

Prepare Data in SNAP for PSI analysis

1-Preparing the SLC data Package **Tutorial videos for this document** ([VIDEO 1](#), [VIDEO 2](#))

NB: All the selected data should be either ascending or descending from the same track (in my case: ASC- 135)

Two source for downloading the data. I prefer the second one as it has no limit for downloading

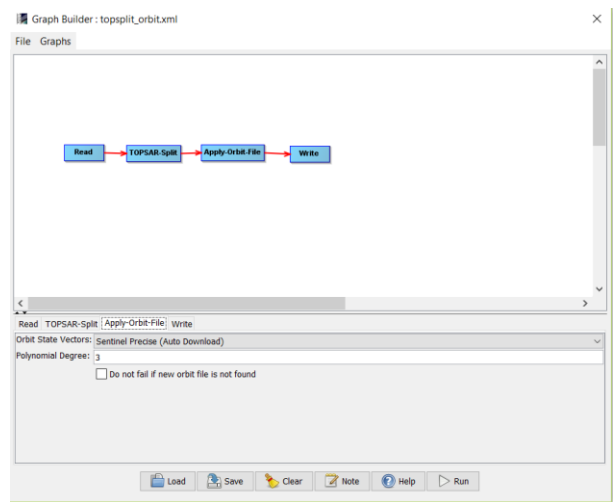
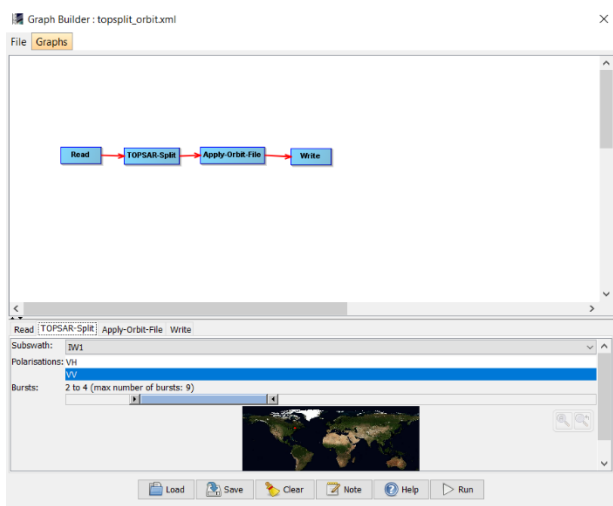
<https://scihub.copernicus.eu/dhus/#/home>

<https://search.asf.alaska.edu/#/>

The perfect size of the package should be something between 13-15. In case of having a bigger package, it should be processed in more than one package. Furthermore, if the desired zone of the process is located in more than one subswath. Each subswath should be processed separately.

1-1 Applying TOPSAR split and precise orbit on all the SLC data

It is easier to be done with a prepared graph.



1-2 finding the master SLC (inputs: results of 1-1)

Radar > Interferometric > InSAR stack overview

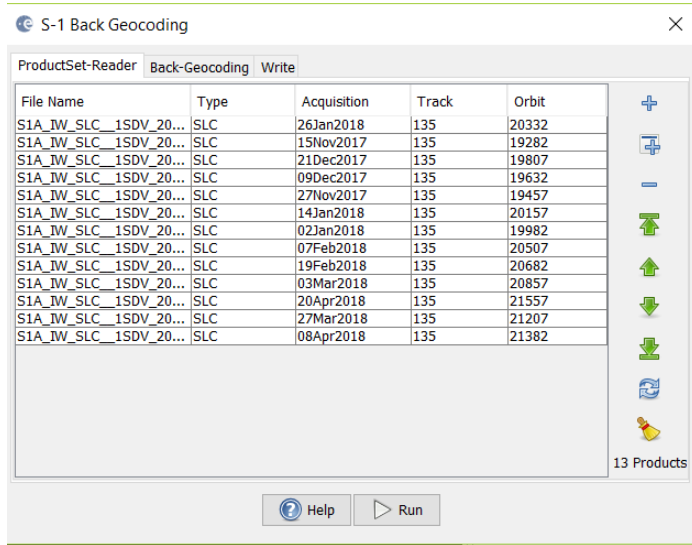
Adding all the Data and then clicking overview

