

An on-demand processing service for Sentinel-1 data, based on the NSBAS processing chain

ISTerre and IPGP teams :

M.-P. Doin, R. Grandin, C. Laurent, E. Pathier, F. Thollard

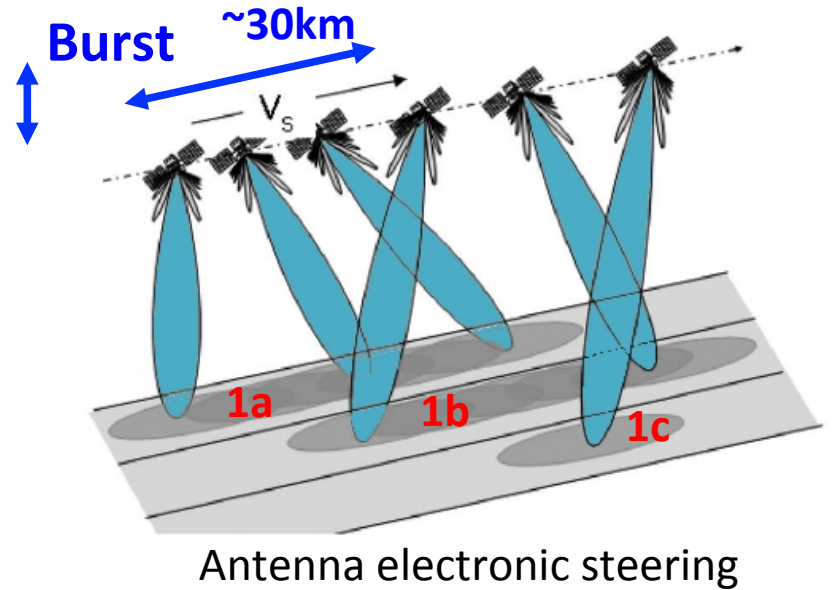
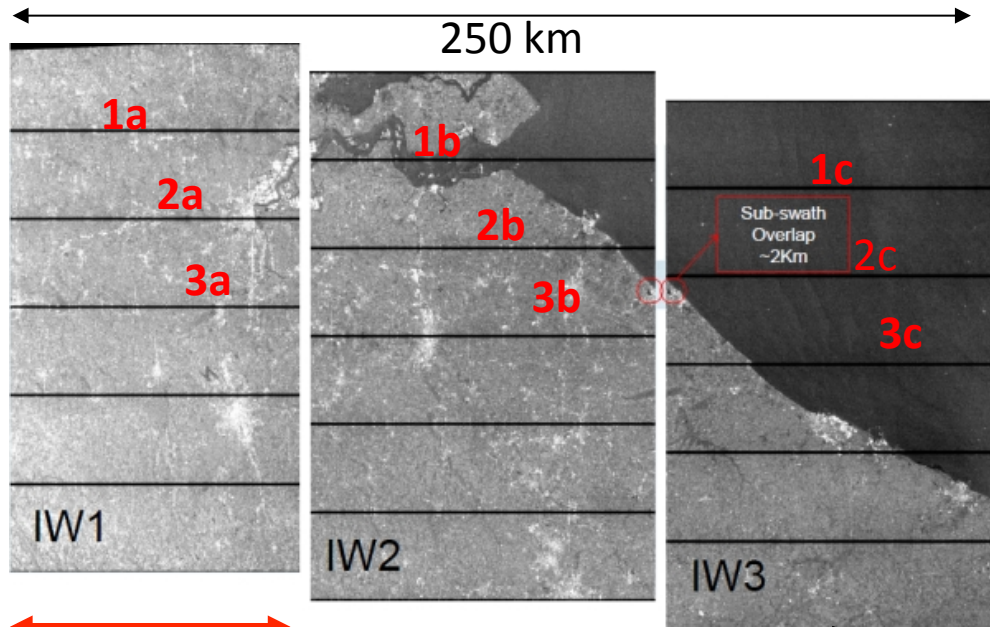
ForM@Ter team :

M. Diament, C. Lasserre, M. Manda, S. Monasson,

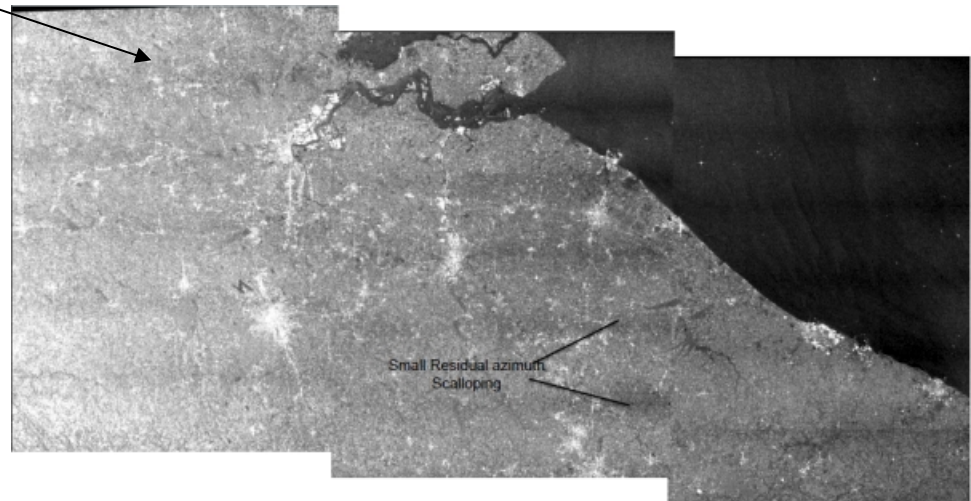
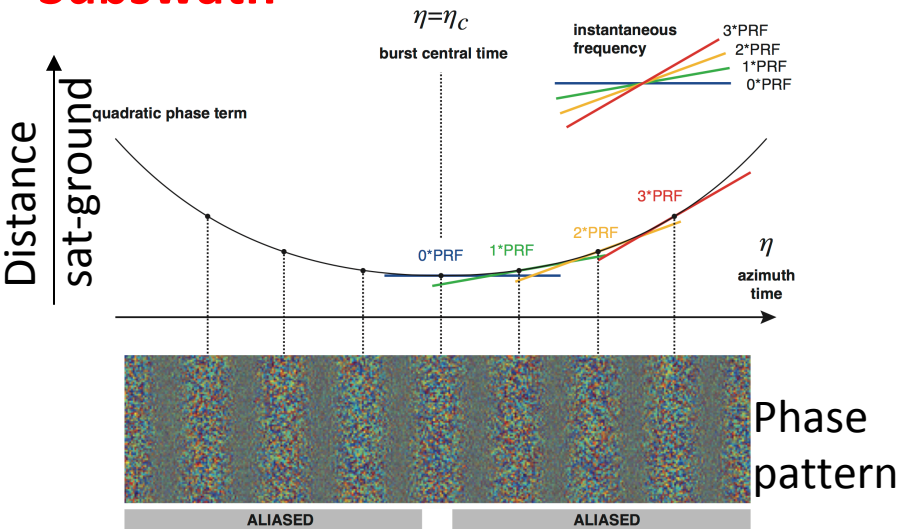
E. Ostanciaux, E. Pointal, C. Proy



