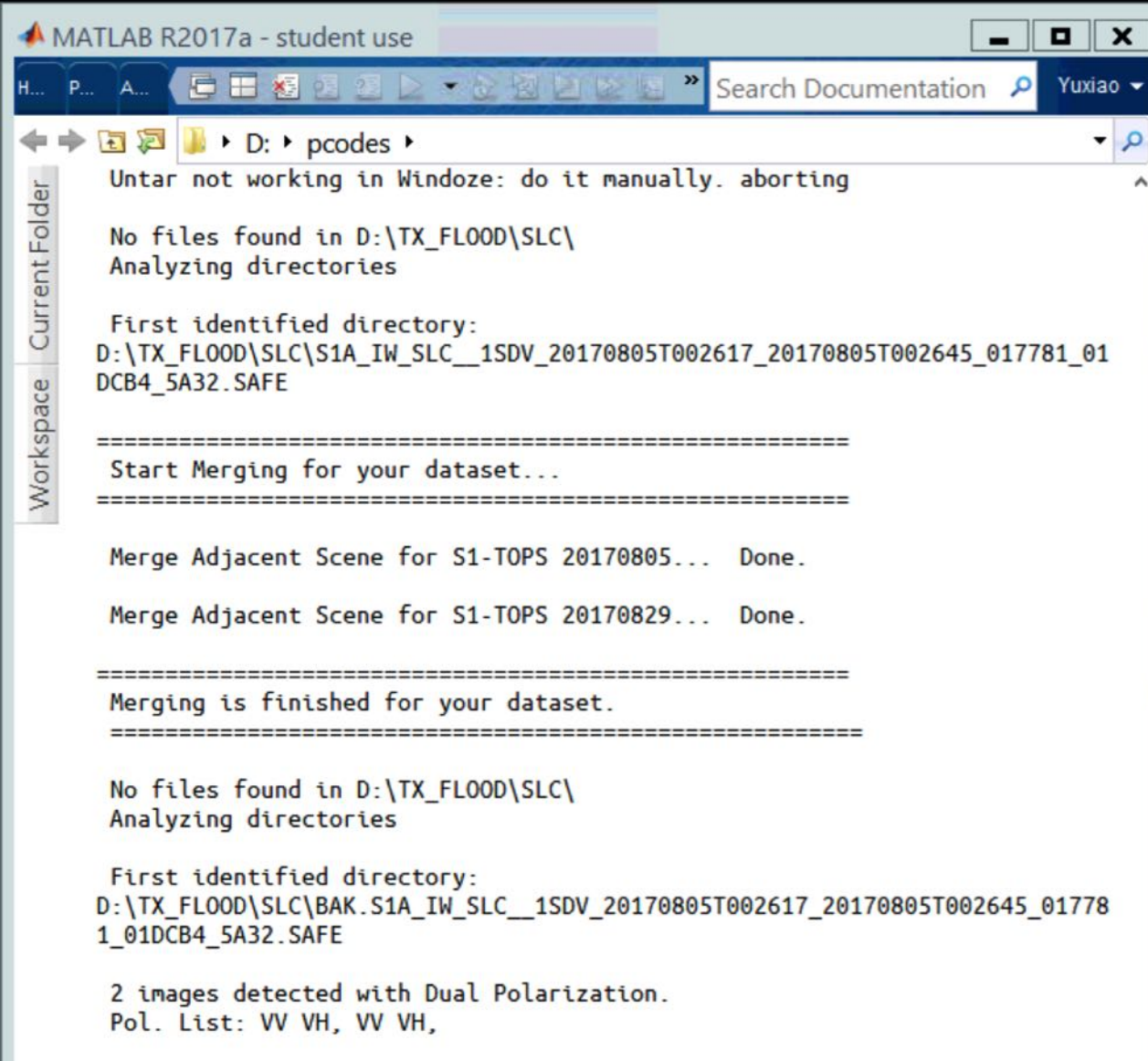
Master Extraction View Master Stop [single img]

Delta: 30 Slaves Extraction ☐ Ovw View Ex. Sl.

Co-reg. param. Co-registration View Co-reg. Sl.

SARPROZ (c) 2009-2017, the SAR PROcessor by periz Refresh OK

5. In the “SLC DATA Processing” module, click “Get Contents” to read in data parameters.



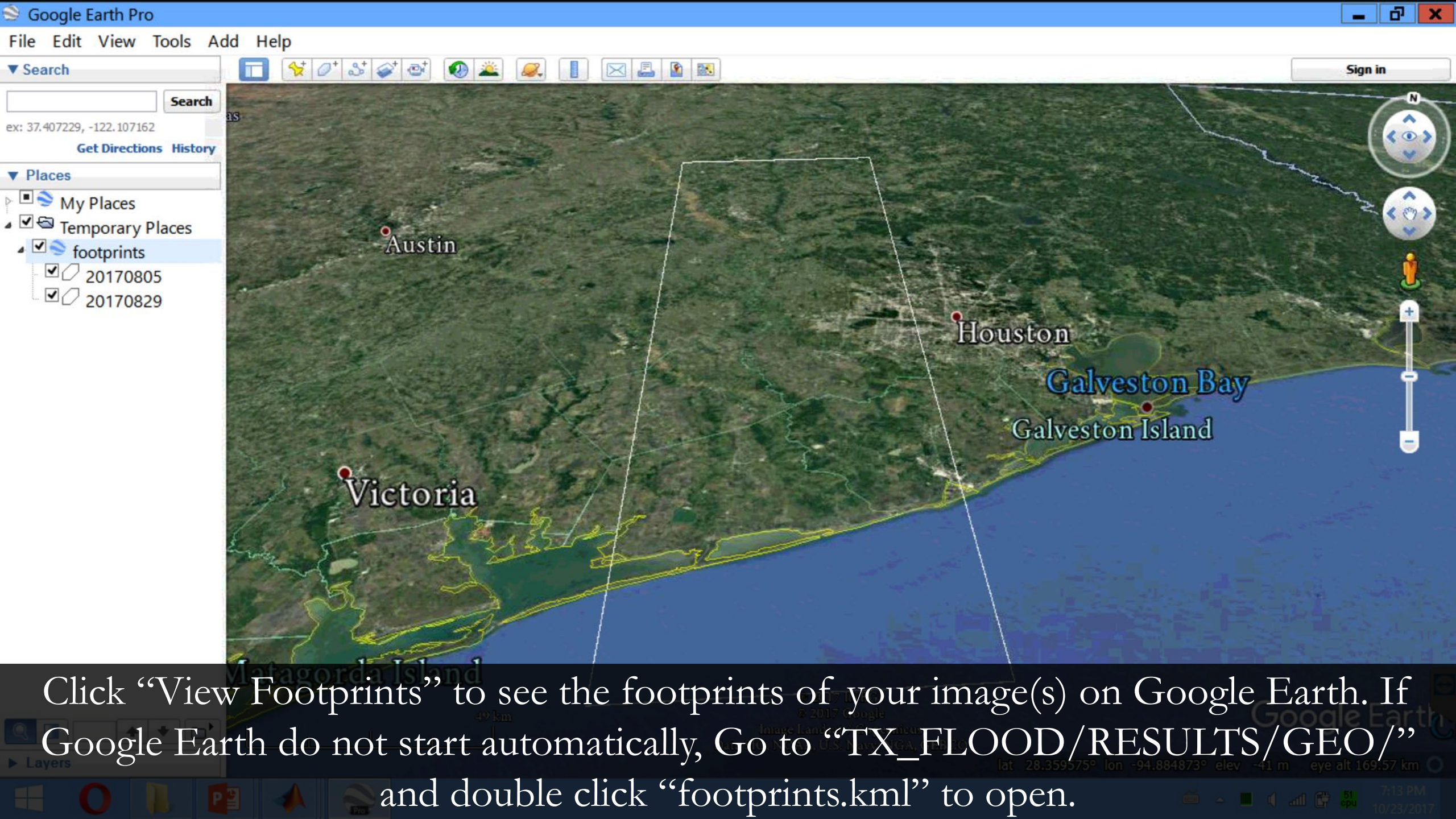
6. Then, select “VV” as polarization, and “2” in Subswath. Click “set Orbits”. This will automatically download the satellite orbits, and calculate the footprint of SAR images.

○ Difference subswaths has different footprints. You can “View Footprints”.

4:33 PM 10/21/2017

Subswath

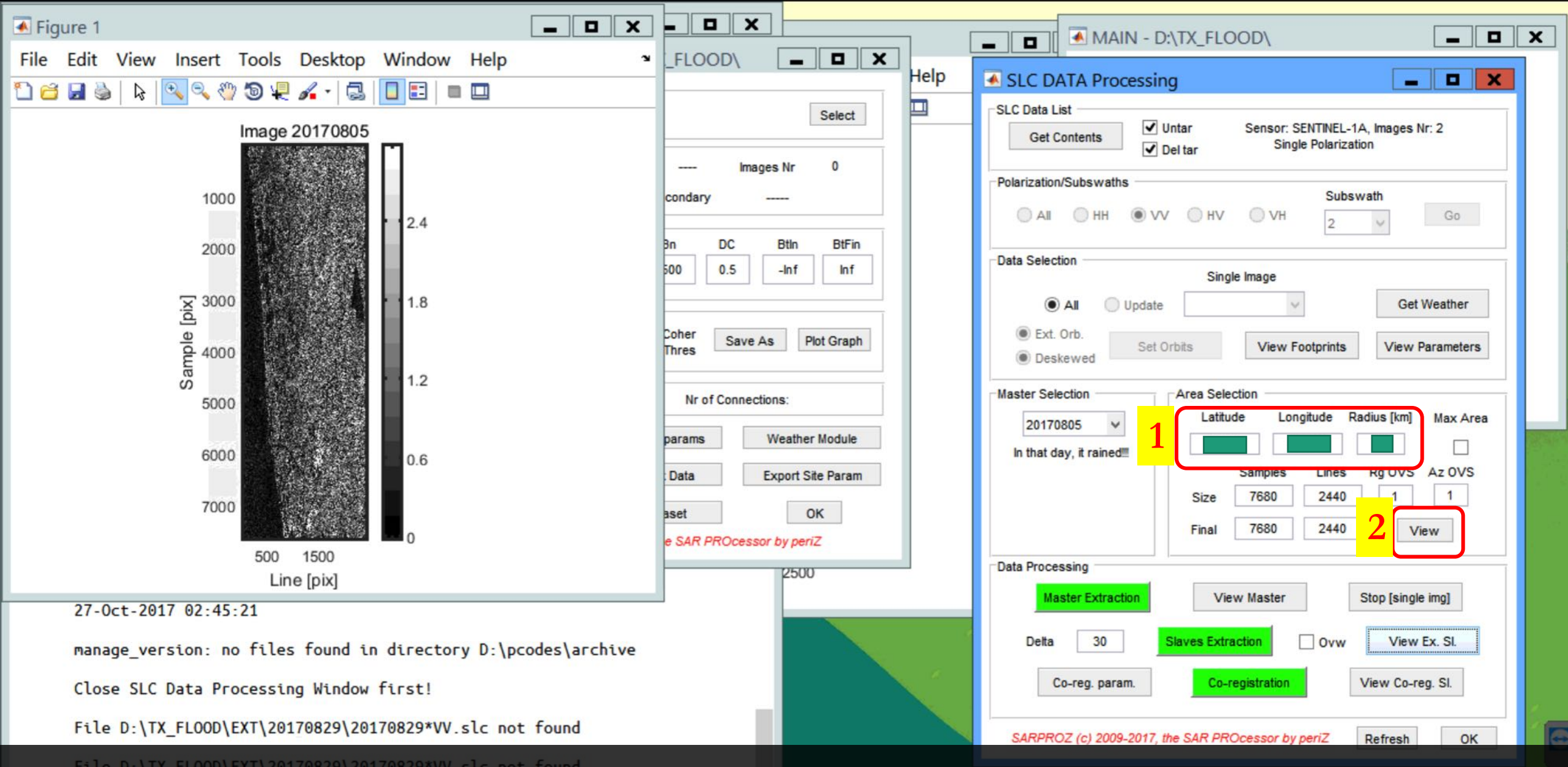
- Sentinel “TOPS” mode, or wide swath(IW) mode is a special mode that contains 3 subswath. This mode covers a larger area.
 - Each subswath could be processed independently. You need to select the corresponding subswath in the software.
 - You can then check the footprint of each subswath after “set orbits”.
 - In this sample data, only subswath 2 is provided. You can download other subswath online as well.
-
- <https://sentinel.esa.int/web/sentinel/user-guides/sentinel-1-sar/acquisition-modes/interferometric-wide-swath>



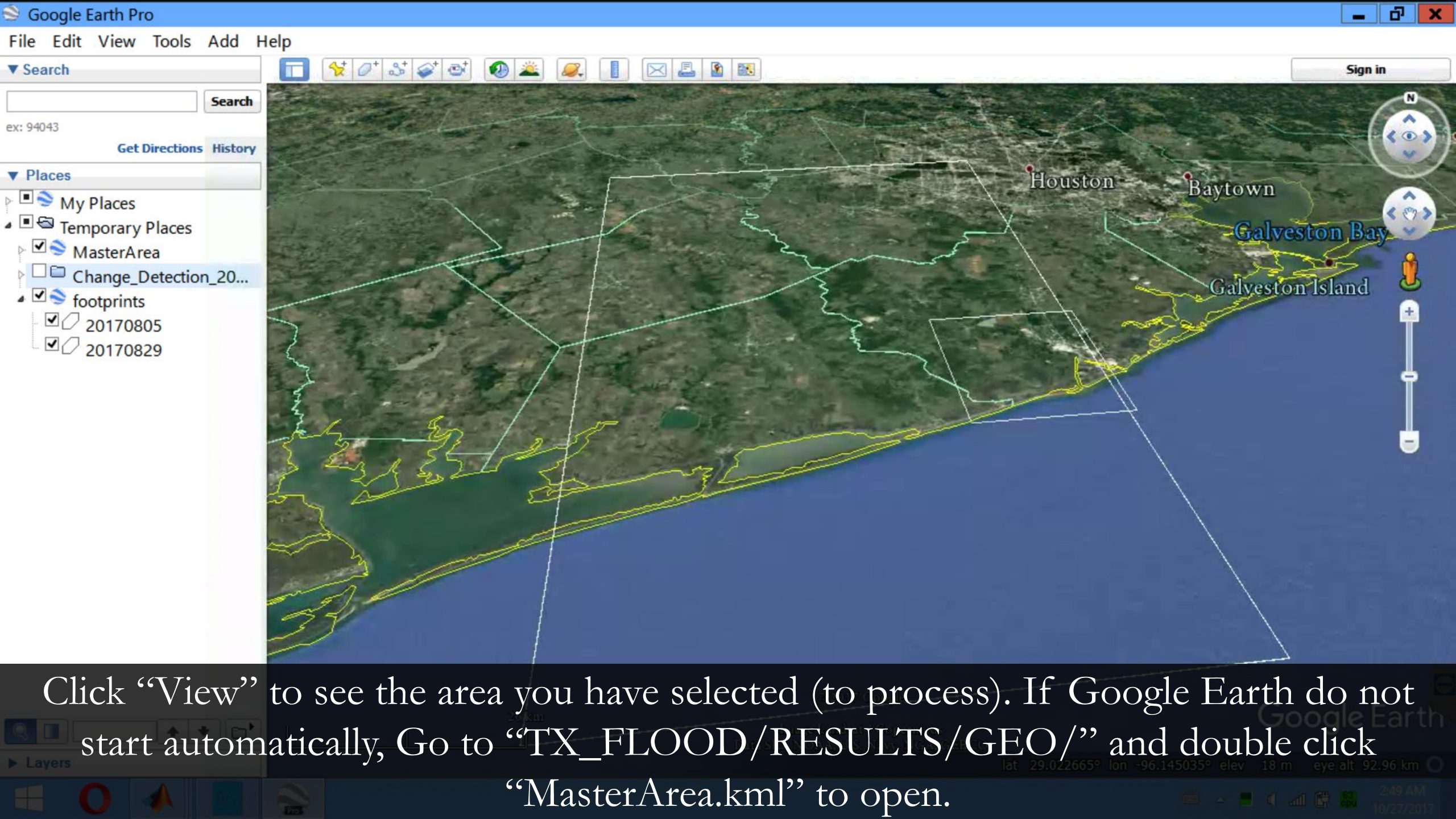
Click “View Footprints” to see the footprints of your image(s) on Google Earth. If Google Earth do not start automatically, Go to “TX_FLOOD/RESULTS/GEO/” and double click “footprints.kml” to open.

Select your own Area of Interest (AOI)

1. In this tutorial, you are asked to select your own AOI by putting down your own AOI center latitude, longitude and area radius.
2. Go to this [website](#) to understand the details about the flood caused by Hurricane Harvey.
3. **Select a center coordinates:**
 - Limit your latitude between 28.7° and 29.0° ;
 - Limit your longitude between -96.0° and -95.7° ([a negative sign just means the west hemisphere](#));
 - Limit your range between 12km and 16km (a sufficient area is required to analysis the flood. On the other side, due to disk space restriction, you need to limit the size of extracted area).
 - Make sure your selected AOI is located at coastal area.

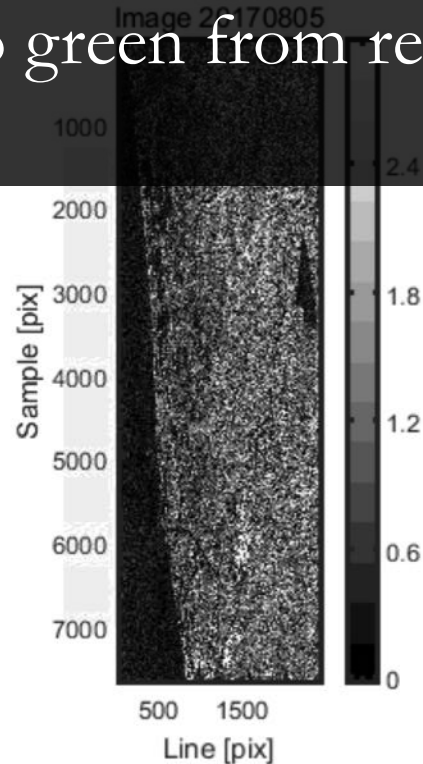


7. In "Area Selection", input your value for latitude, longitude and radius based on the info from previous page. You can click "View" to see your selected AOI.



Click “View” to see the area you have selected (to process). If Google Earth do not start automatically, Go to “TX_FLOOD/RESULTS/GEO/” and double click “MasterArea.kml” to open.