File Name	Type	Acquisition	Track	Orbit							
SIA_IW_SLC_15OV_20171127T2244...											
SIA_IW_SLC_15OV_20171115T2244...											
SIA_IW_SLC_15OV_20171109T2244...											
SIA_IW_SLC_15OV_20171221T2244...											
SIA_IW_SLC_15OV_20180102T2244...											
SIA_IW_SLC_15OV_20180114T2244...											
SIA_IW_SLC_15OV_20180126T2244...											
SIA_IW_SLC_15OV_20180207T2244...											
SIA_IW_SLC_15OV_20180219T2244...											
SIA_IW_SLC_15OV_20180327T2244...											
SIA_IW_SLC_15OV_20180420T2244...											
SIA_IW_SLC_15OV_20180303T2244...											
SIA_IW_SLC_15OV_20180408T2244...											

File Name	Mst/Slv	Acquisition	Track	Orbit	Bperp [m]	Bttmp [days]	Modeled C...	Height Amb...	Delta fDC [...	Open
SIA_IW_SLC_15...Master		26Jan2018	135	20332	0.00	0.00	1.00	∞	0.00	
SIA_IW_SLC_15...Slave		27Nov2017	135	19457	-47.37	60.00	0.90	331.65	5.64	
SIA_IW_SLC_15...Slave		15Nov2017	135	15282	103.74	72.00	0.85	-151.44	-0.07	
SIA_IW_SLC_15...Slave		09Dec2017	135	19632	2.74	48.00	0.95	-5723.96	0.06	
SIA_IW_SLC_15...Slave		21Dec2017	135	19807	116.89	36.00	0.87	-134.40	-4.36	
SIA_IW_SLC_15...Slave		02Jan2018	135	19982	139.65	24.00	0.86	-112.50	4.85	
SIA_IW_SLC_15...Slave		14Jan2018	135	20157	72.58	12.00	0.93	-216.46	2.68	
SIA_IW_SLC_15...Slave		07Feb2018	135	20507	-49.16	-12.00	0.95	319.58	4.71	
SIA_IW_SLC_15...Slave		19Feb2018	135	20682	-31.95	-24.00	0.95	491.73	-1.49	
SIA_IW_SLC_15...Slave		27Mar2018	135	21207	16.48	-60.00	0.93	-263.49	2.55	
SIA_IW_SLC_15...Slave		20Apr2018	135	21557	-34.80	-84.00	0.89	451.40	3.95	
SIA_IW_SLC_15...Slave		03Mar2018	135	20857	-15.34	-36.00	0.95	1024.02	-1.33	
SIA_IW_SLC_15...Slave		08Apr2018	135	21382	-30.90	-72.00	0.91	598.47	1.84	

1-3 Making a Stack by back geocoding from the processed data while the master SLC is set at top of the table. (inputs: results of 1-2)

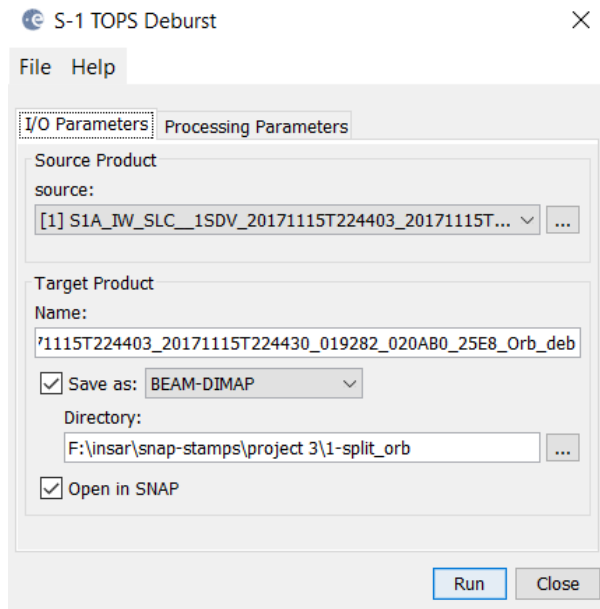
Radar>Coregistration >s1top Coregistration> s1 back geocoding