Sentinel-1 SAR image : what does it look like ?



Subswath



Coregistration to better than 1/100th of a pixel (a few cm)

The NSBAS processing chain

- A Small Baseline Subset approach described in *Doin et al. (Fringe proceeding, 2011)*

PRESENTATION OF THE SMALL BASELINE NSBAS PROCESSING CHAIN ON A CASE
EXAMPLE: THE ETNA DEFORMATION MONITORING FROM 2003 TO 2010 USING
ENVISAT DATA

Marie-Pierre Doin¹, Felicity Lodge³, Stéphane Guillaso², Romain Jolivet³, Cécile Lasserre³, Gabriel Ducret¹,
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based on ROI_PAC software (*Rosen et al., 2004*)

- Adapted to Sentinel-1 data processing following *Grandin et al. (Fringe proceeding, 2015)*

INTERFEROMETRIC PROCESSING OF SLC SENTINEL-1 TOPS DATA

Raphaël Grandin⁽¹⁾

⁽¹⁾Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Univ Paris Diderot, CNRS, F-75005 Paris, France, Email: grandin@ipgp.fr

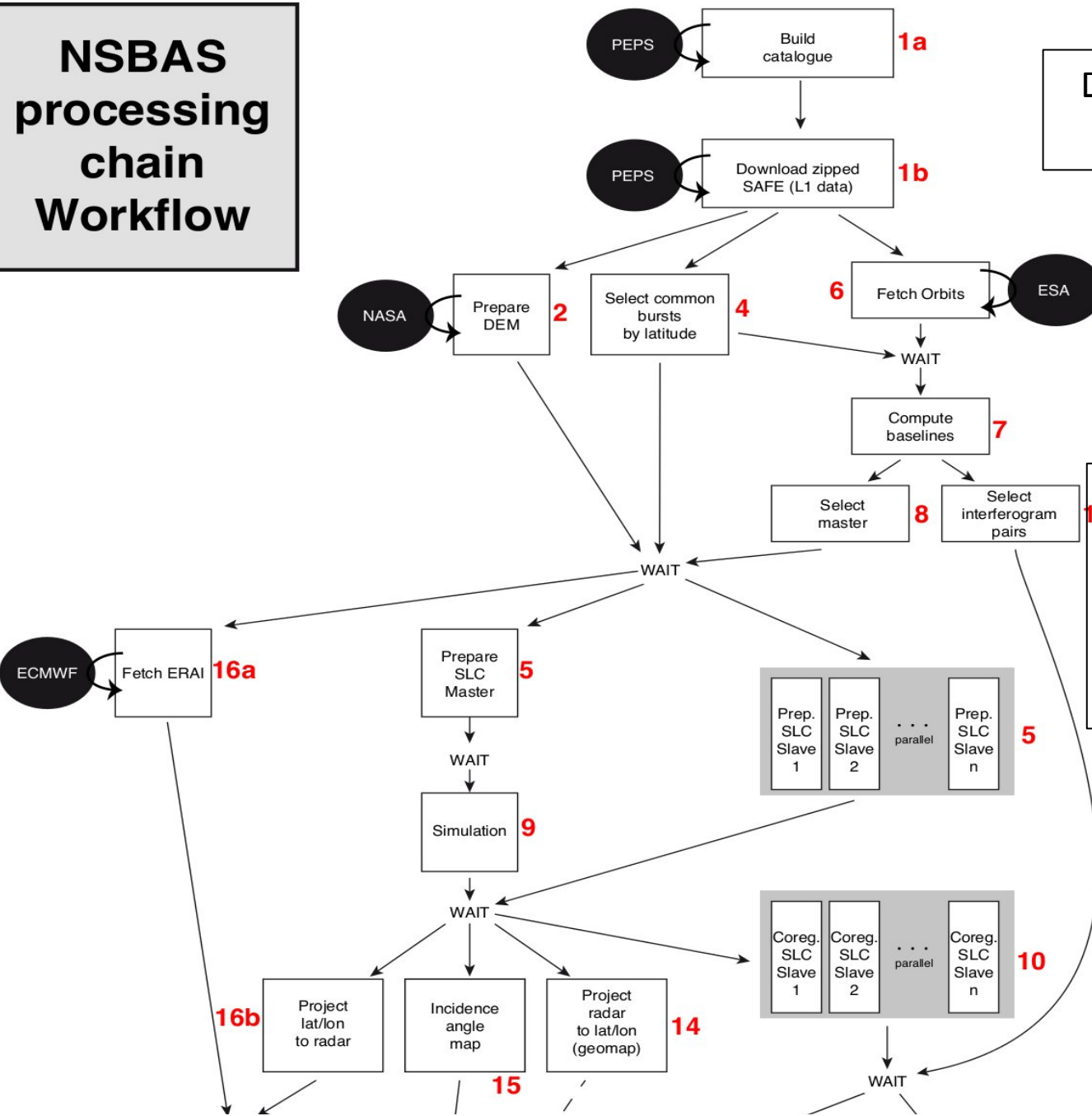
NSBAS processing chain Workflow

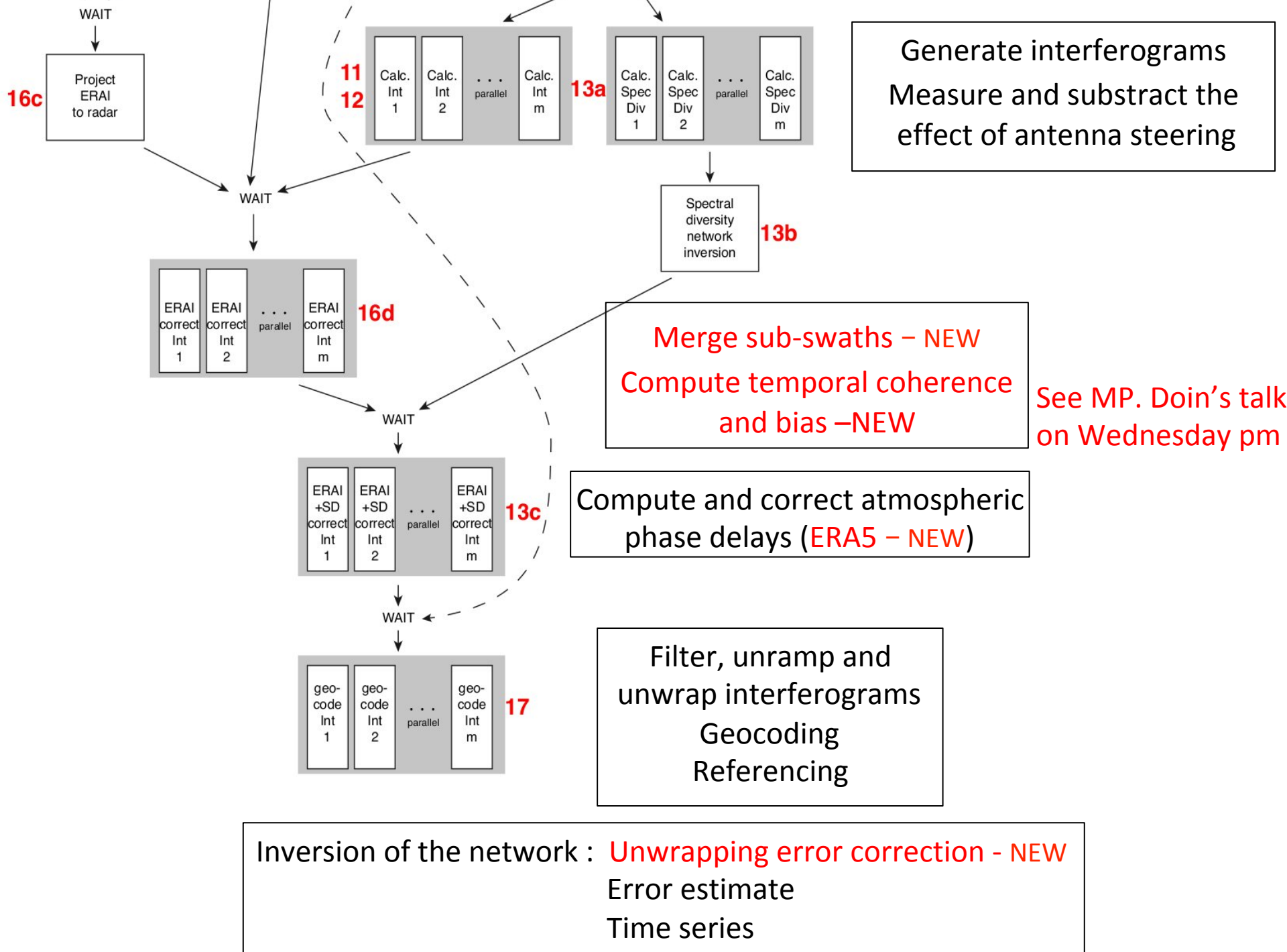
Data Catalogue : from CNES
Raw data : from CNES

Bursts selection

SRTM DEM : from USGS
Precise orbits : from ESA
Atmospheric model :
from ECMWF
(ERA 5 - NEW)

Simulation of the radar
image geometry
Coregister all images
on a master image





The NSBAS on-demand service for InSAR processing

- Developed in the framework of the french Etalab and european EPOS (TCS Satellite Data, WP12) projects
- Supported by ForM@Ter (Data&Services center for Solid Earth), part of the french Research Infrastructure « Data Terra »

=> see E. Ostanciaux's presentation on Friday a.m.