8. In sequence, click “Master Extraction” and “Slave Extraction”. Click “View Master/Slave” to view the SAR image. When the process is finished, the button will turn to green from red. DO NOT GO TO NEXT STEP UNTIL THE BUTTON TURNS GREEN.



DC 0.5 BtIn -Inf BtFin Inf

Coher Thres Save As Plot Graph

Nr of Connections:

params Weather Module

Data Export Site Param

aset OK

the SAR PROcessor by periz

Polarization/Subswaths Subswath 2 Go

Data Selection Single Image

☒ All ☐ Update

☒ Ext. Orb.

☒ Deskewed

Master Selection 20170805

In that day, it rained

Area Selection

Latitude	Longitude	Radius [km]	Max Area
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>

Size	Samples	Lines	Rg OVS	Az OVS
7680	2440	1	1	
Final	7680	2440		

Processing

1 2

3 4

Delta 30 Co-reg. para

SARPROZ (c) 2009-2017, the SAR PROcessor by periz Refresh OK

27-Oct-2017 02:45:21

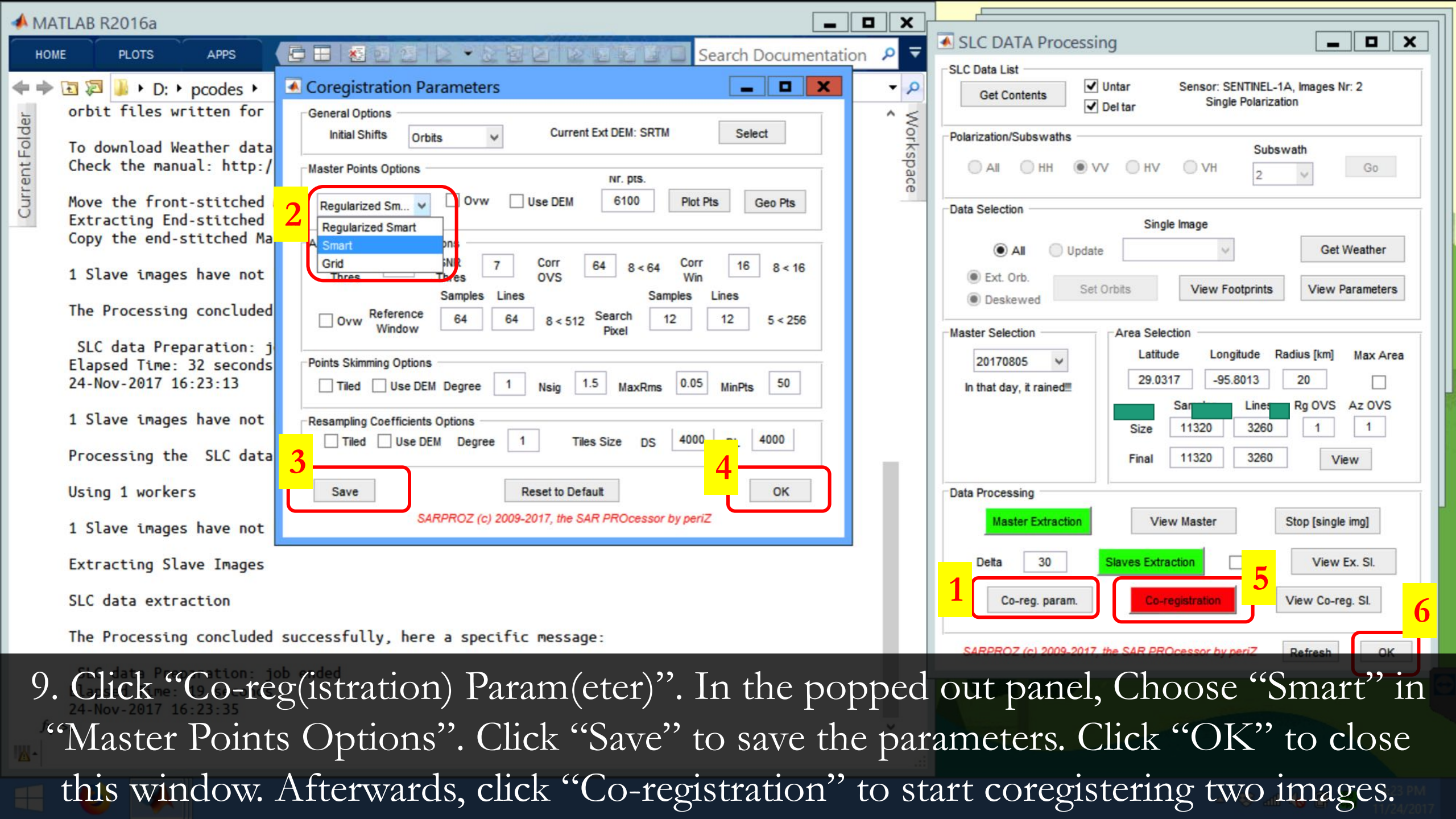
manage_version: no files found in directory D:\pcodes\archive

Close SLC Data Processing Window first!

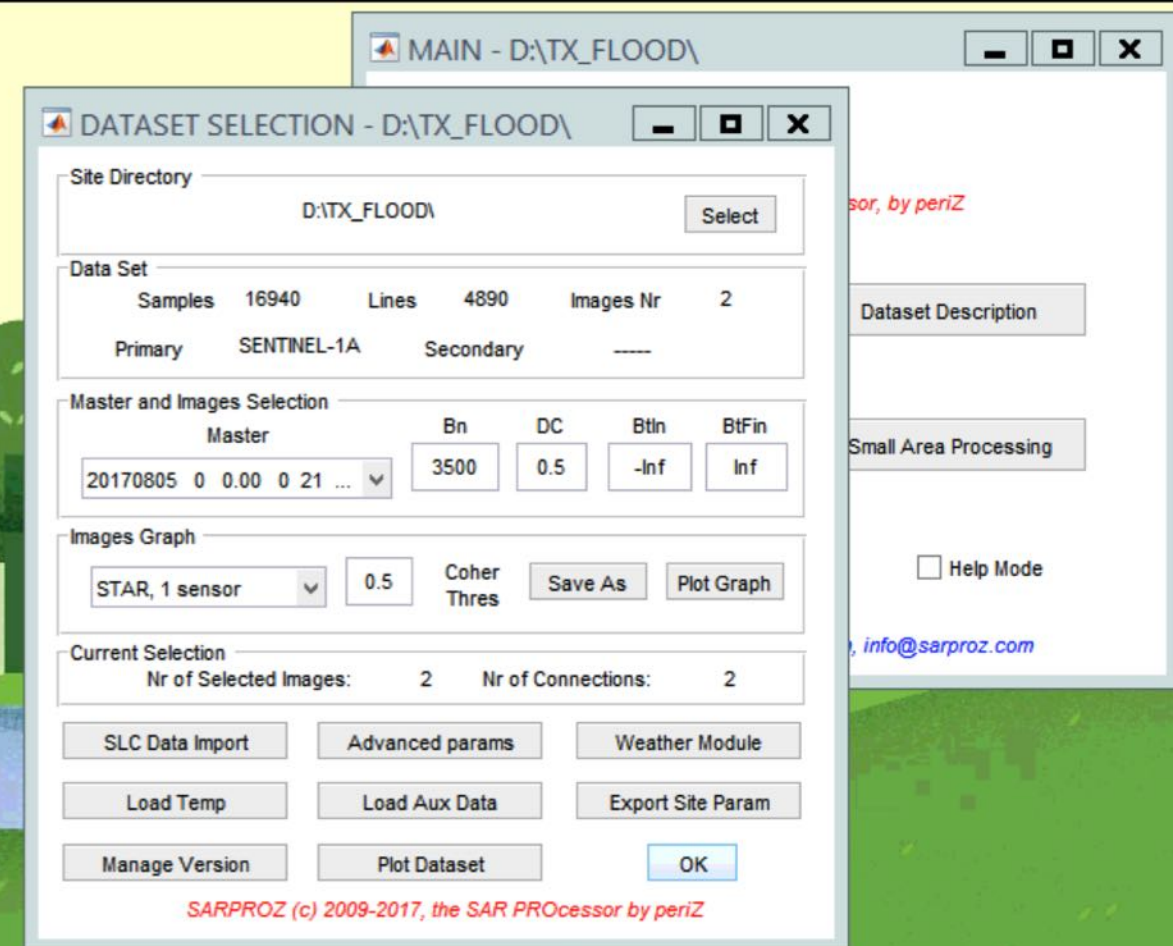
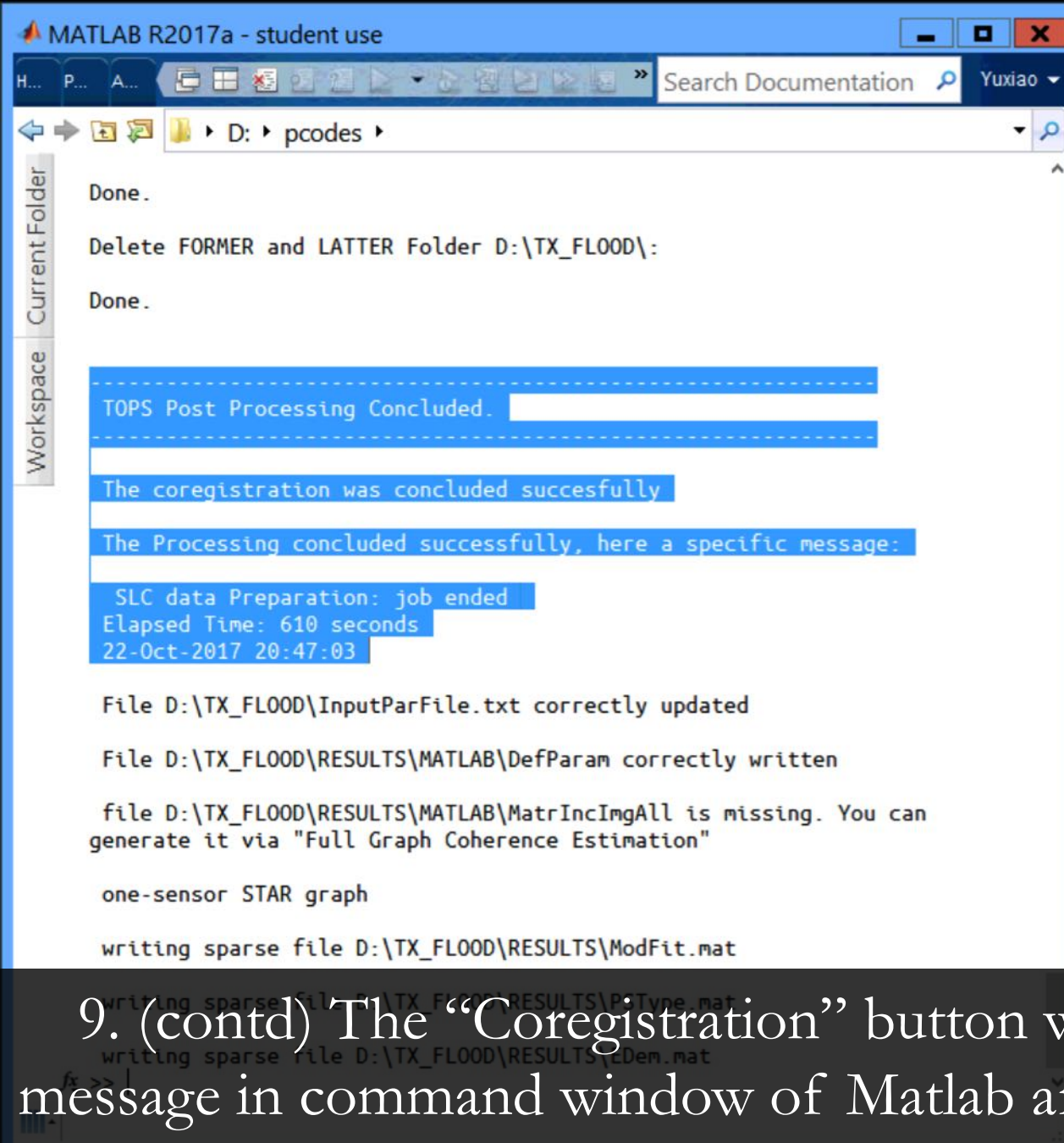
File D:\TX_FLOOD\EXT\20170829\20170829*VV.slc not found

File D:\TX_FLOOD\EXT\20170829\20170829*VV.slc not found

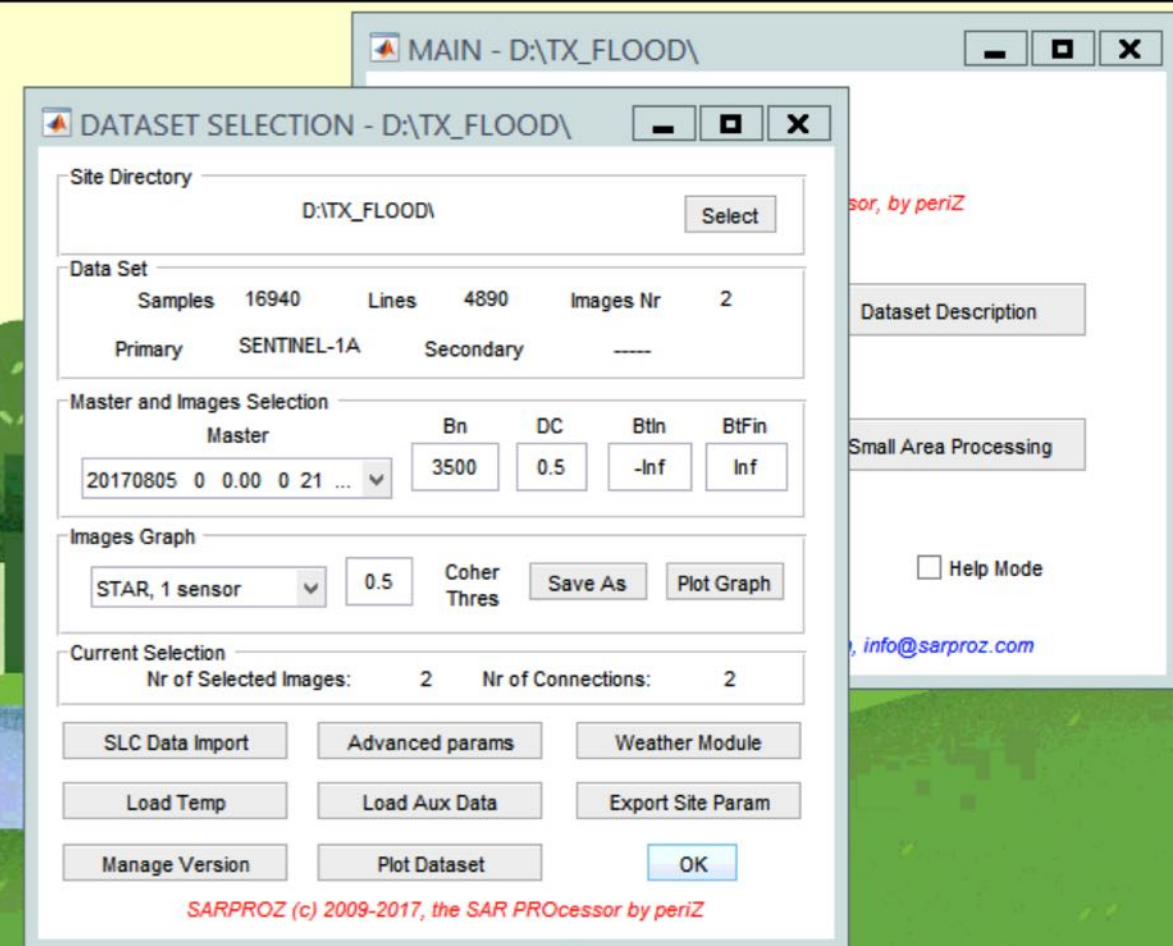
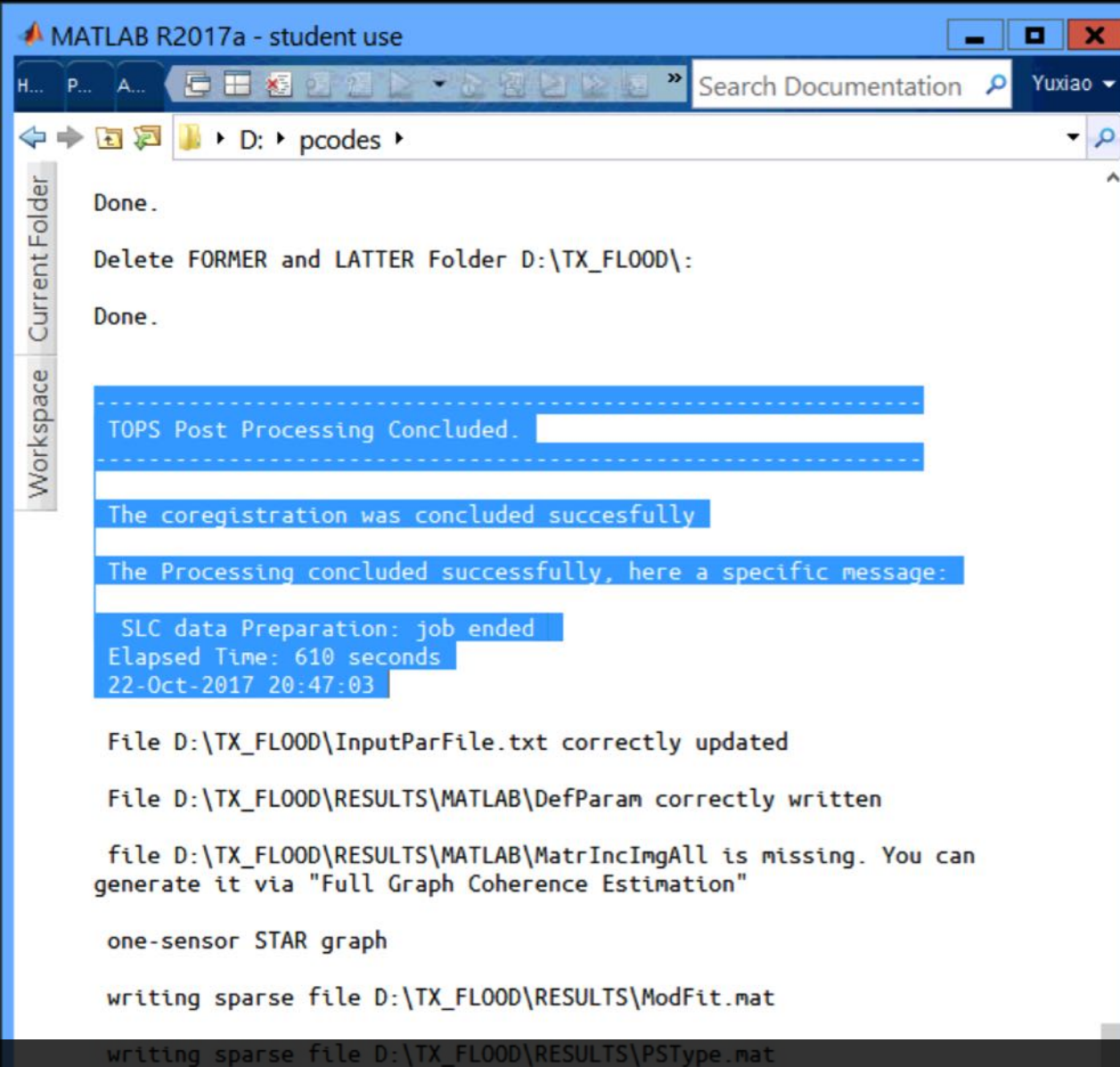
fx >>