1-4 TopSAR deburst

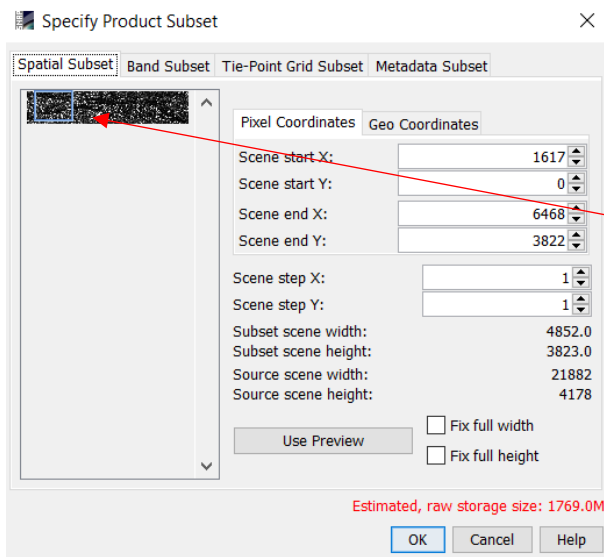
Radar > sentinel 1 top > S1 top deburst

(Input: result of 1-3)



1-5 making a subset (cutting down the SLC to the desired size)

Raster > subset (input: result of 1-4)



This box set the final size of the subset

After the time that the process is done, you should save the subset

1-6

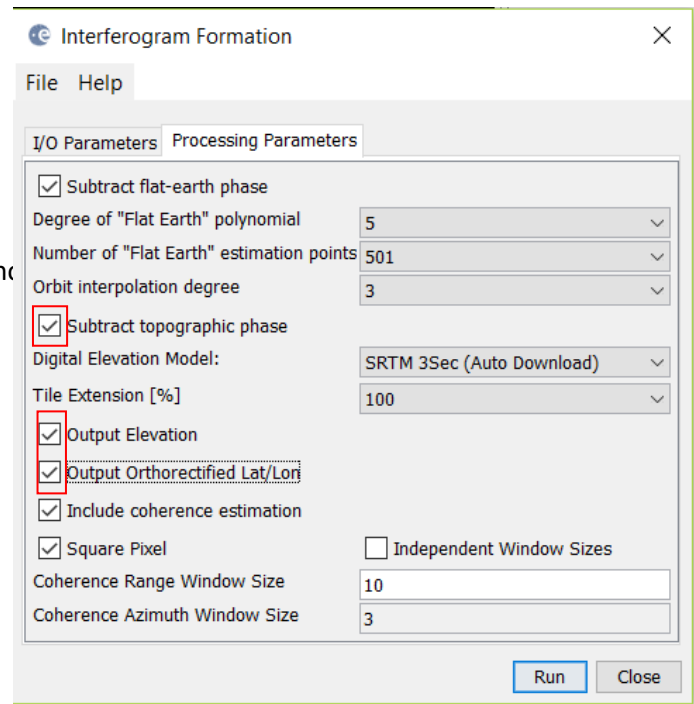
Making the interferogram

Radar > interferometric > (input: result of 1-5)

the topographic phase should be removed and

The elevation band and orthorectified Latitude, longitude sh

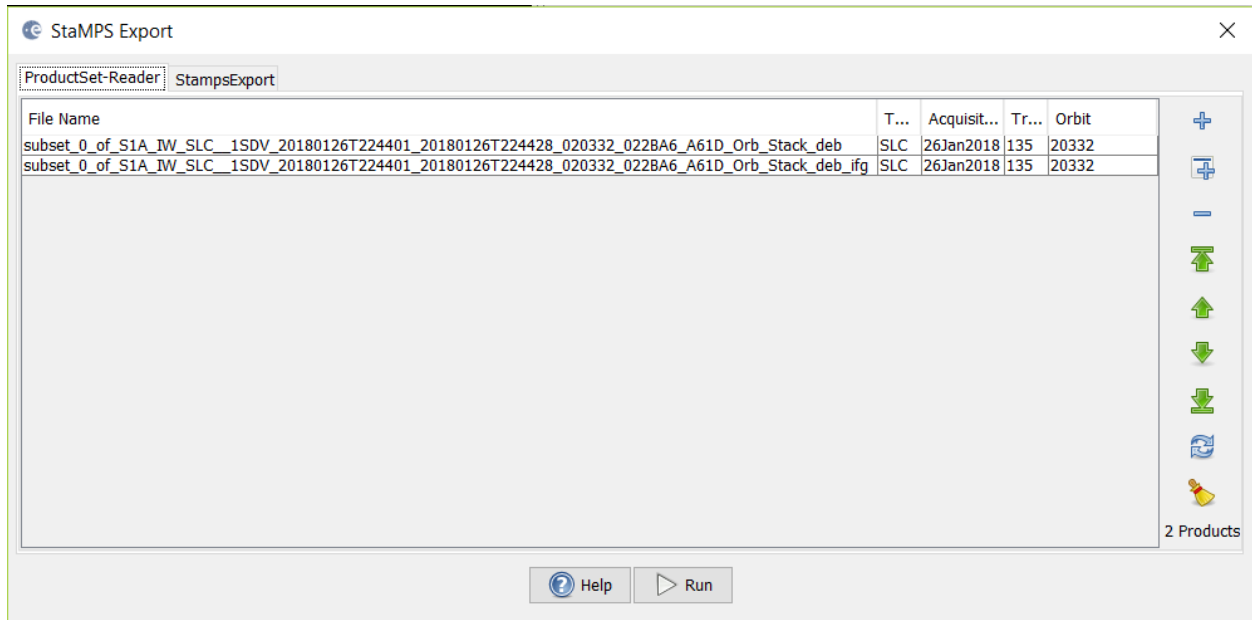
So, all the checkbox should be checked as the picture