EPOS : Ground Deformation Monitoring (GDM) service

WP12:

TCS – Satellite Data

Proposed Governance Structure:
Consortium Agreement

Proposed Gateway: Geohazards Exploitation Platform

GDM (FR) 😊

Web-portal

COMET (UK) 🌙

EPOSAR (IT) 😊
🌙

Web-portal

3D-Def (ES) 😊
🌙

Web-portal

MOD (DE) 😊
🌙

Web-portal

Services



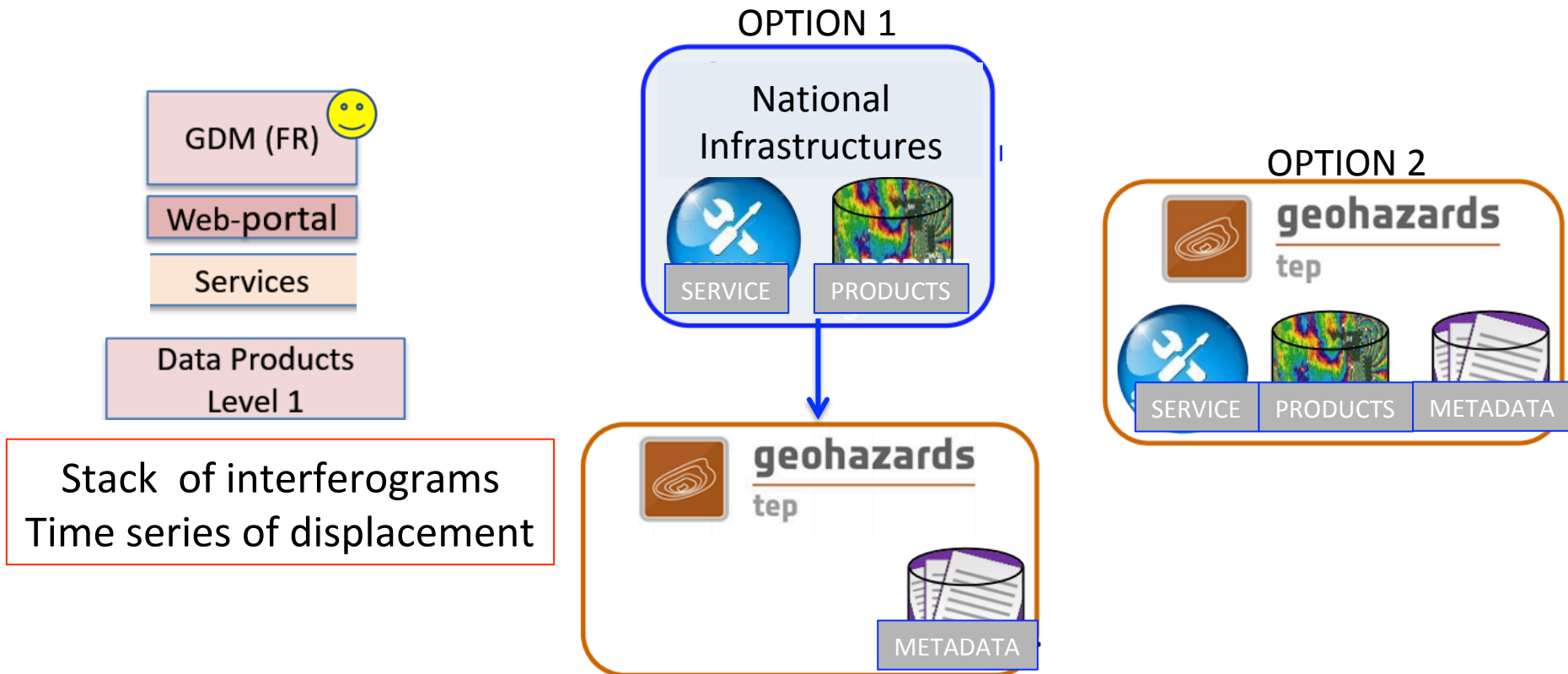
Systematic and periodic processing on defined areas



On demand, from a web interface

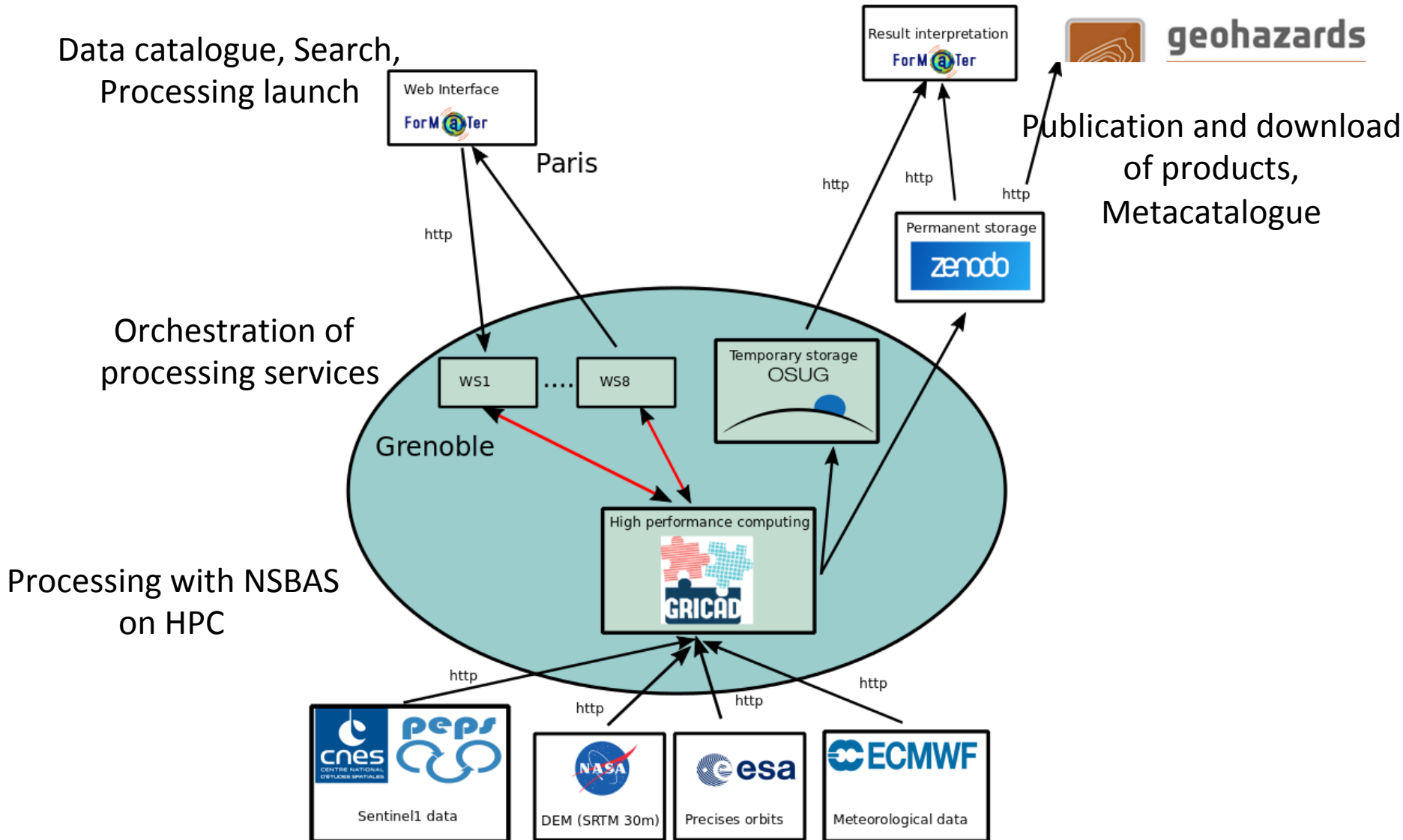
EPOS : Ground Deformation Monitoring (GDM) service