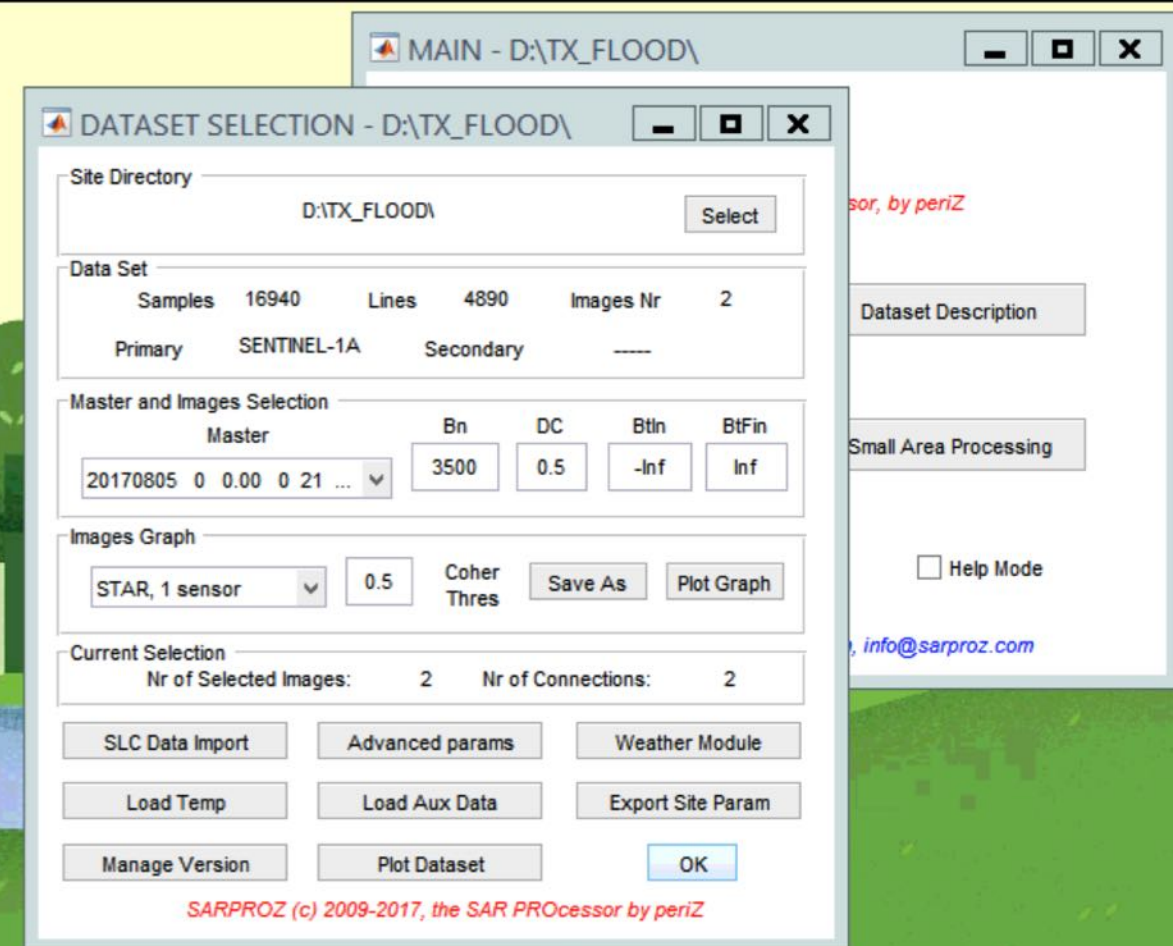
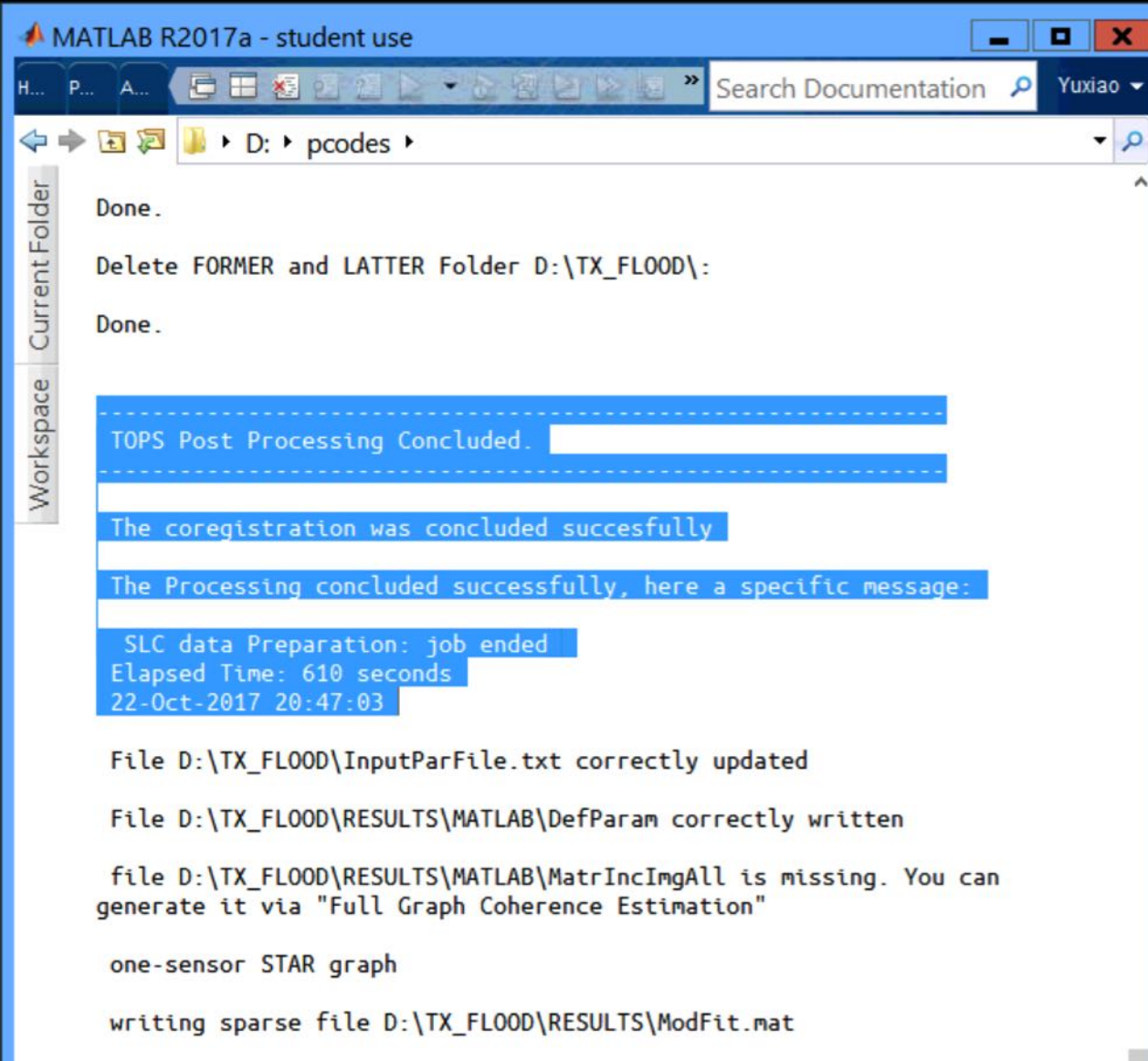
9. Click “Co-reg(istration) Param(eter)”. In the popped out panel, Choose “Smart” in “Master Points Options”. Click “Save” to save the parameters. Click “OK” to close this window. Afterwards, click “Co-registration” to start coregistering two images.



9. (contd) The “Coregistration” button will turn green and you will see the success message in command window of Matlab after the process is completed. Click “OK” to close the “SLC Data Processing” panel.



Coregistration will “align” all images pixel-by-pixel. This will allow us to compare the images pixel-by-pixel.



At this point, to save space, please delete (or move to an external disk of yours) the whole "SLC" folder. This will save you ~2.5GB space. If later you need to reprocess everything, you can download the data from ftp again.

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H... P... A... Search Documentation Yuxiao

D: \ pcodes

Toolbox Path Cache read in 0.03 seconds.
MATLAB Path initialized in 0.69 seconds.

Student License -- for use by students to meet course requirements
and perform academic research at degree granting institutions only.

```
>> fig=main;
```

Welcome to SARPROZ

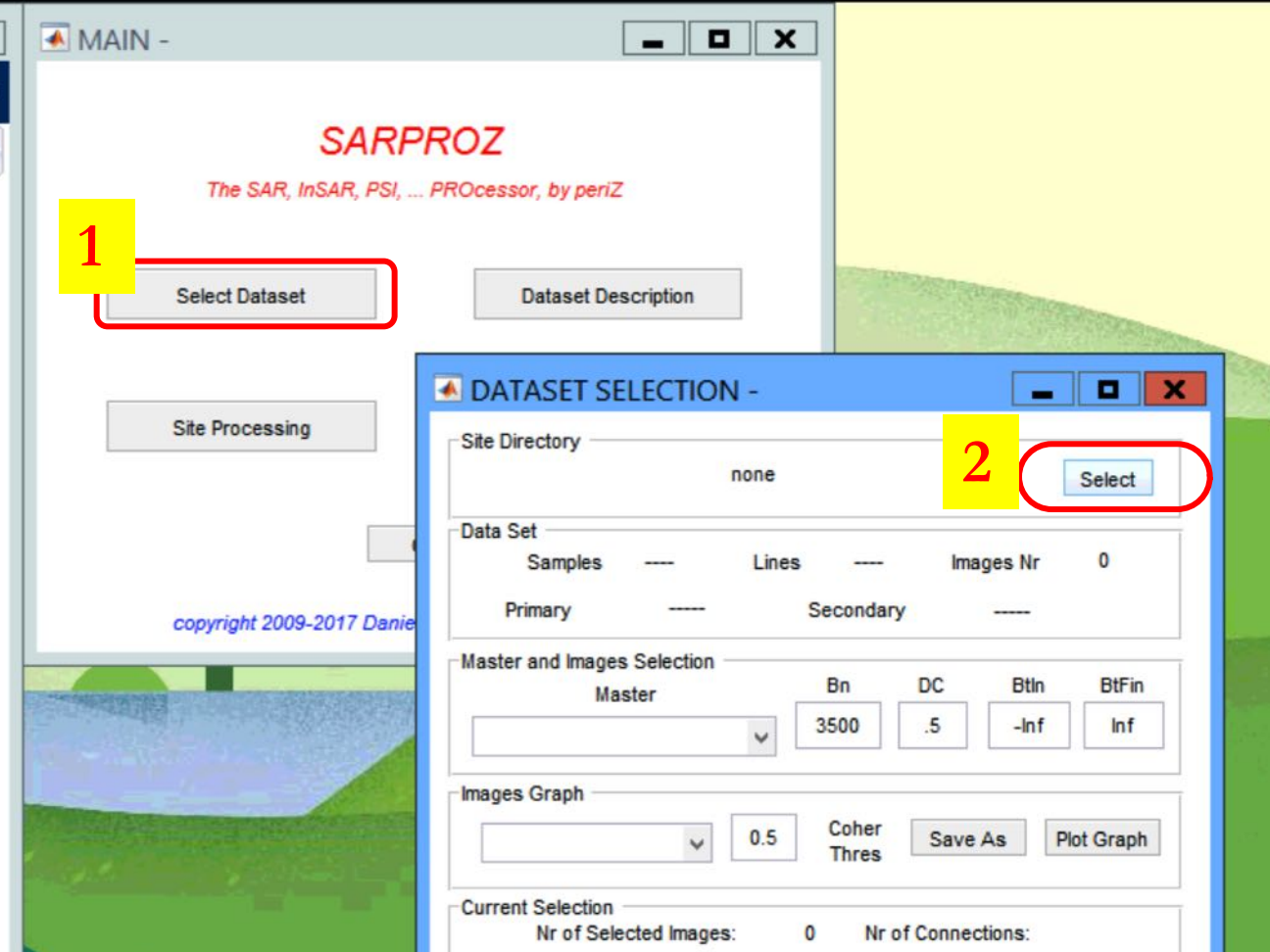
by Daniele Perissin, copyright 2009-2017, www.sarproz.com

Messages from this session are written in file
21_Oct_2017_01_15_58_sarproz.log
directory D:\pcodes

pcodes generated on: 18-Oct-2017 09:40:27,

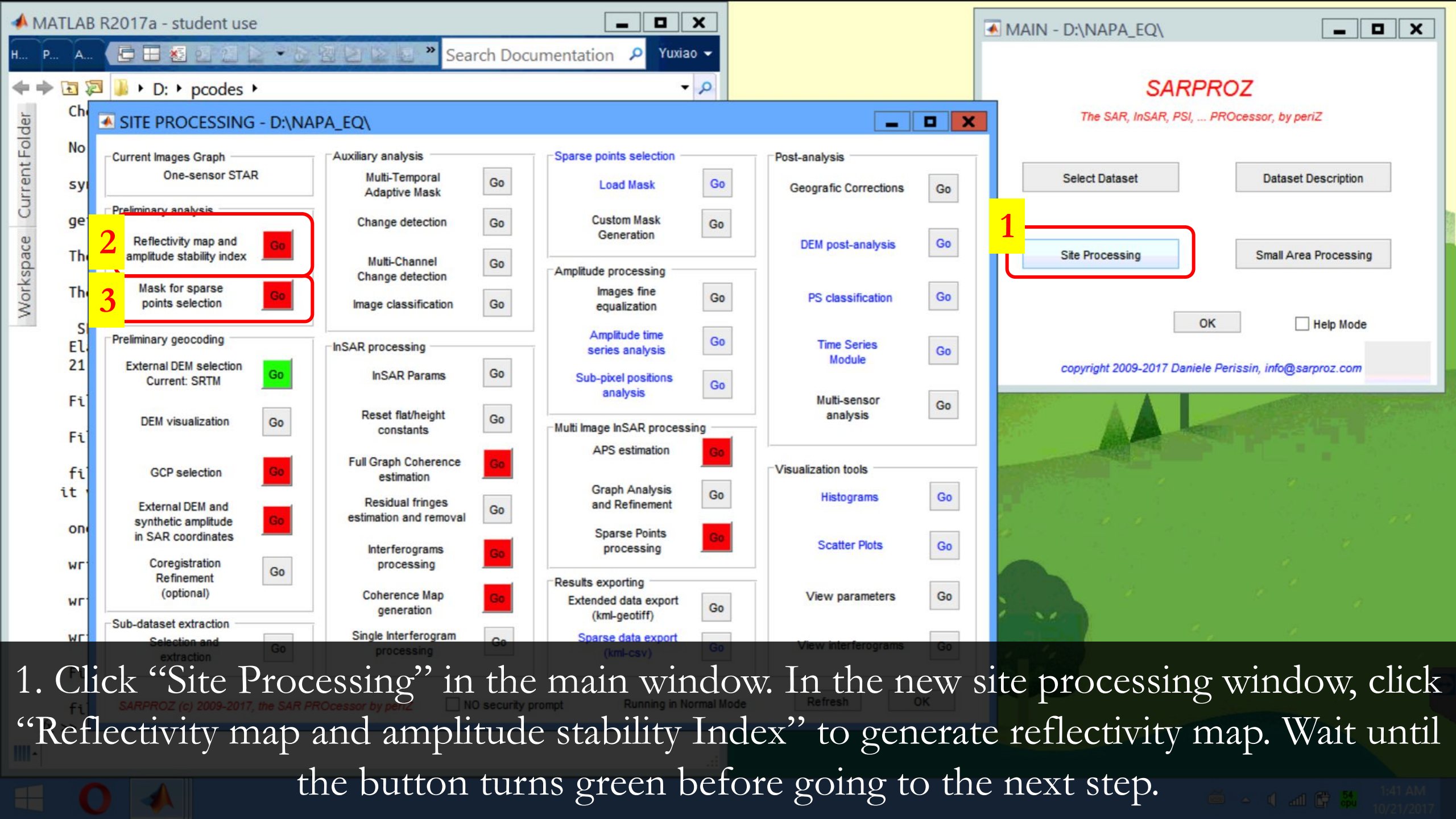
Configuration check... ...Done!

```
fx >>
```



After the “SLC Data Import” is finished, all the processed data are stored in your TX_FLOOD folder. It means you can close sarproz and reload your data anytime. There is no “saving” needed in sarproz. Just click “Select Dataset”-> “Select” -> Select “TX_FLOOD” folder to load your dataset every time you start sarproz.

Part 2: Pre-processing for Change Detection



MATLAB R2017a - student use

Workspace Current Folder

D:\pcodes\

one-sensor STAR graph

writing sparse file D:\NAPA_EQ\RESULTS\ModFit.mat

writing sparse file D:\NAPA_EQ\RESULTS\PSType.mat

writing sparse file D:\NAPA_EQ\RESULTS\EDem.mat

File D:\NAPA_EQ\InputParFile.txt correctly updated

file D:\NAPA_EQ\RESULTS\MATLAB\InSarParam written!

the tool is going to process Reflectivity Map Calculation proceed (no is default) ?