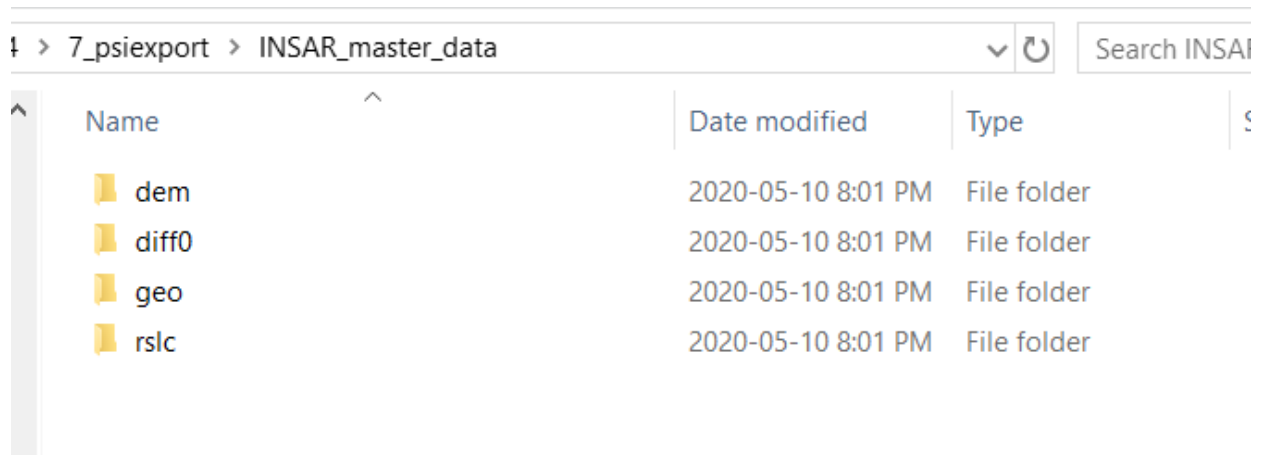
1-7 Export to PSI StaMPS format (inputs: result of 1-4 + result of 1-6)

Radar > Interferometric > PSI, SBAS > StaMPS export

In the final step, the subset of the stack and the result of the interferogram will be used in order to export the data