- **GDM-SAR** and GEP : 2 options



Still in implementation phase, not operational

Etalab : a prototype of an on-demand service, at the base of the GDM-SAR service



Web user interface

https://en.poletterresolide.fr/services/interferogrammes-on-demand-demo/?noredirect=en_US#/

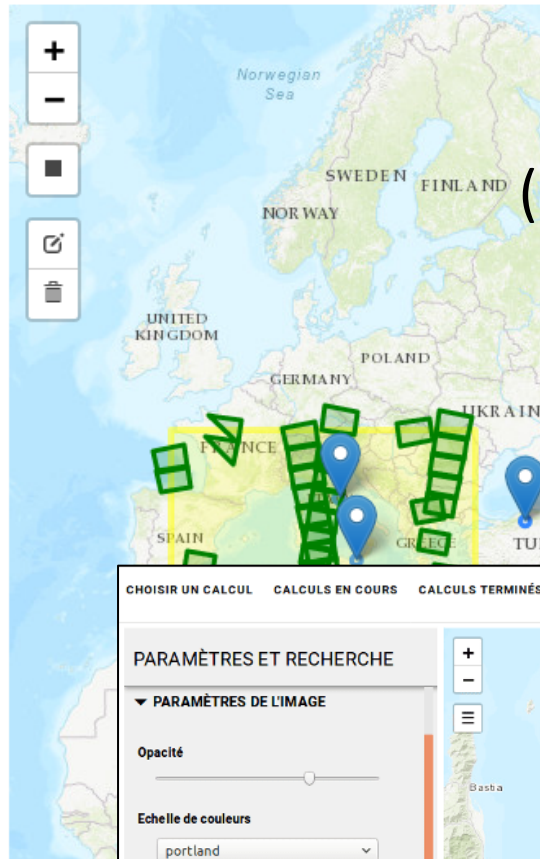
CALCULS INTERFEROGRAMME

Délimiter une zone géographique en évitant si possible les surfaces aquatiques et la végétation.

Période d'acquisition (non obligatoire)
Début :
Fin :

Paramètres du satellite

SENTINEL-1
SAR BANDE C
LEVEL1
SLC
S1A S1B
IW
SENS DE L'ORBITE



Data catalogue, Search,
Processing launch
(personalized parametrization)
and follow on

Visualization and
download of results

CHOISIR UN CALCUL CALCULS EN COURS CALCULS TERMINÉS RÉSULTATS DES CALCULS Log as aa@truc.fr Log out

PARAMÈTRES ET RECHERCHE

▼ PARAMÈTRES DE L'IMAGE

Opacité

Echelle de couleurs
portland

Minimum et maximum sur l'échelle de couleur
-30.0 -8.10 8.10 30.0

 Curseurs synchronisés

Valeurs à afficher
 Afficher les valeurs inférieures à -8.10
 Afficher les valeurs supérieures à 8.10