Processing the Reflectivity Map Calculation

Using 2 workers

preparation of files for quick view: job ended

File D:\NAPA_EQ\InputParFile.txt correctly updated

The Processing concluded successfully, here a specific

Reflectivity Map Calculation: job ended

Elapsed Time: 61 seconds

21-Oct-2017 01:42:31

Processing the Sparse Mask Generation

Using 2 workers

crea masch: selecting local maxima

SET MASK

Mask Options

- ☐ All Points (no mask)
- ☒ Local Maxima
- ☐ Loc Max, no range lobes
- ☐ Loc Max, no range/azimuth lobes
- ☐ Regular Grid Rg 10 Az 10

1 Go 2 OK

Runtime: 1s - ETA: u...

Mask creation

0%

SARPROZ (c) 2009-2017, the SAR PROcessor by periz

NO security prompt

Running in Normal Mode

Refresh OK

Analysis

- Temporal
- Active Mask
- e detection
- Channel
- e detection
- Classification
- Processing
- AR Params

DEM visualization

Reset flat/height

GCP selection

External DEM and synthetic amplitude in SAR coordinates

Coregistration Refinement (optional)

Sub-dataset extraction

Selection and extraction

Regular range estimation and removal

Interferograms processing

Coherence Map generation

Single Interferogram processing

Sparse points selection

- Load Mask
- Custom Mask Generation

Amplitude processing

- Images fine equalization
- Amplitude time series analysis
- Sub-pixel positions analysis

Multi Image InSAR processing

- APS estimation
- Graph Analysis and Refinement
- Sparse Points processing

Results exporting

- Extended data export (kml-geotiff)
- Sparse data export (kml-csv)

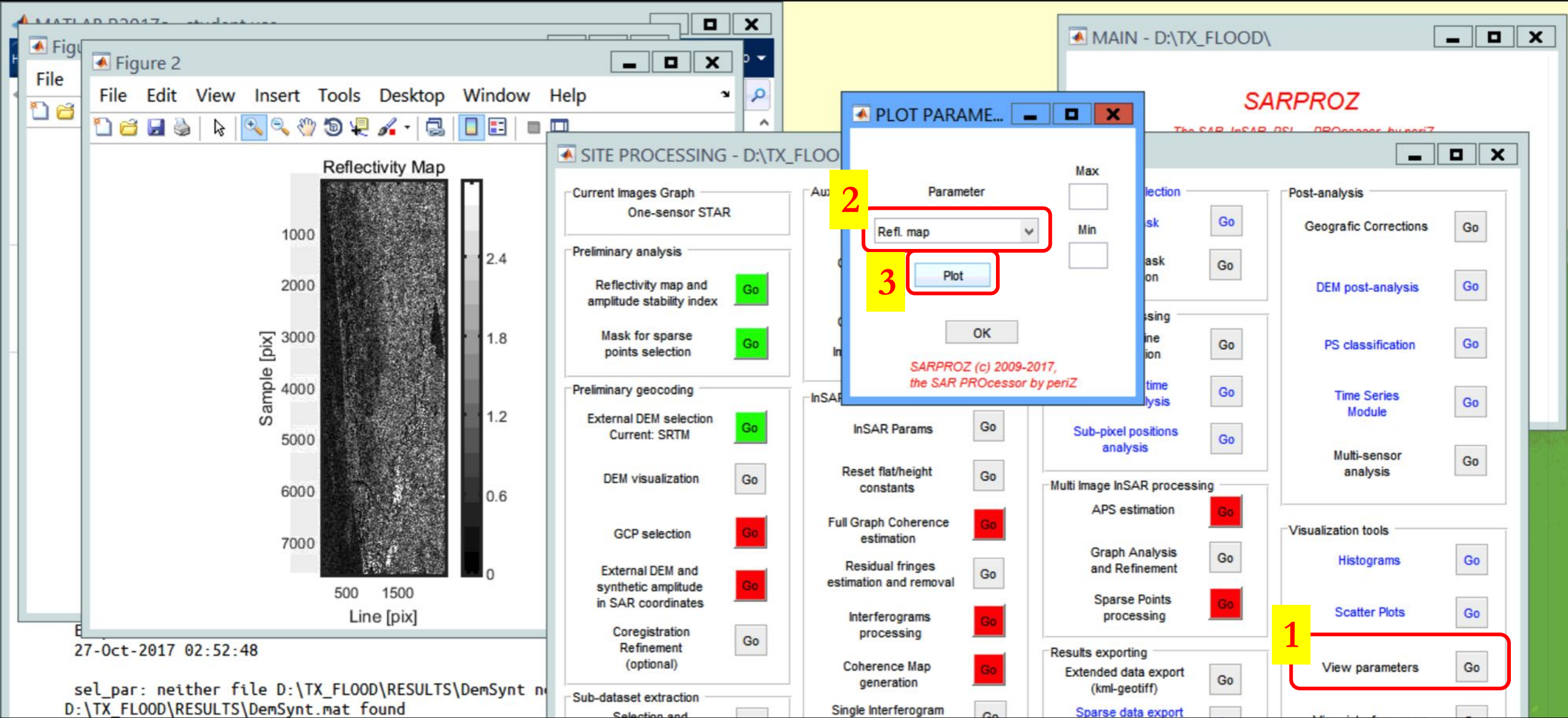
Post-analysis

- Geographic Corrections
- DEM post-analysis
- PS classification
- Time Series Module
- Multi-sensor analysis

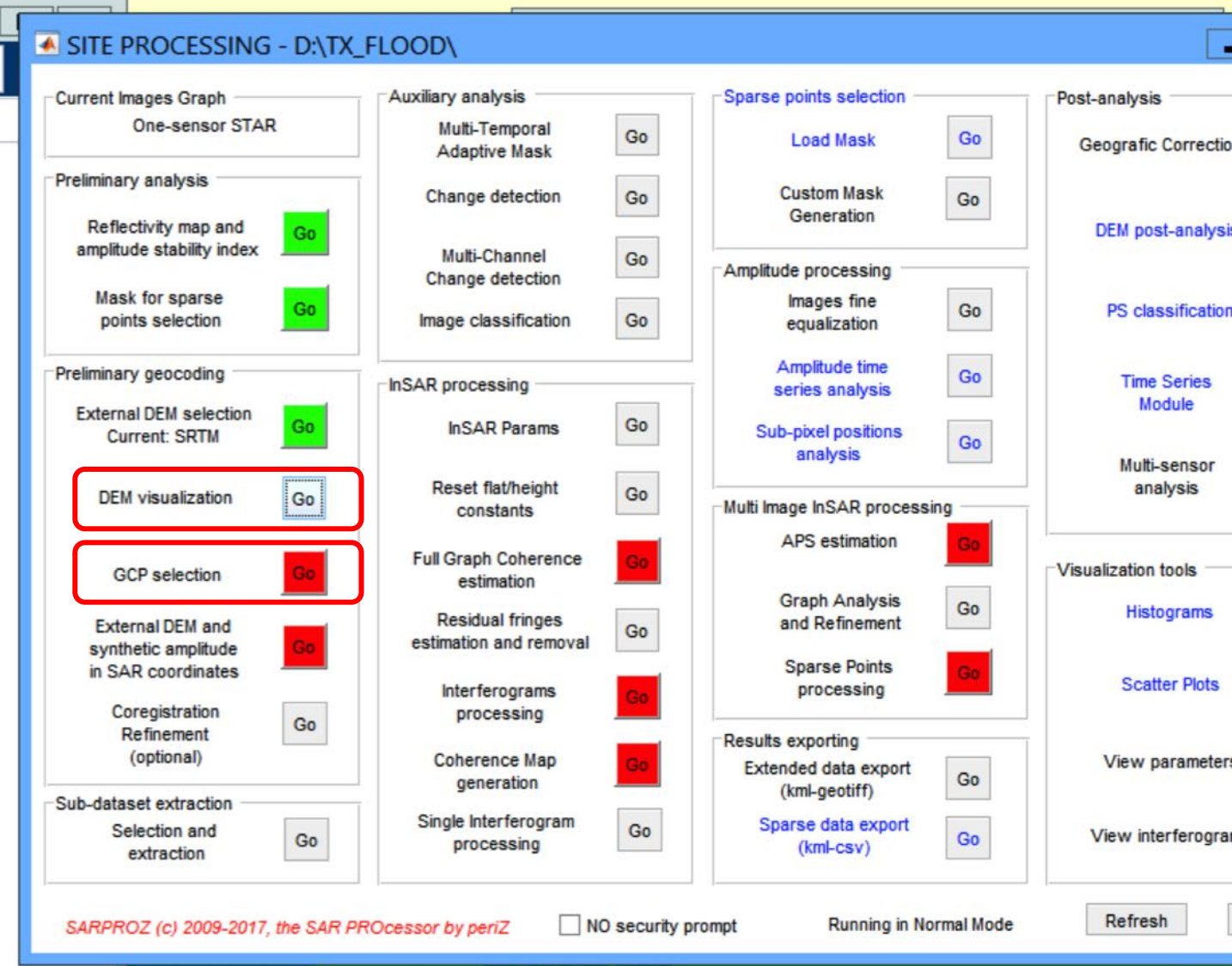
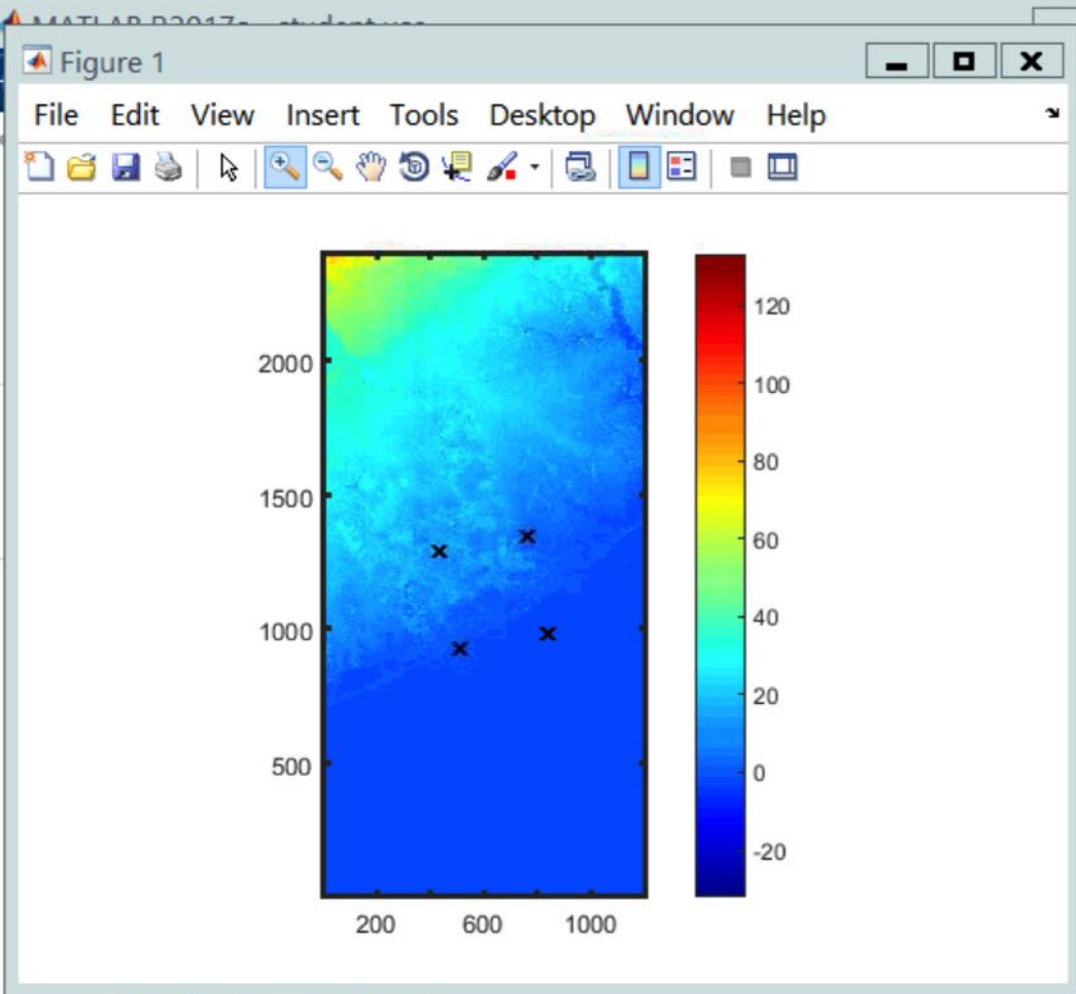
Visualization tools

- Histograms
- Scatter Plots
- View parameters
- View interferograms

2. Click “Mask for sparse points selection” and Click “Go” in the new popped up window. Click “OK” to close the window when it is finished.



You can click “View Parameters” in visualization tools panel. Then select “Refl. Map” in parameter and click “plot” to plot it. You can also go to “TX_FLOOD/RESULT” and open “MeanFirst.jpg” to check the jpeg format of reflectivity map.

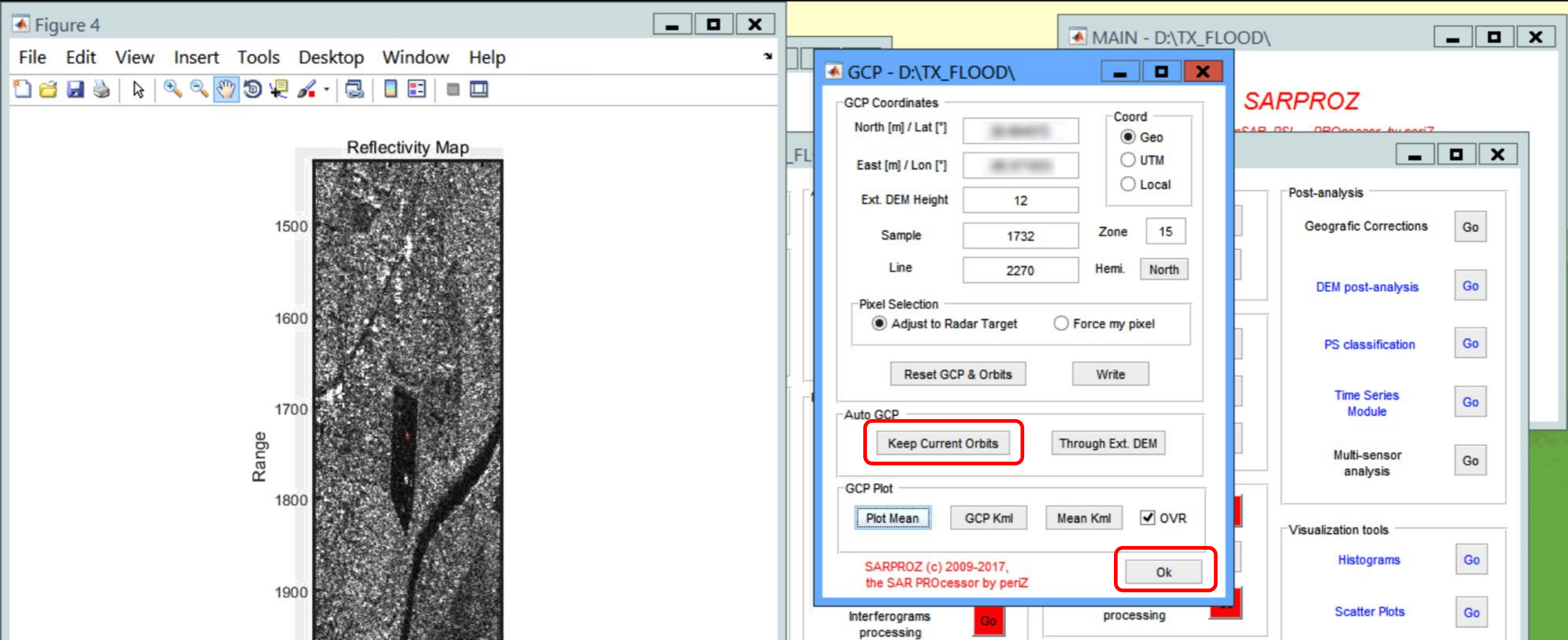


Elapsed Time: 7 seconds
27-Oct-2017 02:52:48

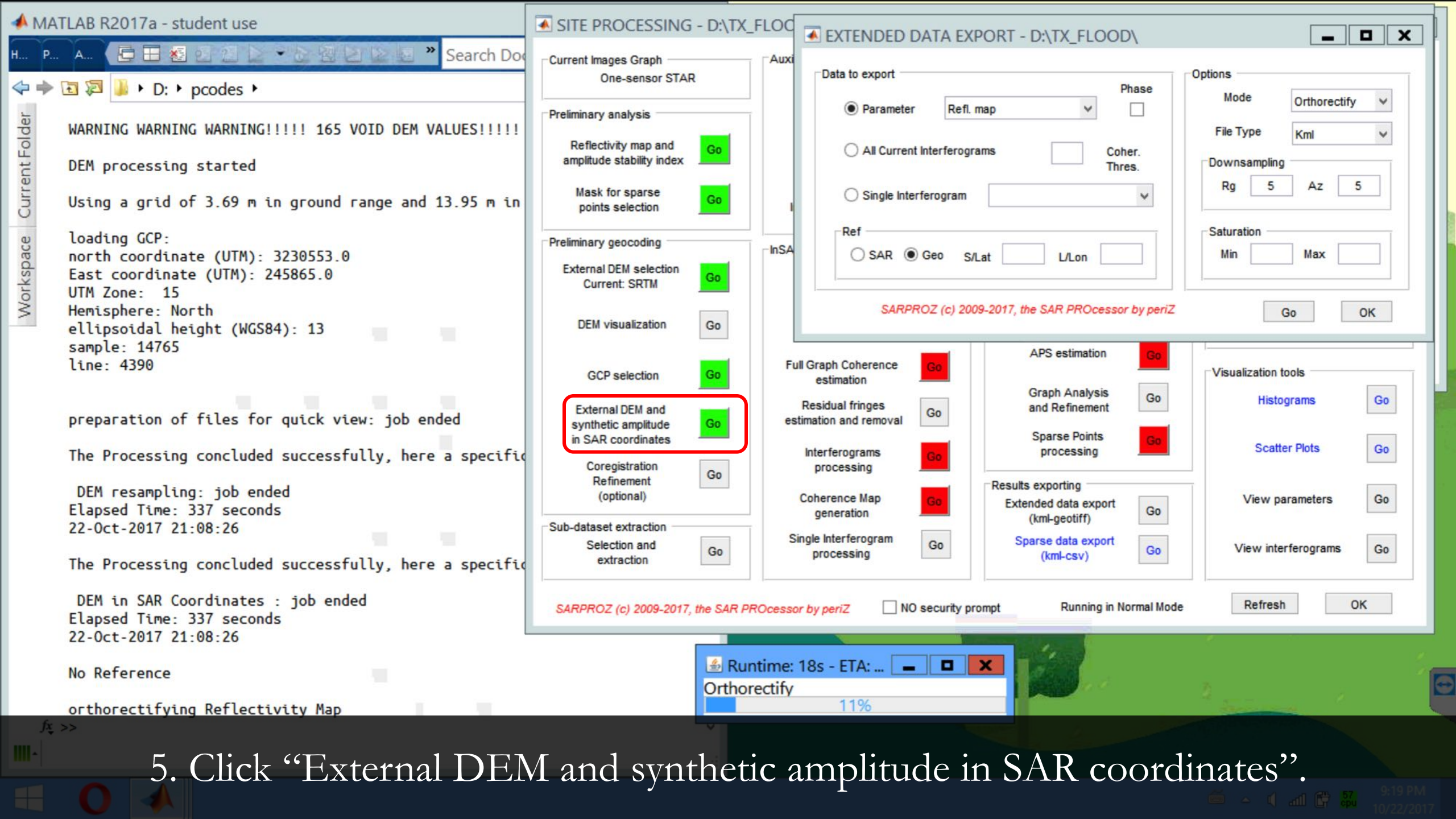
sel_par: neither file D:\TX_FLOOD\RESULTS\DemSynt nor
D:\TX_FLOOD\RESULTS\DemSynt.mat found

files D:\TX_FLOOD\RESULTS\DemSynt and D:\TX_FLOOD\RESULTS\DemSynt.mat not
found

3. Click “DEM Visualization” to visualize the DEM inside your area of interest (AOI).
The four black cross indicates the four corner of AOI.