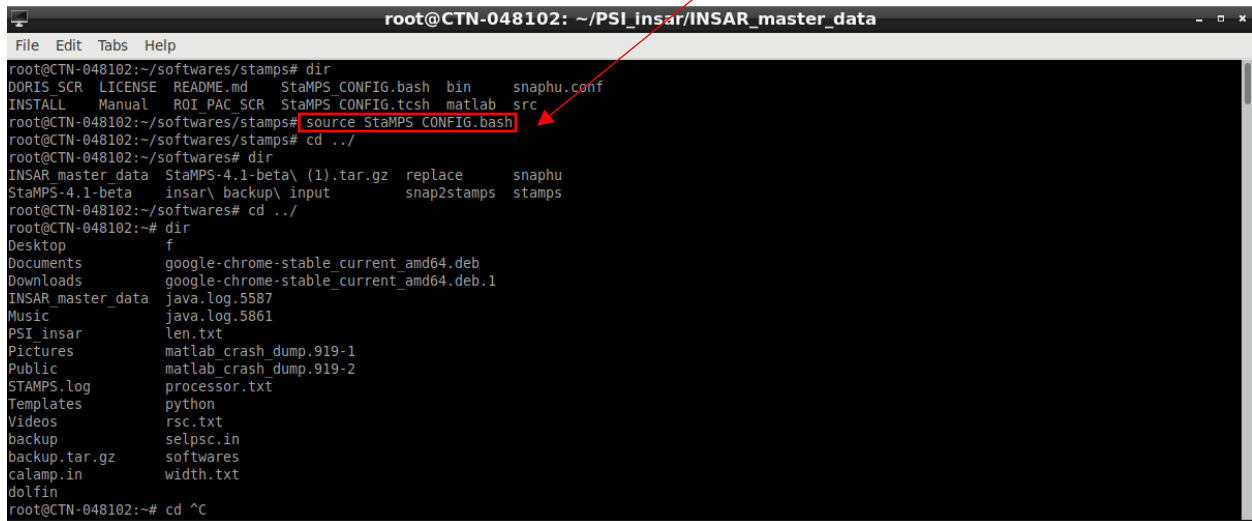
The final result package for stamps should be like this



The folder name that contains these folders should be renamed to **INSAR_master_data** in order to be ready for StaMPS process

2- PSI process in StaMPS

2-1 you should open the terminal in ubuntu and the first step is sourcing the bash file in Stamps folder



```
root@CTN-048102: ~/PSI_inсар/INSAR_master_data
File Edit Tabs Help
root@CTN-048102:~/softwares/stamps# dir
DORIS_SCR LICENSE README.md StaMPS_CONFIG.bash bin snaphu.conf
INSTALL Manual ROI_PAC_SCR StaMPS_CONFIG.tch matlab src
root@CTN-048102:~/softwares/stamps# source StaMPS_CONFIG.bash
root@CTN-048102:~/softwares/stamps# cd ../
root@CTN-048102:~/softwares# dir
INSAR_master_data StaMPS-4.1-beta\ (1).tar.gz replace snaphu
StaMPS-4.1-beta insar\ backup\ input snap2stamps stamps
root@CTN-048102:~/softwares# cd ../
root@CTN-048102:~# dir
Desktop f
Documents google-chrome-stable_current_amd64.deb
Downloads google-chrome-stable_current_amd64.deb.1
INSAR_master_data java.log.5587
Music java.log.5861
PSI_inсар len.txt
Pictures matlab_crash_dump.919-1
Public matlab_crash_dump.919-2
STAMPS.log processor.txt
Templates python
Videos rsc.txt
backup selpsc.in
backup.tar.gz softwares
calamp.in width.txt
dolfin
root@CTN-048102:~# cd ^C
```

It is important that all the following steps in ubuntu be done in the same terminal. Otherwise, the stamps files would not be accessible for the process.

2-2

Changing the current path to INSAR_master_data destination

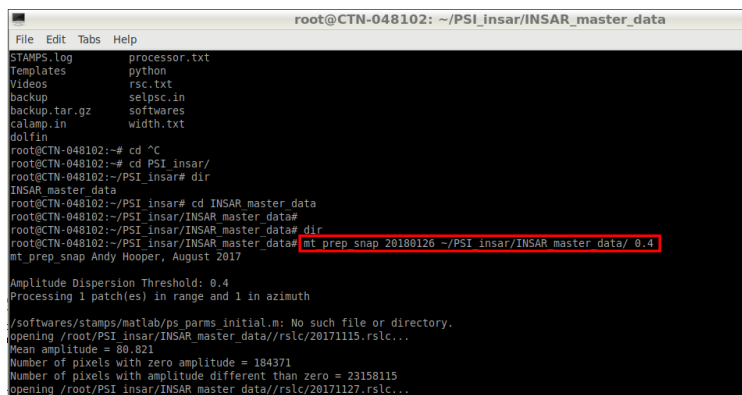
** In case of doing the process in windows subsystem for Linux (WSL), this folder should be in moved from windows to ubuntu