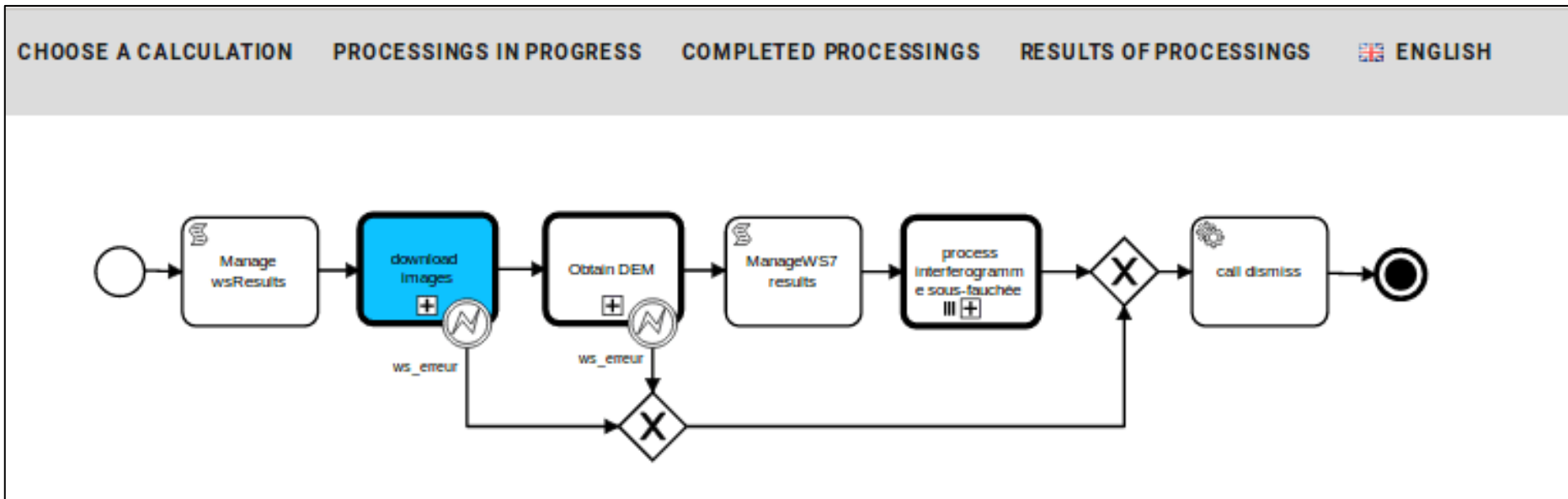
Initialiser

Orchestrator

NSBAS chain divided in a reduced number of web services :



Orchestrated in a workflow that can be followed on the interface :



Workflow controlled by BPMN

Distributed products

Name	DDSS
WRAPPED_INTERFEROGRAM	1
SPATIAL_COHERENCE	2
UNWRAPPED_INTERFEROGRAM	3
MAP_OF_LOS_VECTOR	4
ATMOSPHERIC_PHASE_SCREEN	5
DEM	6
LOOKUP_TABLE_RADAR2GROUND_COORDINATES	7
LOS_DISPLACEMENT_TIMESERIES	8
TEMPORAL_COHERENCE	9
NETWORK_MISCLOSURE	10
MEAN_LOC_VELOCITY	12
STACK_INTERFEROGRAMS	13

+ Auxiliary files

WP12-DDSS-001 WRAPPED_INTERFEROGRAM

Metadata



Geotiff

Grenoble/Zenodo

Preview

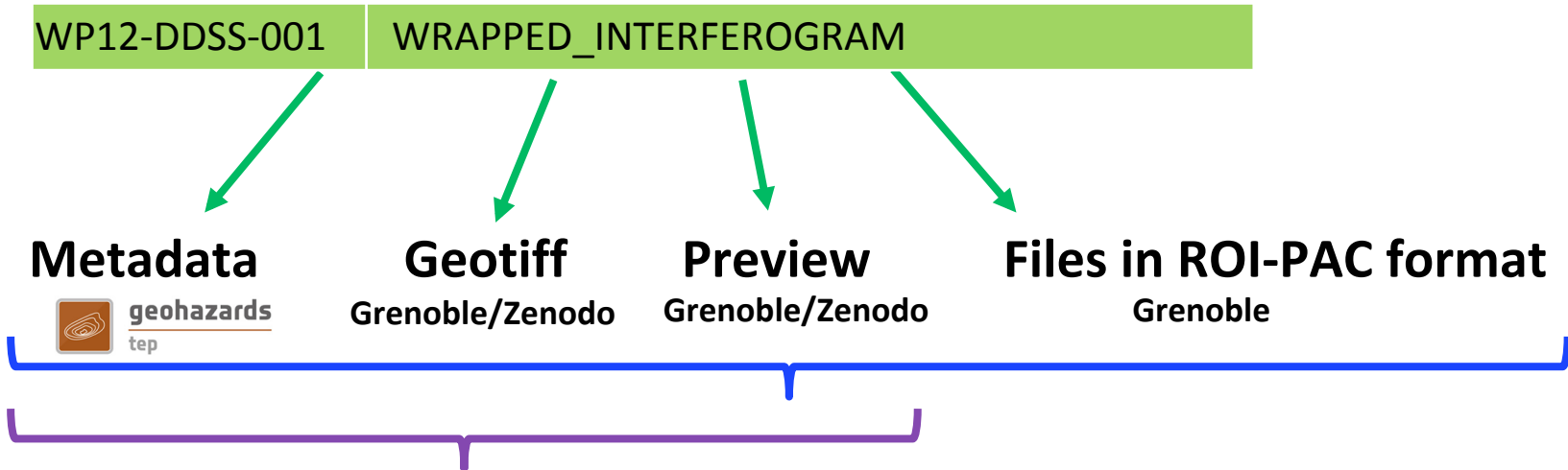
Grenoble/Zenodo

Files in ROI-PAC format

Grenoble

ETALAB

GDM



Prototype demonstration



Application to the study of the Ridgecrest earthquake sequence (Mw 6.4-7.1, 4-6 July 2019)