4. Click “GCP selection” to open the Ground Control Point (GCP) panel. Click “Keep Current Orbits” to automatically find a GCP. After the process is completed, (Check the Command window of Matlab for information of success) click “OK” to close the panel.



5. Click “External DEM and synthetic amplitude in SAR coordinates”.

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Search Doc

D: \ pcodes \

WARNING WARNING WARNING!!!!!! 165 VOID DEM VALUES!!!!!!

DEM processing started

Using a grid of 3.69 m in ground range and 13.95 m in

loading GCP:
north coordinate (UTM): 3230553.0
East coordinate (UTM): 245865.0
UTM Zone: 15
Hemisphere: North
ellipsoidal height (WGS84): 13
sample: 14765
line: 4390

preparation of files for quick view: job ended

The Processing concluded successfully, here a specific

DEM resampling: job ended
Elapsed Time: 337 seconds
22-Oct-2017 21:08:26

The Processing concluded successfully, here a specific

DEM in SAR Coordinates : job ended
Elapsed Time: 337 seconds
22-Oct-2017 21:08:26

SITE PROCESSING - D:\TX_FLOOD\

Current Images Graph
One-sensor STAR

Preliminary analysis

Reflectivity map and amplitude stability index **Go**

Mask for sparse points selection **Go**

Preliminary geocoding

External DEM selection
Current: SRTM **Go**

DEM visualization **Go**

GCP selection **Go**

External DEM and synthetic amplitude in SAR coordinates **Go**

Coregistration Refinement (optional) **Go**

Sub-dataset extraction
Selection and extraction **Go**

Extended Data Export - D:\TX_FLOOD\

2 data to export

☒ Parameter Refl. map **3** Mode **Orthorectify**

☐ All Current Interferograms ☐ Coher. Thres.

☐ Single Interferogram

Ref ☐ SAR ☒ Geo S/Lat L/Lon

Options

File Type **Kml**

Downsampling
Rg 5 Az 5

Saturation
Min Max

4 **Go** **OK**

SARPROZ (c) 2009-2017, the SAR PROcessor by periz

Full Graph Coherence estimation **Go**

Residual fringes estimation and removal **Go**

Interferograms processing **Go**

Coherence Map generation **Go**

Single Interferogram processing **Go**

APS estimation **Go**

Graph Analysis and Refinement **Go**

Sparse Points processing **Go**

1 Results exporting

Extended data export (kml-geotiff) **Go**

Sparse data export (kml-csv) **Go**

Visualization tools

Histograms **Go**

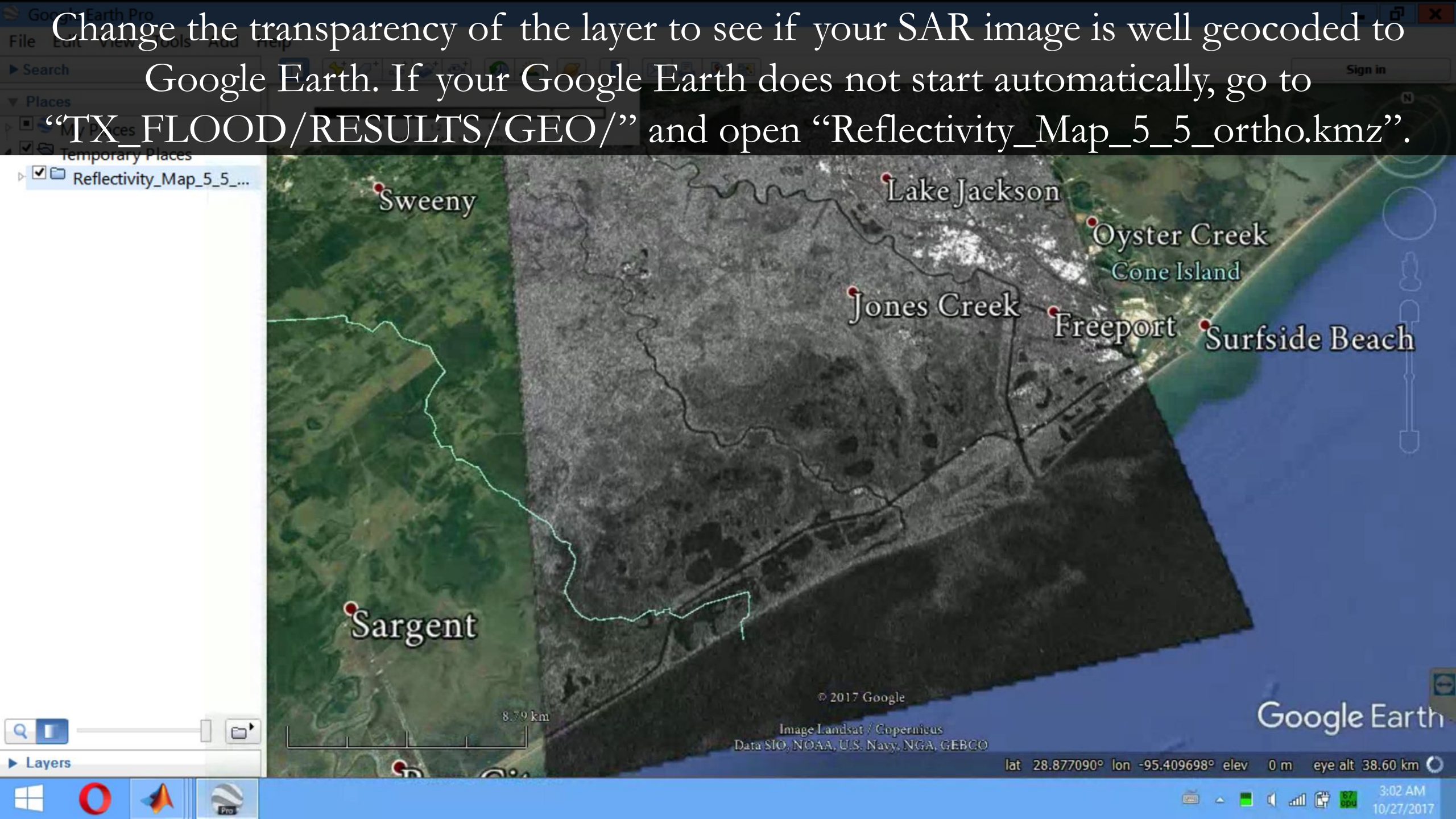
Scatter Plots **Go**

View parameters **Go**

View interferograms **Go**

SARPROZ (c) 2009-2017, the SAR PROcessor by periz ☐ NO security prompt Running in Normal Mode **Refresh** **OK**

6. We need to geocode the SAR image to Google Earth. To do so, click “Extended data export” in “Results exporting” panel. Choose “Refl. Map” in Parameter; Choose “Orthorectify” in Mode, Press “Go”.



Change the transparency of the layer to see if your SAR image is well geocoded to Google Earth. If your Google Earth does not start automatically, go to “TX_FLOOD/RESULTS/GEO/” and open “Reflectivity_Map_5_5_ortho.kmz”.

Part 3: Change(flood) Detection

Change Detection

- The change detection is straightforward. It compares the intensity of the two SAR SLC images and calculate the difference.
- This is especially useful for flood detection.
- Go to “TX_FLOOD\FITTED” folder, compare “20170805.jpeg” and “20170829.jpeg”. Get an intuitive understanding of how the flood is changing the SAR image.

MATLAB R2017a - student use

Current Folder

Workspace

DEM processing started

Using a grid of 3.69 m in ground range and 13.95 m in

loading GCP:
north coordinate (UTM): 3230553.0
East coordinate (UTM): 245865.0
UTM Zone: 15
Hemisphere: North
ellipsoidal height (WGS84): 13
sample: 14765
line: 4390

preparation of files for quick view: job ended

The Processing concluded successfully, here a specific

DEM resampling: job ended
Elapsed Time: 337 seconds
22-Oct-2017 21:08:26

The Processing concluded successfully, here a specific

DEM in SAR Coordinates : job ended
Elapsed Time: 337 seconds
22-Oct-2017 21:08:26

No Reference

orthorectifying Reflectivity Map

file D:\TX_FLOOD\RESULTS\REF\Reflectivity_Map_5_5_ortho.kmz written

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SITE PROCESSING - D:\TX_FLOOD\

Current Images Graph
One-sensor STAR

Preliminary analysis

Reflectivity map and amplitude stability index

Mask for sparse points selection

Preliminary geocoding

External DEM selection
Current: SRTM

DEM visualization

GCP selection

External DEM and synthetic amplitude in SAR coordinates

Coregistration Refinement (optional)

Sub-dataset extraction
Selection and extraction

Auxiliary analysis

Multi-Temporal Adaptive Mask

Change detection

Multi-Channel Change detection

Image classification

Sparse points selection

Load Mask

Custom Mask Generation

Amplitude processing

Images fine equalization

Amplitude time

Post-analysis

Geographic Corrections

DEM post-analysis

PS classification

CHANGE DETECTION - D:\TX_FLOOD\

Data Selection

☒ Single Pair ☐ Multiple Pairs

Current Loaded Graph: One-sensor STAR

Master 20170805 0 0.00 0 21 11.8

Slave 20170829 44 -0.01 24 21 11.6

Processing Options

Input Data Amplitude

Comparison Difference

☒ Normalization

Stretch None

Filter window 15

Noise/Lower thres .3

Upper thres

View

Results Input D. Ref. Fig.

Histogram

Cumulative Changes

Save Plot Min Max

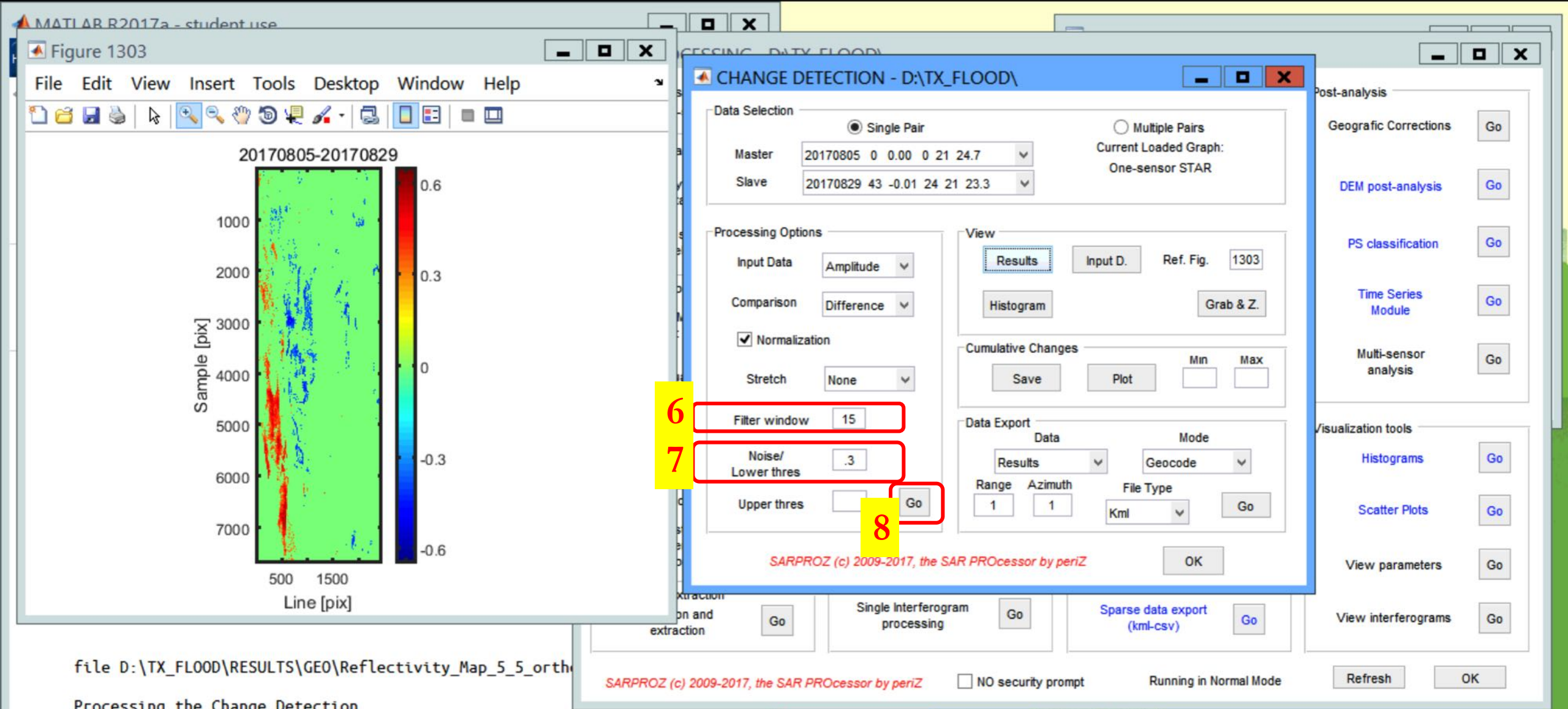
Data Export

Data Results Mode Geocode

Range 1 Azimuth 1 File Type Km File Type

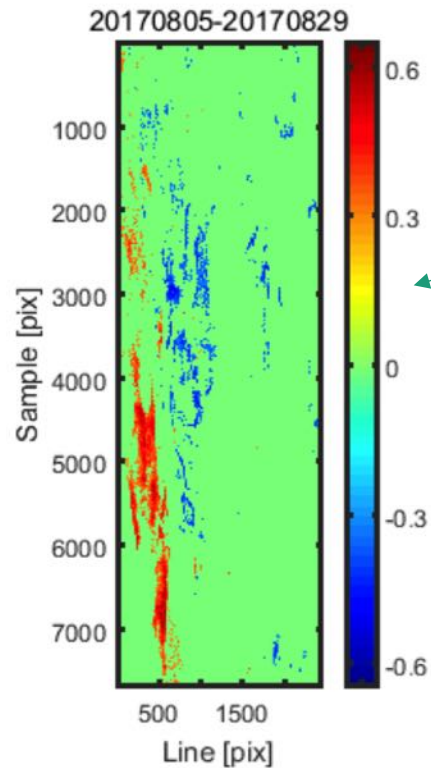
OK

1. Click “Change detection” in “Auxiliary analysis” module. Choose Master and Slave image. Use “Amplitude” as input and “Difference” as comparison. Tick “Normalization”. This will normalize the result to [-1,1]. Choose “None” for Stretch.



1. (contd.) Put “15” as the filter window size. Input “0.3” as lower noise threshold. This will treat all value below 0.3 to zero. Leave upper threshold as blank. Click “Go” to start the change detection process.

2. When you see the success message in command window, click “Results” to see the result. Click “Histogram” to see the effect of threshold.



Processing Options

Input Data: Amplitude

Comparison: Difference

☒ Normalization

Stretch: None

Filter window: 15

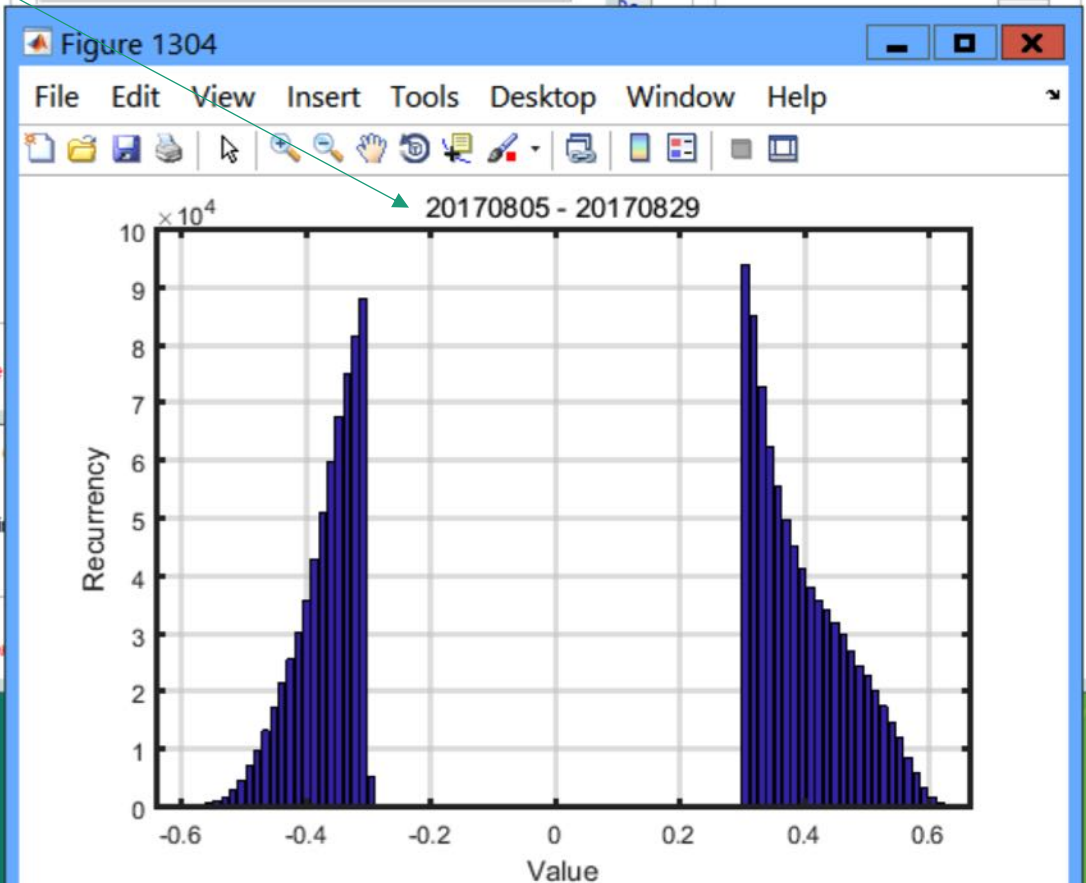
Noise/ Lower thres: .3

Upper thres:

Go

9 Results

10 Histogram



file D:\TX_FLOOD\RESULTS\GEO\Reflectivity_Map_5_5_ortho

Processing the Change Detection

writing sparse file D:\TX_FLOOD\RESULTS\CHDETECT\20170805-20170829.mat
Elapsed time is 5.255512 seconds.

fx >>

matlab:matlab.internal.language.introspective.errorDocCallb: 'matlab.graphics.intern...