Running the preparation command

mt_prep_snap 20180126 ~/PSI_inсар/INSAR_master_data/0.4

Main command Master date Data path Threshold

It is important



```
root@CTN-048102: ~/PSI_inсар/INSAR_master_data
File Edit Tabs Help
STAMPS.log processor.txt
Templates python
Videos rsc.txt
backup selpsc.in
backup.tar.gz softwares
calamp.in width.txt
dolfin
root@CTN-048102:~# cd ^C
root@CTN-048102:~# cd PSI_inсар/
root@CTN-048102:~/PSI_inсар# dir
INSAR_master_data
root@CTN-048102:~/PSI_inсар# cd INSAR_master_data
root@CTN-048102:~/PSI_inсар/INSAR_master_data#
root@CTN-048102:~/PSI_inсар/INSAR_master_data# dir
root@CTN-048102:~/PSI_inсар/INSAR_master_data# mt_prep_snap 20180126 ~/PSI_inсар/INSAR_master_data/0.4
mt_prep_snap Andy Hooper, August 2017

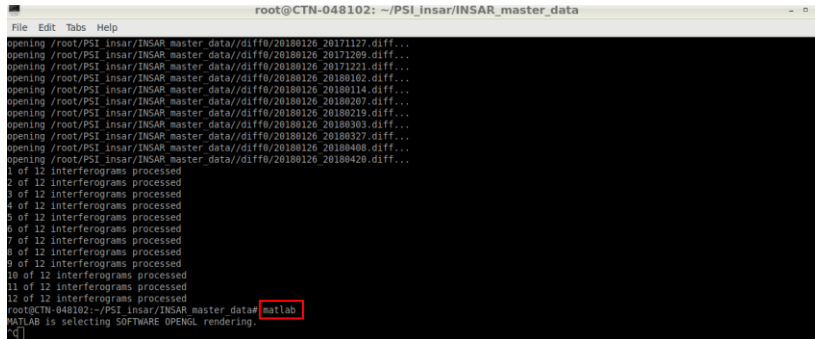
Amplitude Dispersion Threshold: 0.4
Processing 1 patch(es) in range and 1 in azimuth

~/softwares/stamps/matlab/ps_parms_initial.m: No such file or directory.
opening /root/PSI_inсар/INSAR_master_data//rslc/20171115.rslc...
Mean amplitude = 80.821
Number of pixels with zero amplitude = 184371
Number of pixels with amplitude different than zero = 23150115
opening /root/PSI_inсар/INSAR_master_data//rslc/20171127.rslc...
```

** This command is for snap 7 and stamps 4.1 b. In older version the command was a bit different and it might change in newer version.

2-3 After the initial process, we should run the MATLAB in the same terminal and the rest of the process will be done there

Command: Matlab



3-PSI process (STaMPS-MATLAB)

Command: stamps (1,8)



This command run the process from step 1 to step 8 (more detail in stamps manual)

Then we should wait a plenty of time for finishing the all steps.

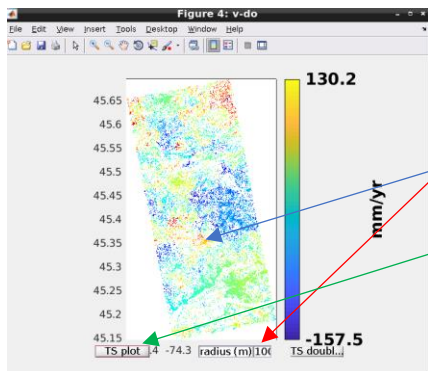
4-Exporting the final result for the visualization in R-Studio

In matlab command window:

It can be different in different cases, more details in STaMPS manual.

```
ps_plot('v-do', 'ts');
PS_SCN_FILT: Finished
STaMPS: Finished
>> ps_plot('v-do', 'ts');
Deramping computed on the fly.
**** z = ax + by + c
63126 ref PS selected
Warning: MATLAB has disabled some advanced graphics rendering features by switching to software OpenGL. For more information, click here.
Color Range: -157.509 to 130.177 mm/yr
Please select a point on the figure to plot time series (TS)
Selected point coordinates (lon,lat):-74.2769, 45.3969
```