Src : Wikipedia

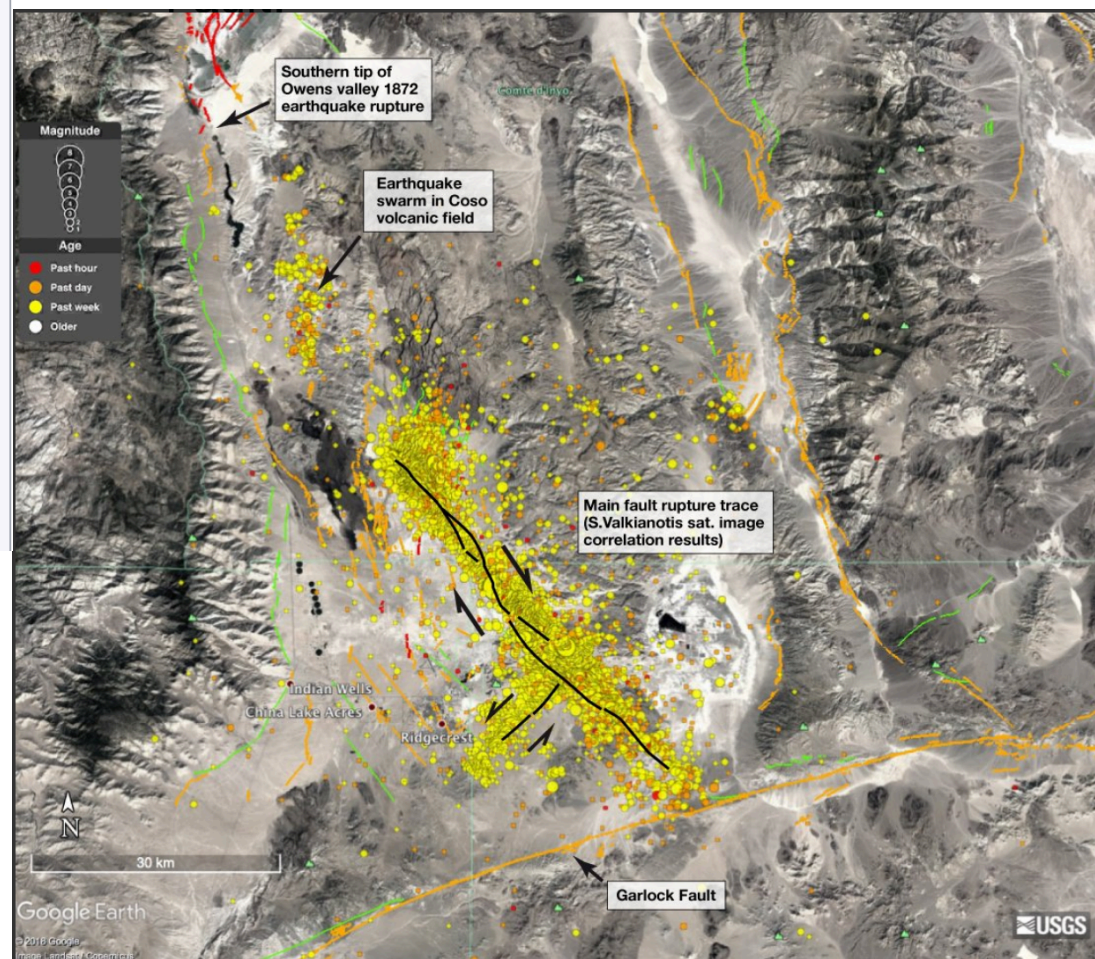
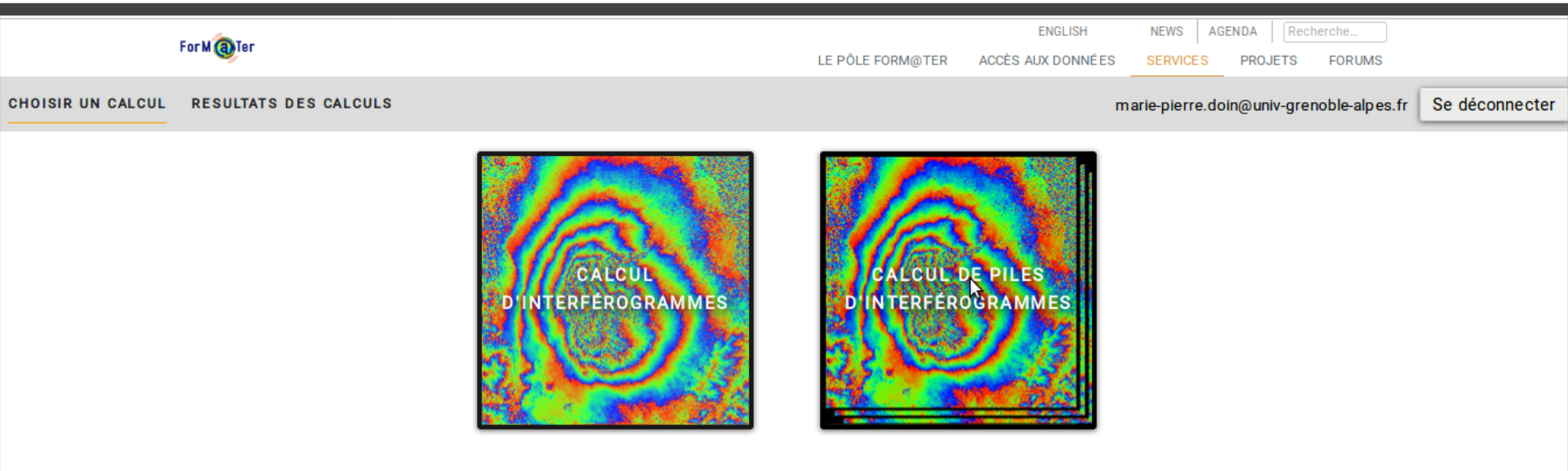


Fig: R. Lacassin, Rupture map : S. Valkianotis

Access to the web interface to select data

https://en.poleterresolide.fr/services/interferogrammes-on-demand-demo/?noredirect=en_US#/



Go
to
California !