3. Geocode your result to Google Earth. Select “Orthorectify” in Mode, and press “Go” to export your result to Google Earth.

The coregistration was concluded successfully

The Processing concluded successfully, here a specific

SLC data Preparation: job ended
Elapsed Time: 489 seconds
24-Nov-2017 16:39:40

File D:\TX_FLOOD\InputParFile.txt correctly updated

File D:\TX_FLOOD\RESULTS\MATLAB\DefParam correctly writ

file D:\TX_FLOOD\RESULTS\MATLAB\MatrIncImgAll is missin
Coherence Estimation"

One-Sensor STAR Images Graph

writing sparse file D:\TX_FLOOD\RESULTS\ModFit.mat

writing sparse file D:\TX_FLOOD\RESULTS\PSType.mat

writing sparse file D:\TX_FLOOD\RESULTS\EDem.mat

File D:\TX_FLOOD\InputParFile.txt correctly updated

file D:\TX_FLOOD\RESULTS\MATLAB\InSarParam written!

Processing the Change Detection

writing sparse file D:\TX_FLOOD\RESULTS\CHDETECT\20170805-20170829.mat
Elapsed time is 7.910723 seconds.

fx >>

Master: 20170805 0 0.00 0 21 11.8
Slave: 20170829 43 -0.01 24 21 11.6

Current Loaded Graph: One-sensor STAR

Processing Options

Input Data: Amplitude
Comparison: Difference
☒ Normalization
Stretch: None
Filter window: 15
Noise/Lower thres: .3
Upper thres: Go

View

Results Input D. Ref. Fig.
Histogram Grab & Z.

Cumulative Changes

Save Plot Min Max

Data Export

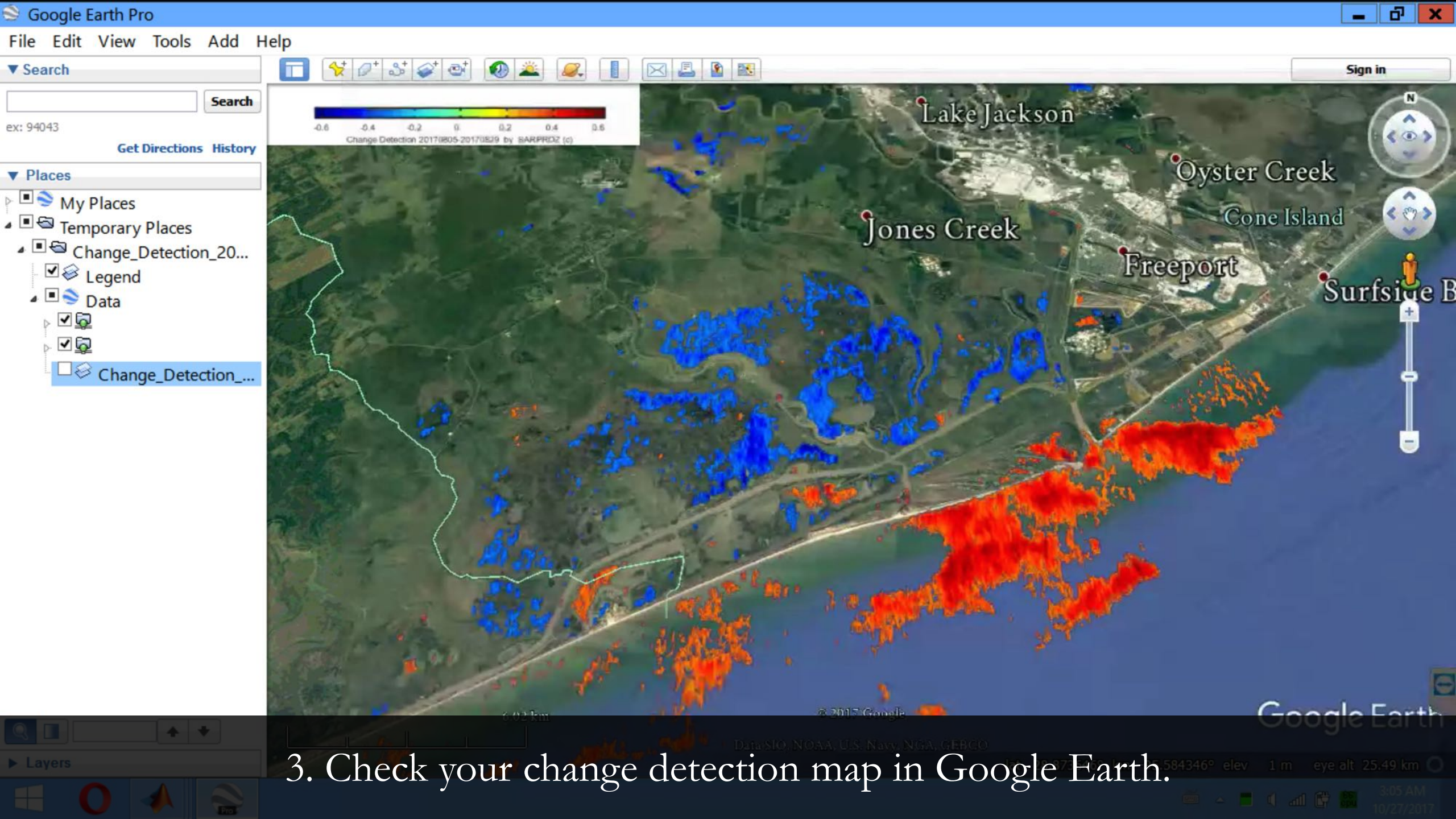
Data: Results Mode: Orthorectify
Range: 5 Azimuth: 5 File Type: Kml

Sub-dataset extraction Selection and extraction Go

Single Interferogram processing Go

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NO security prompt Running in Normal Mode Refresh OK



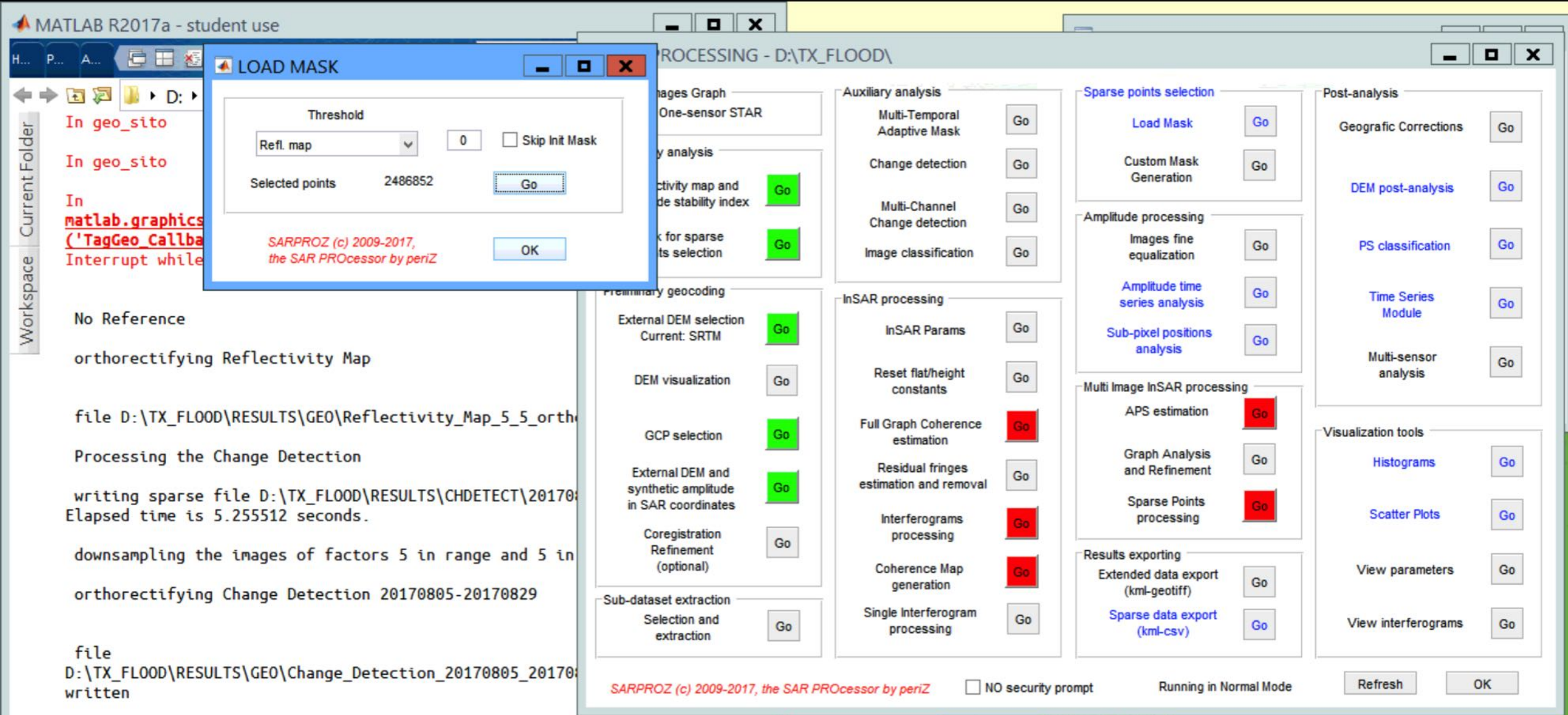
3. Check your change detection map in Google Earth.

Optional Exercise

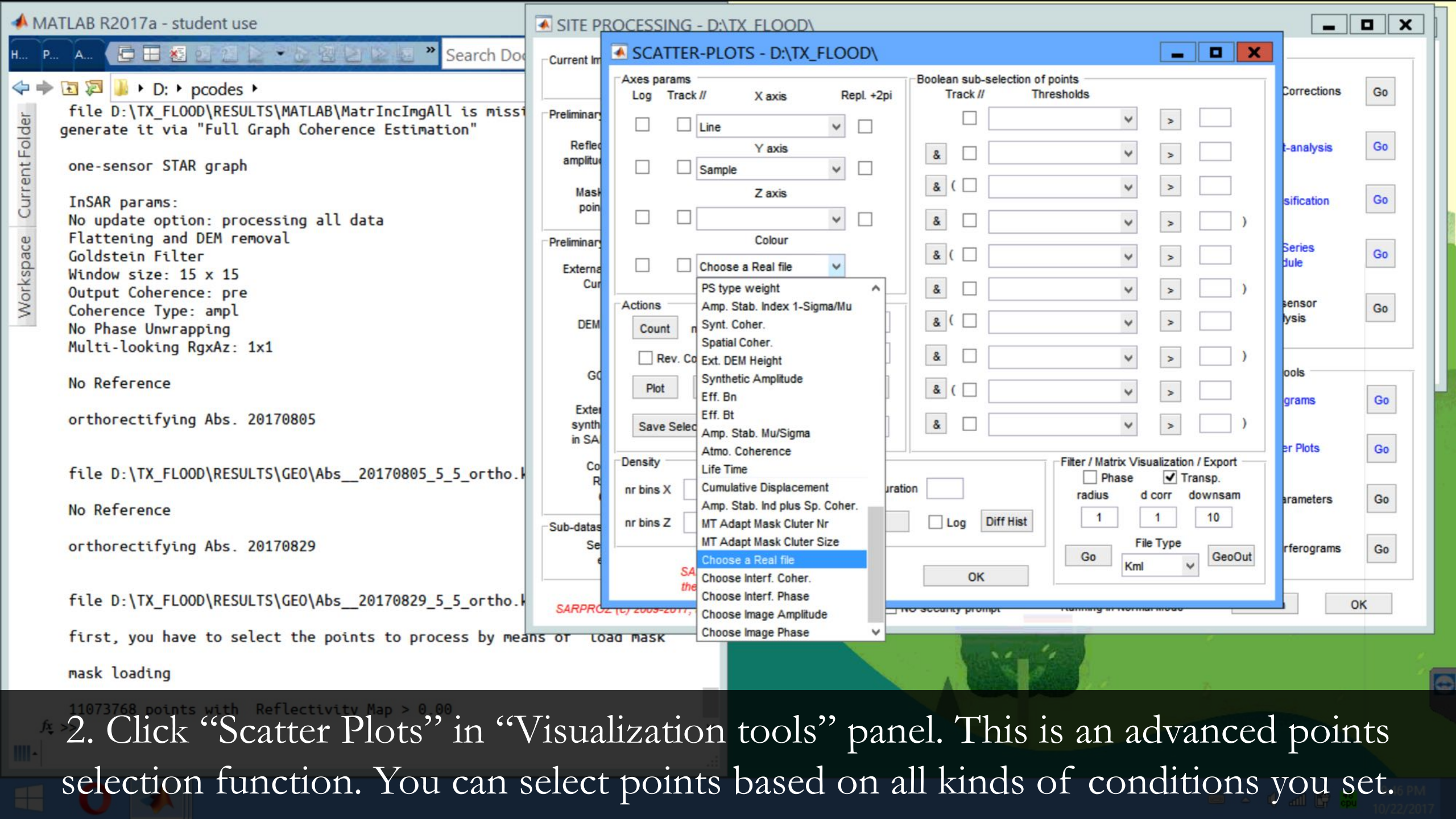
Part 4: Masking out the sea

Mask out the sea

- In previous page, we can see that there are positive and negative value for change detection. Positive value (**red**) means the slave intensity is greater than master. Negative value (**blue**) means the slave is smaller than master.
- If we want to look for **flood**, we need only the **blue** value part where the slave pixel level is significantly smaller than master. (**why?**)
- In this part, we will study how to mask out the red region and keep only the blue region.



1. Click “Scatter” in “sparse points selection” panel. Select “Refl. map” as the parameter of threshold. Input “0” as press “Go”. You will see a total of around 2.5 million points selected as the points to be processed.



file D:\TX_FLOOD\RESULTS\MATLAB\MatrIncImgAll is missing
generate it via "Full Graph Coherence Estimation"

one-sensor STAR graph

InSAR params:

No update option: processing all data

Flattening and DEM removal

Goldstein Filter

Window size: 15 x 15

Output Coherence: pre

Coherence Type: ampl

No Phase Unwrapping

Multi-looking RgxAz: 1x1

No Reference

orthorectifying Abs. 20170805

file D:\TX_FLOOD\RESULTS\GEO\Abs_20170805_5_5_ortho.k

No Reference

orthorectifying Abs. 20170829

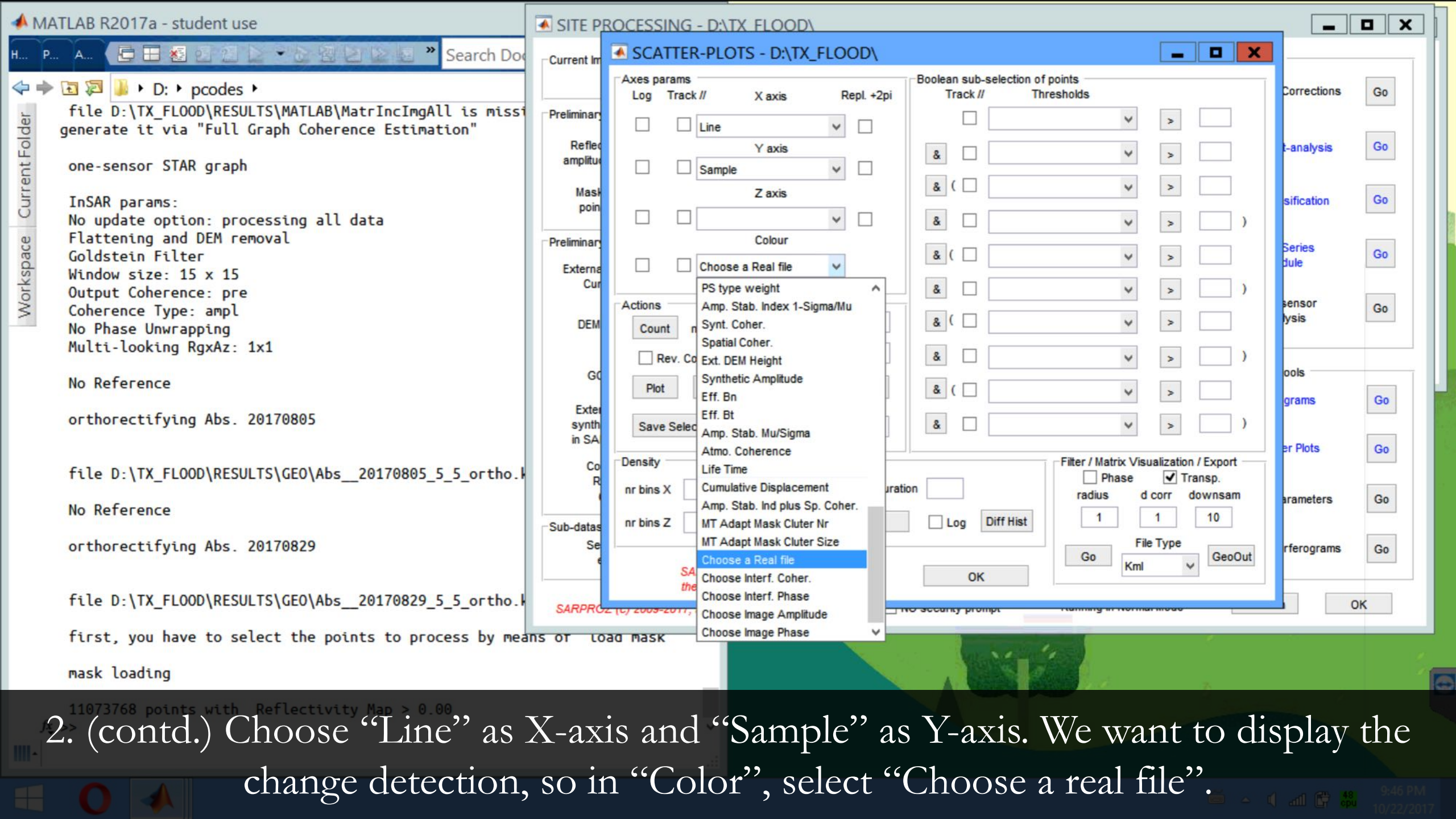
file D:\TX_FLOOD\RESULTS\GEO\Abs_20170829_5_5_ortho.k