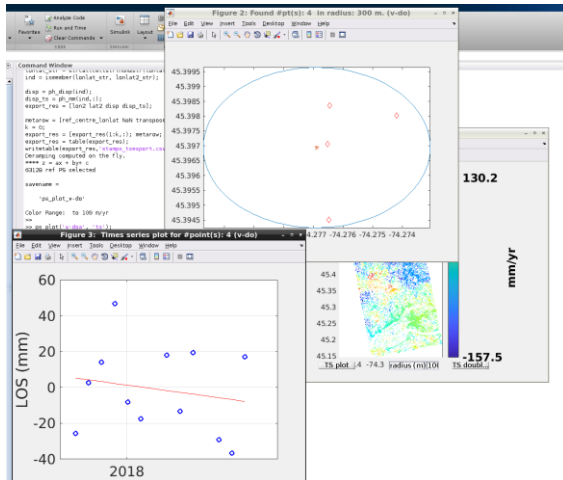
Then we should select the PS point and the diameter of the area around it for the exported time series (TS)



1-Setting the diameter of area

2-Selecting the spot

3-TS plot



The following codes can then just get copy pasted to command window. It is important that whatever we had in the first command v-d or v-do or v-doa should be followed in exact same way in the following codes

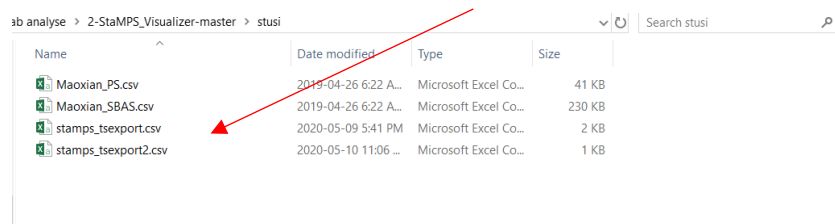
```
load parms.mat;
ps_plot('v-do', -1);
load ps_plot_v-do.mat;
lon2_str = cellstr(num2str(lon2));
lat2_str = cellstr(num2str(lat2));
lonlat2_str = strcat(lon2_str, lat2_str);
lonlat_str = strcat(cellstr(num2str(lonlat(:,1))), cellstr(num2str(lonlat(:,2))));
ind = ismember(lonlat_str, lonlat2_str);
disp = ph_disp(ind);
disp_ts = ph_mm(ind,:);
export_res = [lon2 lat2 disp disp_ts];
metarow = [ref_centre_lonlat NaN transpose(day)-1];
k = 0;
export_res = [export_res(1:k,:); metarow; export_res(k+1:end,:)];
export_res = table(export_res);
writetable(export_res, 'stamps_tsexport.csv')
```

The name can be any thing

5- visualization in R-studio with Thorsten Höser codes

5-1 We should move the final product in the format of csv **...CSV** to **stusi** subfolder of the visualization package

The RStudio package can be used either in windows or ubuntu platform



5-2 open ui.R file in Rstudio

stusi	2020-05-10 11:10 ...	File folder	
DESCRIPTION.txt	2019-04-26 6:22 A...	Text Document	1 KB
global.R	2019-04-26 6:22 A...	R File	2 KB
impressum.html	2019-04-26 6:22 A...	HTML File	597 KB
install_packages.R	2019-04-26 6:22 A...	R File	1 KB
manual.html	2019-04-26 6:22 A...	HTML File	911 KB
README.md	2019-04-26 6:22 A...	MD File	3 KB
server.R	2019-04-26 6:22 A...	R File	10 KB
stamps_visualizer2_preview.png	2019-04-26 6:22 A...	PNG File	283 KB
styles.css	2019-04-26 6:22 A...	Cascading Style Sh...	1 KB
ui.R	2020-05-10 11:11 ...	R File	4 KB

5-3 Running the code

The screenshot shows the RStudio interface. On the left, the source editor contains R code for a web application. A red box highlights the 'Run' button (a green play icon) in the top toolbar. On the right, the Environment pane shows the 'data' object with 12 observations and 11 variables. Below the Environment pane, a preview window displays a web application titled 'STAMPS-Visualizer 2.1'. The application features a satellite map of a mountainous region and a 'Single TS selection' dialog box. The dialog box has a date input field set to '2020-05-10' and a 'Convert MP' button. Below the dialog, a line graph shows time series data from 2015-06-01 to 2016-06-01. The y-axis ranges from 0 to 20. The graph shows a fluctuating line with a peak around 2015-12-01.

5- 4 the result will then be shown in explorer, and we can select the different scatter points to check the result.

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