first, you have to select the points to process by means of load mask

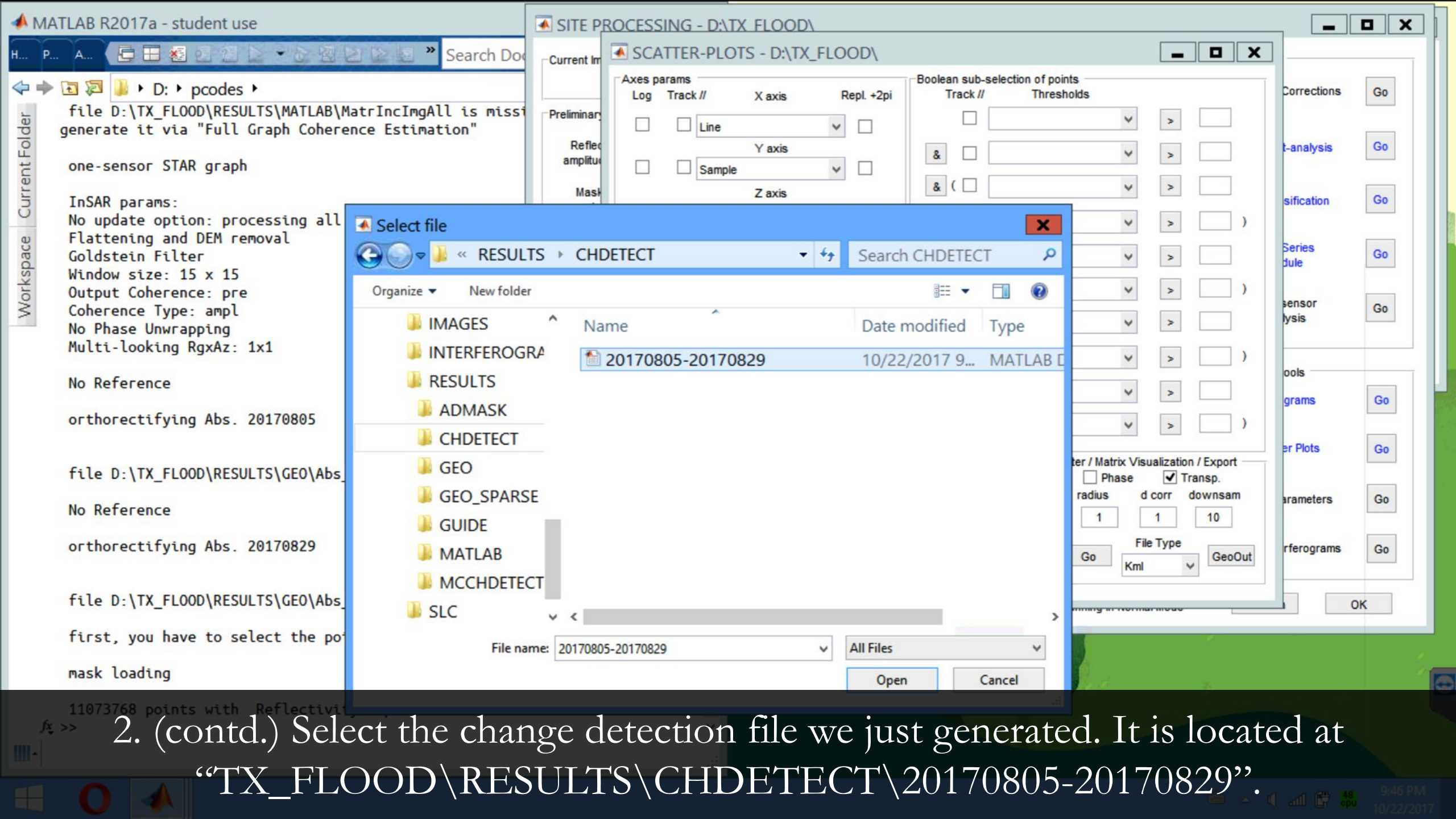
mask loading

11073768 points with Reflectivity Map > 0.00

2. Click "Scatter Plots" in "Visualization tools" panel. This is an advanced points selection function. You can select points based on all kinds of conditions you set.



2. (contd.) Choose "Line" as X-axis and "Sample" as Y-axis. We want to display the change detection, so in "Color", select "Choose a real file".



2. (contd.) Select the change detection file we just generated. It is located at “TX_FLOOD\RESULTS\CHDETECT\20170805-20170829”.

MATLAB R2017a - student use

Current Folder

Workspace

D:\TX_FLOOD\RESULTS\MATLAB\MatrIncImgAll is missing. Generate it via "Full Graph Coherence Estimation"

one-sensor STAR graph

InSAR params:

- No update option: processing all data
- Flattening and DEM removal
- Goldstein Filter
- Window size: 15 x 15
- Output Coherence: pre
- Coherence Type: ampl
- No Phase Unwrapping
- Multi-looking RgxAz: 1x1

No Reference

orthorectifying Abs. 20170805

file D:\TX_FLOOD\RESULTS\GEO\Abs_20170805_5_5_ortho.k

No Reference

orthorectifying Abs. 20170829

file D:\TX_FLOOD\RESULTS\GEO\Abs_20170829_5_5_ortho.k

first, you have to select the points to process by means of load mask

mask loading

11073768 points with Reflectivity Map > 0.00

3> As said, we want to filter out all the positive value in change detection map. To do so, in the "Threshold" drop down menu on the right, choose the same file.

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SCATTER-PLOTS - D:\TX_FLOOD\

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nr bins Y

Upper saturation

nr bins Z

nr bins C

Go

Log

Diff Hist

Boolean sub-selection of points

Track //

Thresholds

PS type weight

Amp. Stab. Index 1-Sigma/Mu

Synt. Coher.

Spatial Coher.

Ext. DEM Height

Synthetic Amplitude

Eff. Bn

Eff. Bt

Amp. Stab. Mu/Sigma

Atmo. Coherence

Life Time

Cumulative Displacement

Amp. Stab. Ind plus Sp. Coher.

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MT Adapt Mask Cluter Size

Choose a Real file

Choose Interf. Coher.

Choose Interf. Phase

Choose Image Amplitude

Choose Image Phase

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Page 1 of 1

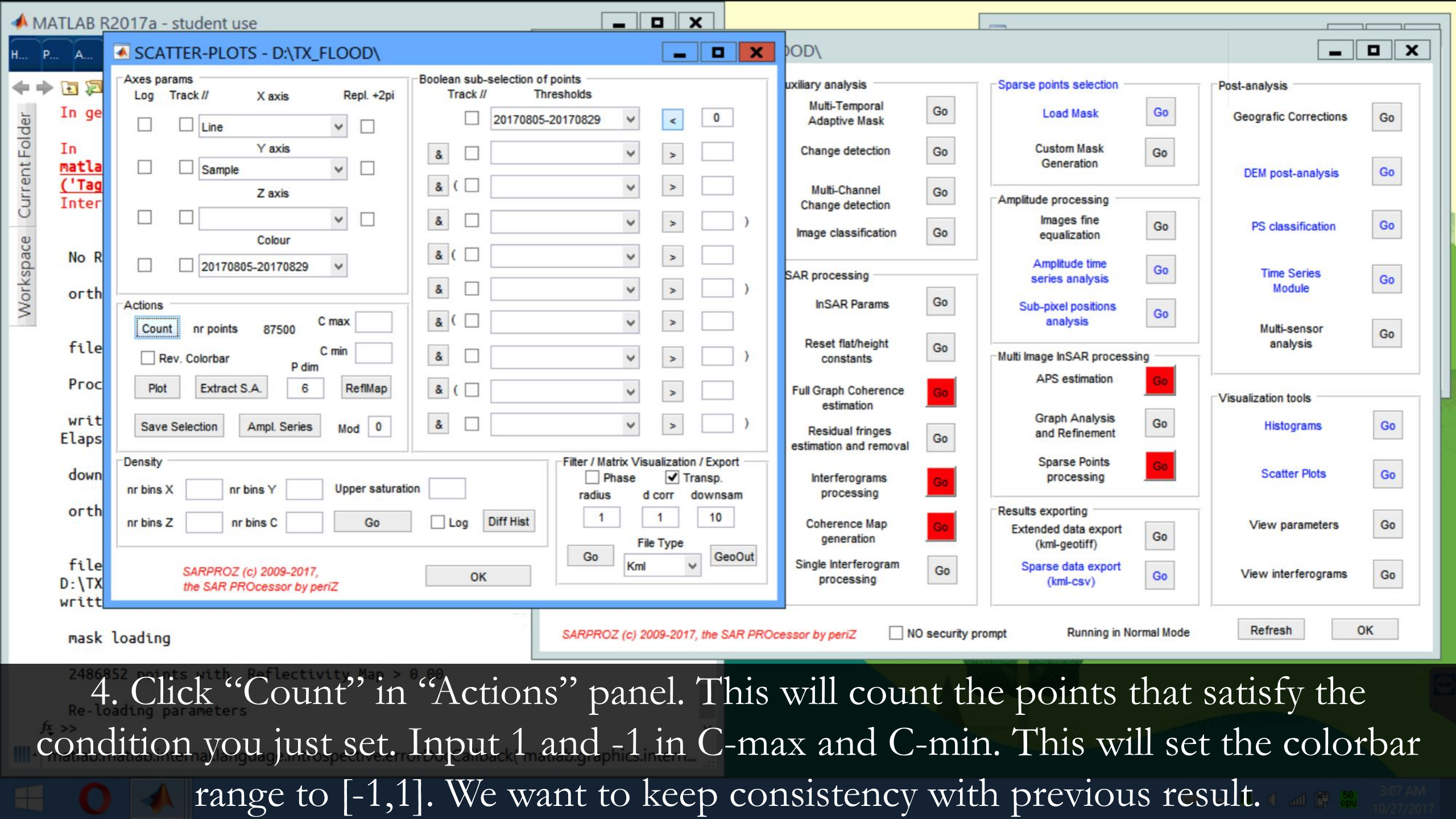
Filter / Matrix Visualization / Export

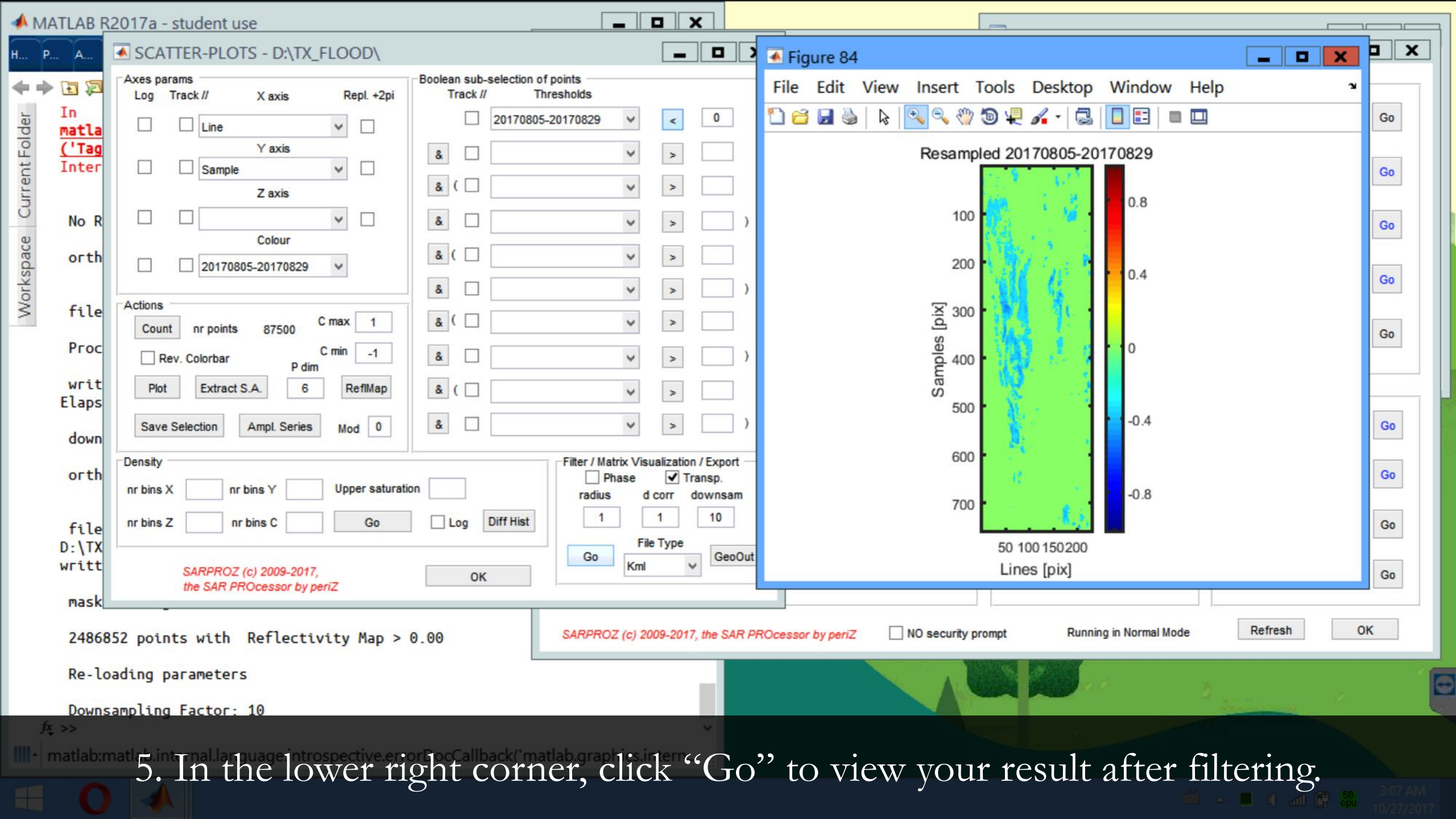
radius d corr downsam

☐ Log ☒ Diff Hist 1 1 10

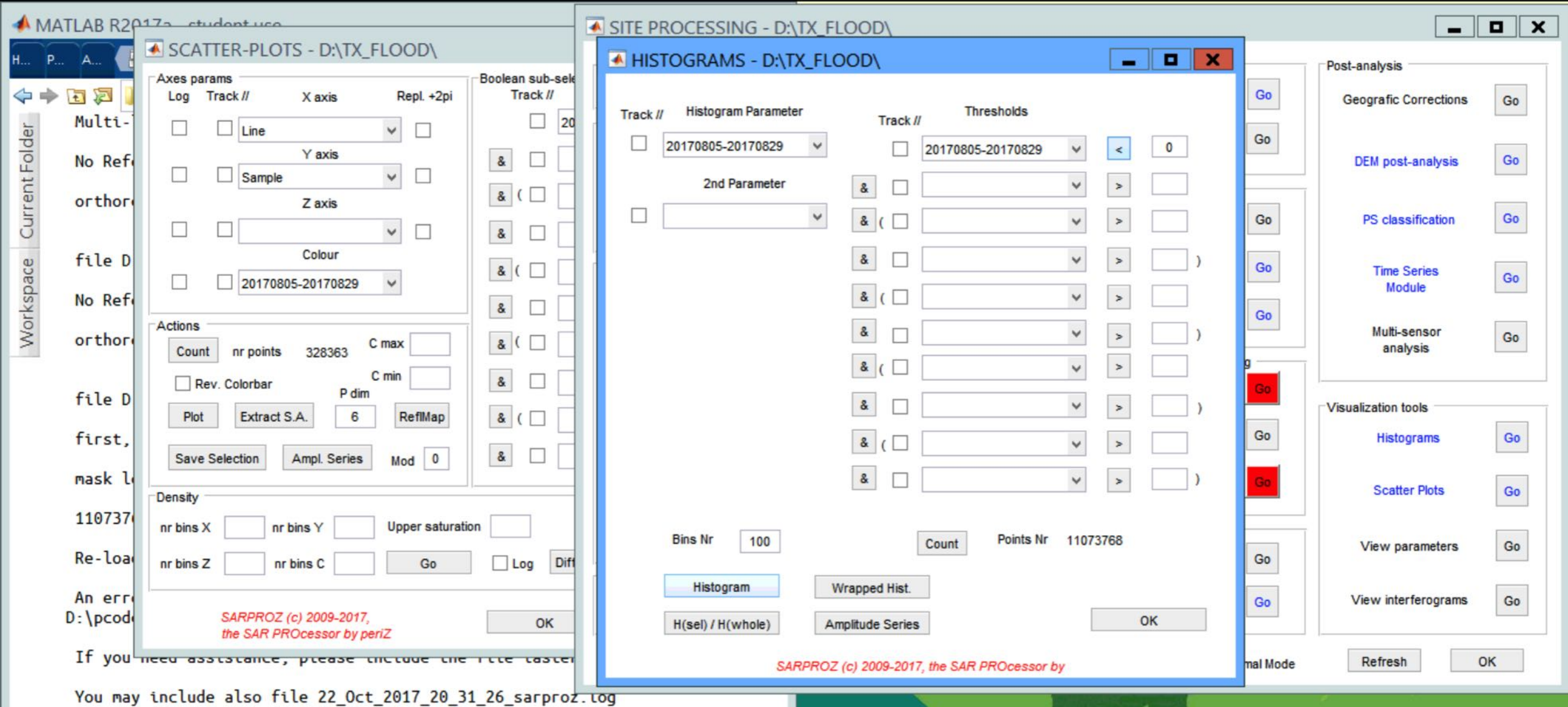
File Type

OK

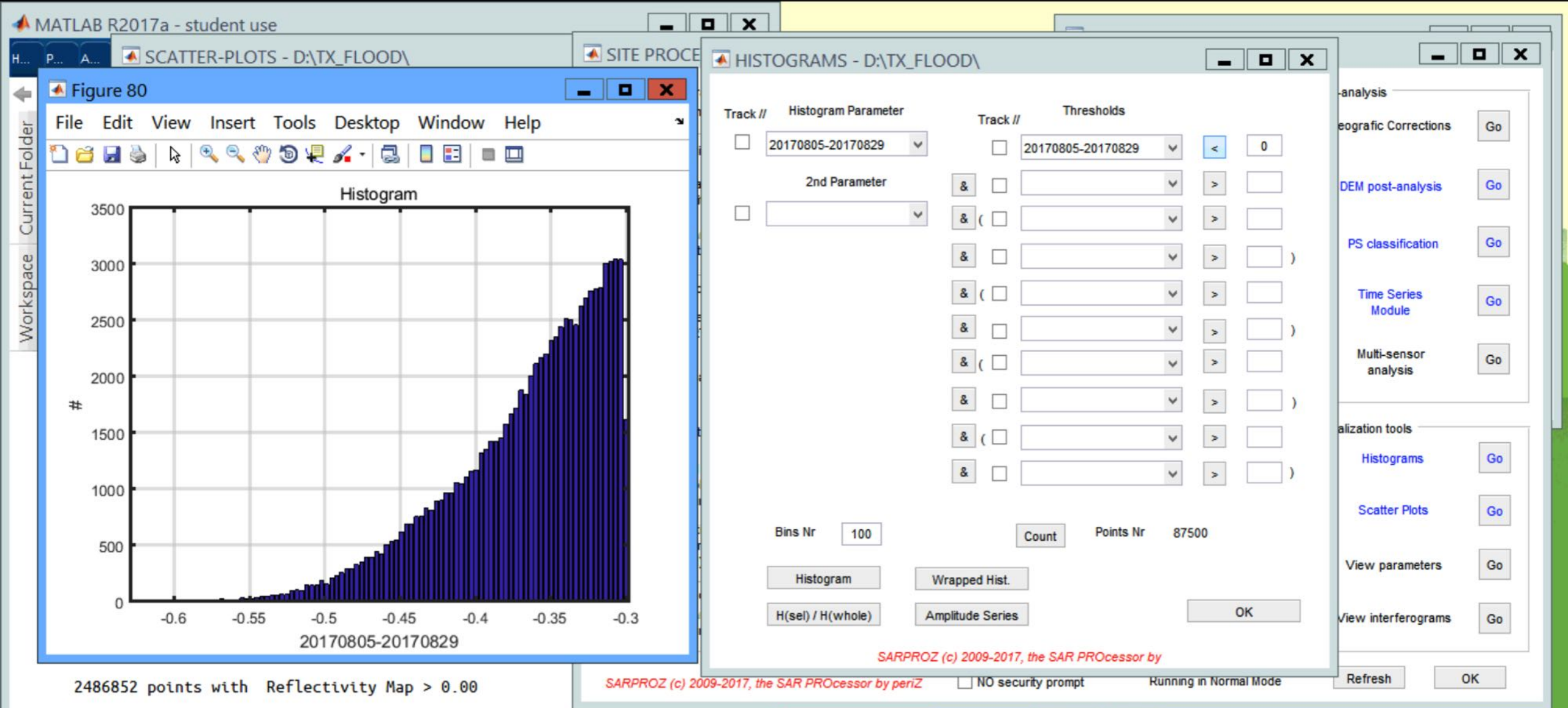




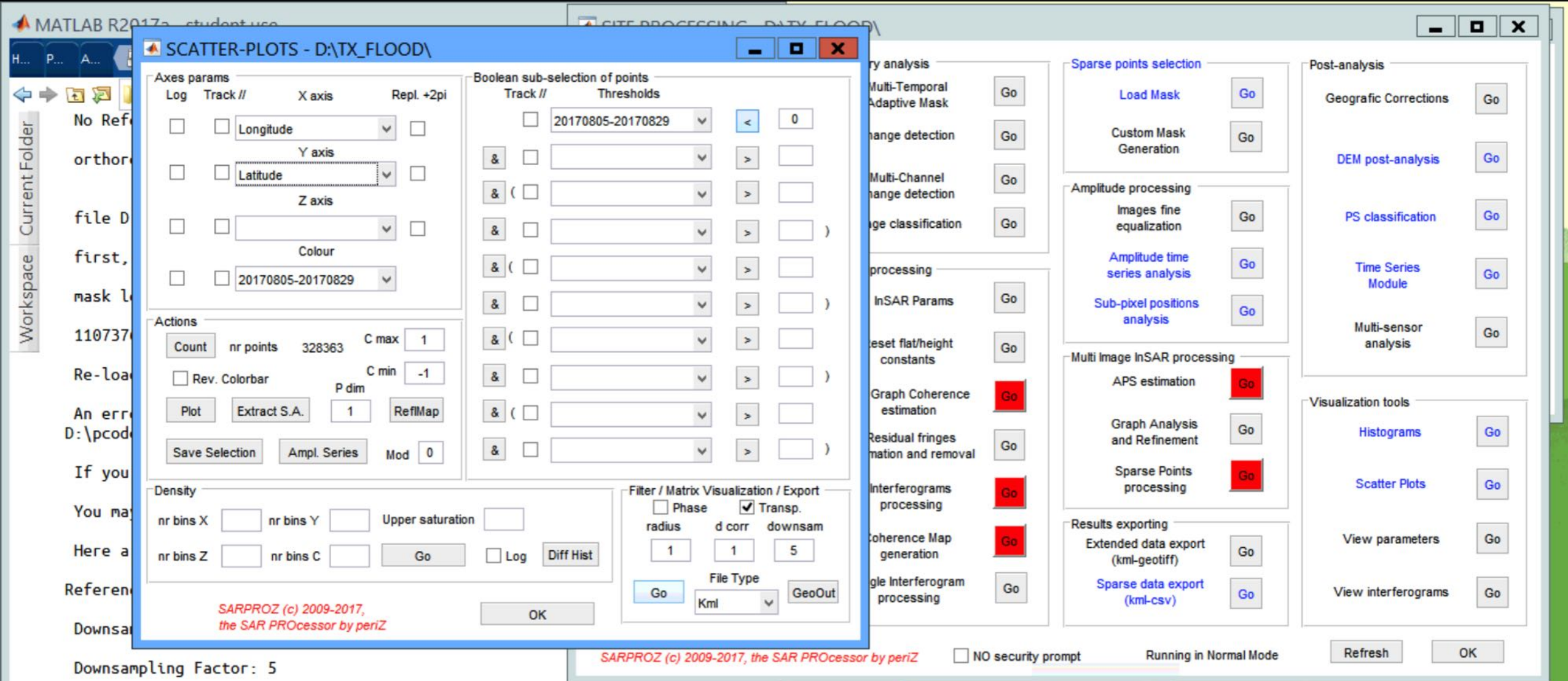
5. In the lower right corner, click “Go” to view your result after filtering.



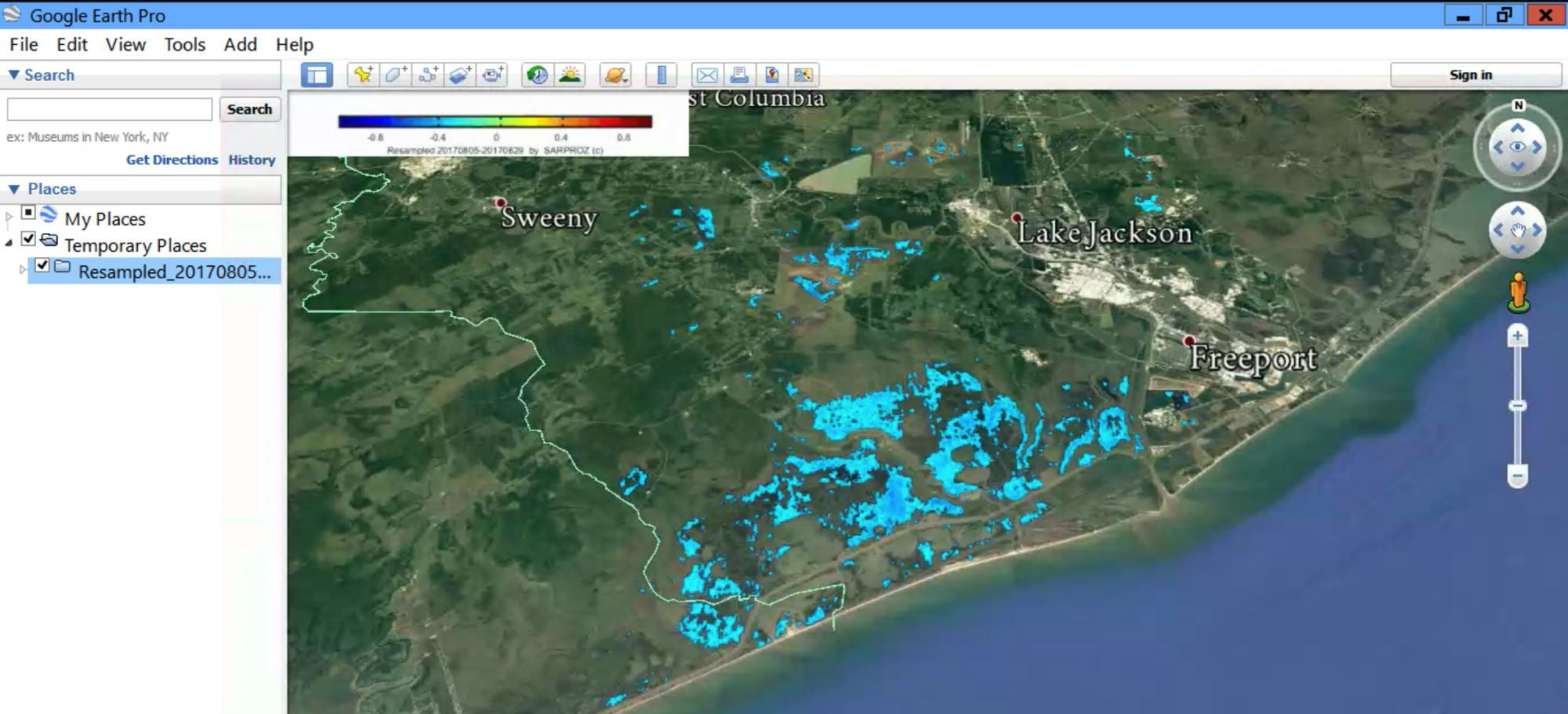
6. Another way to check your result is by **histogram**. Click “Histogram” in “Visualization tools” panel to use this function. Use the exact same steps to choose points with negative value in change detection result.



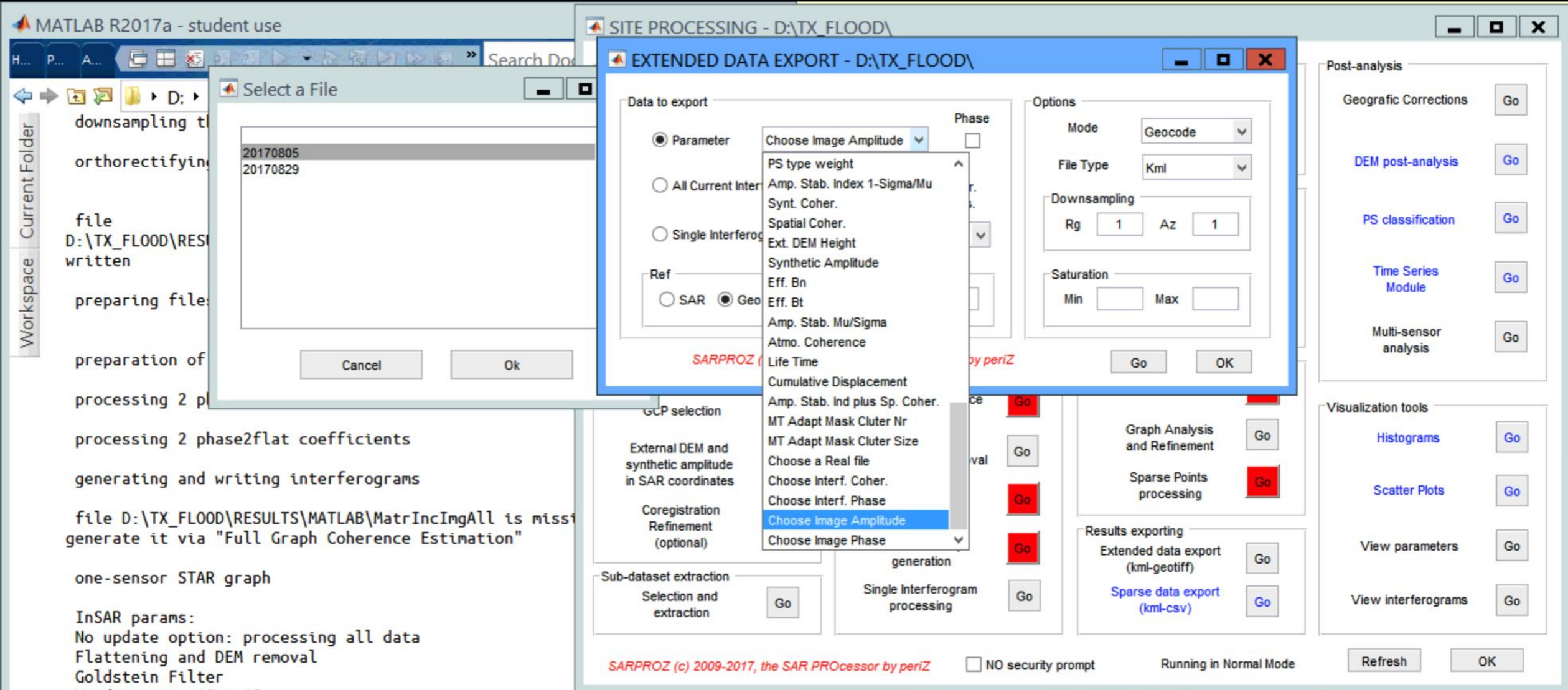
7. Click “Count” to count the points after you set the condition. Click “Histogram” to display the histogram. We could clearly see that all the points with positive value in change detection result is filtered out.



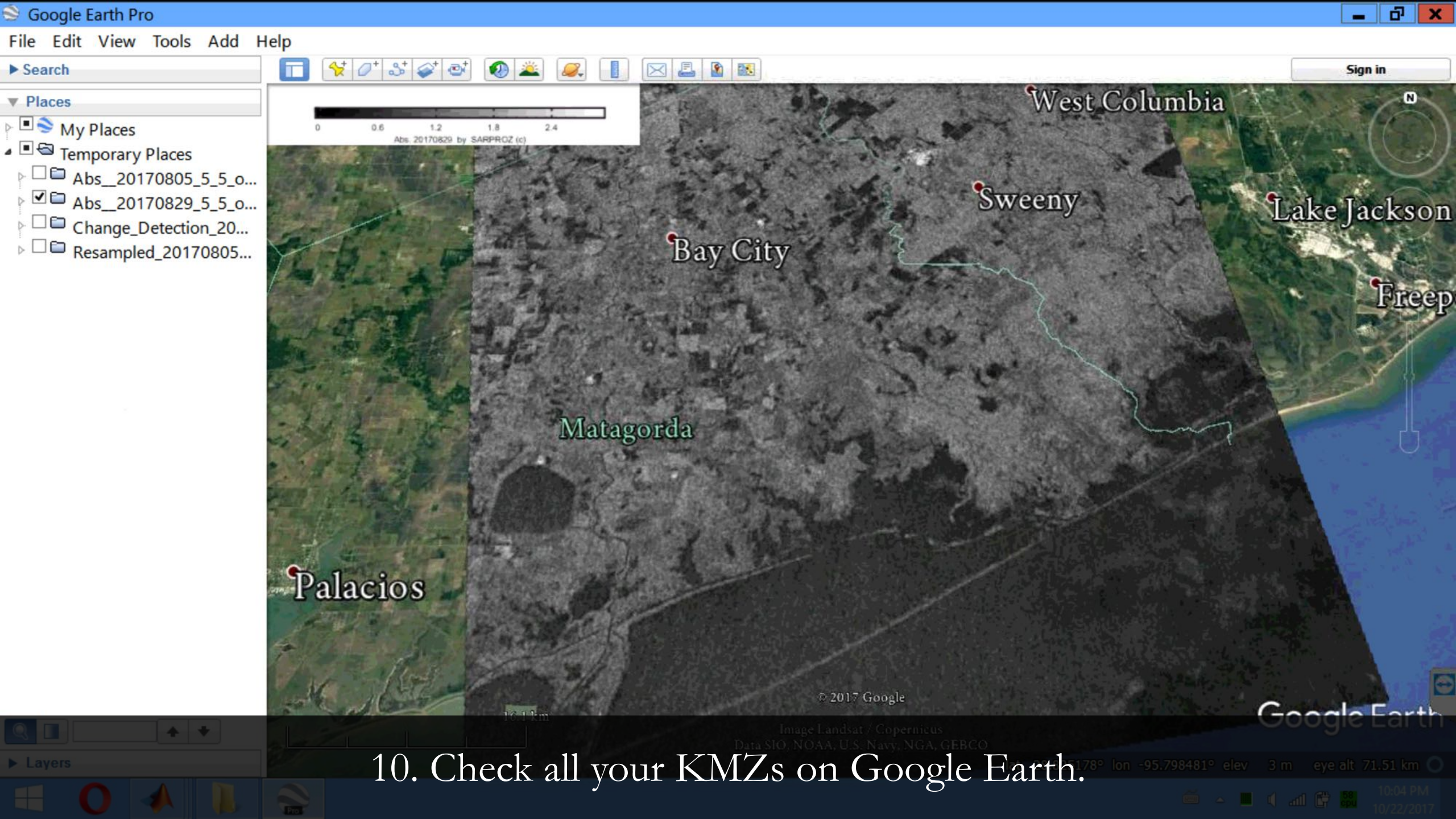
8. At last, to geocode the new result to Google Earth, change X-axis to “Longitude” and Y axis to “Latitude”. Choose 5 as downsample factor. Click “GeoOut” to geocode.



9. If Google Earth does not start automatically, you can always find all your products in “TX_FLOOD\RESULTS\GEO” folder.



You can also geocode master and slave image separately. Select “Choose Image Amplitude” when selecting geocoding parameter.



10. Check all your KMZs on Google Earth.

Bye