The screenshot shows the 'CALCULATIONS INTERFEROGRAMS STACK' interface. On the left, there is a sidebar with the following sections:

- CALCULATIONS INTERFEROGRAMS STACK**
- Delimit a geographical area avoid, if possible, water surfaces and vegetation.
- Acquisition period (required)**
Start:
End:
- Satellite settings**
 - SENTINEL-1
 - SAR BAND C
 - LEVEL1
 - SLC
 - S1A S1B
 - IW
 - VV
 - DIRECTION OF THE ORBIT

On the right, there is a map of California with various geographical features and cities labeled. A mouse cursor is pointing at a location in the Mojave Desert region. The map includes labels for 'COASTAL RANGE', 'SALINAS', 'JOAQUIN VALLEY', 'CALIFORNIA', 'MOJAVE DESERT', and 'SAN FRANCISCO'. Other cities shown include Salinas, Fresno, Visalia, Bakersfield, Lancaster, Victorville, Los Angeles, Riverside, Anaheim, Santa Ana, Long Beach, and Phoenix.

Select Ridgecrest area

CALCULATIONS INTERFEROGRAMS STACK

Delimit a geographical area avoid, if possible, water surfaces and vegetation.

Acquisition period (required)
Start: 31 Oct 2019
End:

Satellite settings

- SENTINEL-1
- SAR BAND C
- LEVEL1
- SLC
- S1A S1B
- IW
- VV
- DIRECTION OF THE ORBIT

The map displays a topographic view of the Ridgecrest area in California. A yellow rectangular selection box is centered on the Ridgecrest region. The map includes labels for various geographical features and locations: Visalia, Delano, Bakersfield, Lancaster, Barstow, Fort Irwin, Mojave National Preserve, Death Valley, and the Mojave Desert. Elevation markers are visible, such as 9988 ft, 8451 ft, 8829 ft, 7522 ft, and 7141 ft. The interface also features standard map controls like zoom in (+), zoom out (-), and a layer management icon in the top right corner.

and proper time span and parameters

Explore and select available images per track

CALCULATIONS INTERFEROGRAMS STACK

Delimit a geographical area avoid, if possible, water surfaces and vegetation.

Acquisition period (required)
 Start :
 End :

Satellite settings

SENTINEL-1 ▼

SAR BAND C ▼

LEVEL1 ▼

SLC ▼

S1A S1B ▼

IW ▼

VV ▼

DIRECTION OF THE ORBIT ▼

Search for the images

Search for the images

CHOOSE A RELATIVE ORBIT

N° 64 a (34 images)

N° 71 d (23 images)

N° 144 d (19 images)





N° 166 a (24 images)

All orbits

See more images ...

See all images ...

170 images found, 50 filtered images according to the parameters, 50 valid images for processing

	Product : 7dfb1054-4e05-59e9-9f57-8a3b8cb9756b Date : 2019-09-26T01:50:53.810Z Location : ["United States of America"] Platform : S1A Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 29186	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH Display the footprint : <input checked="" type="checkbox"/>
	Product : 7d65f732-288e-52d6-af6f-5a5f9bdd7618 Date : 2019-09-26T01:50:28.050Z Location : ["United States of America"] Platform : S1A Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 29186	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH Display the footprint : <input checked="" type="checkbox"/>
	Product : b32dbf76-a7b8-532e-81d5-768382cae125 Date : 2019-09-08T01:50:03.058Z Location : ["United States of America"] Platform : S1B Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 17940	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH Display the footprint : <input checked="" type="checkbox"/>
	Product : e8671849-f0f3-527f-88f0-5a29fc47351c Date : 2019-09-08T01:49:38.227Z Location : ["United States of America"] Platform : S1B Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 17940	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH Display the footprint : <input checked="" type="checkbox"/>

For example for ascending track 64

Delimit a geographical area avoid, if possible, water surfaces and vegetation.

Acquisition period (required)
 Start:
 End:

Satellite settings

SENTINEL-1
 SAR BAND C
 LEVEL1
 SLC
 S1A S1B
 IW
 VV
 DIRECTION OF THE ORBIT

Search for the images

CHOOSE A RELATIVE ORBIT

170 images found, 62 filtered images according to the parameters, 62 valid images for processing

	Product : 7dfb1054-4e05-59e9-9f57-8a3b8cb9756b Date : 2019-09-26T01:50:53.810Z Location : ["United States of America"] Platform : S1A Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 29186	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>
	Product : 7d65f732-288e-52d6-af6f-5a5f9bdd7618 Date : 2019-09-26T01:50:28.050Z Location : ["United States of America"] Platform : S1A Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 29186	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>
	Product : b32dbf76-a7b8-532e-81d5-768382cae125 Date : 2019-09-08T01:50:03.058Z Location : ["United States of America"] Platform : S1B Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 17940	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>
	Product : e8671849-f0f3-527f-88f0-5a29fc47351c Date : 2019-09-08T01:49:38.227Z Location : ["United States of America"] Platform : S1B Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 17940	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>
	Product : 30ae2148-7a93-5d76-9b2d-f9a3c4940de5 Date : 2019-09-02T01:50:52.715Z Location : ["United States of America"] Platform : S1A Instrument : SAR-C SAR	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 28836	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>
	Product : 8b0b0176-d12c-59e3-b5e7-76368f689e17 Date : 2019-09-02T01:50:26.948Z Location : ["United States of America"] Platform : S1A	Product type : SLC Product NRT : 0 Swath number : 64 Orbit number : 28836	Orbit direction : ascending Treatment level : LEVEL1 Sensor mode : IW Polarization : VV VH	Display the footprint : <input checked="" type="checkbox"/>

LAUNCH INTERFEROGRAMS STACK CALCULATIONS (ORBIT A64)

Atmospheric correction :

Subswaths : 1 2 3

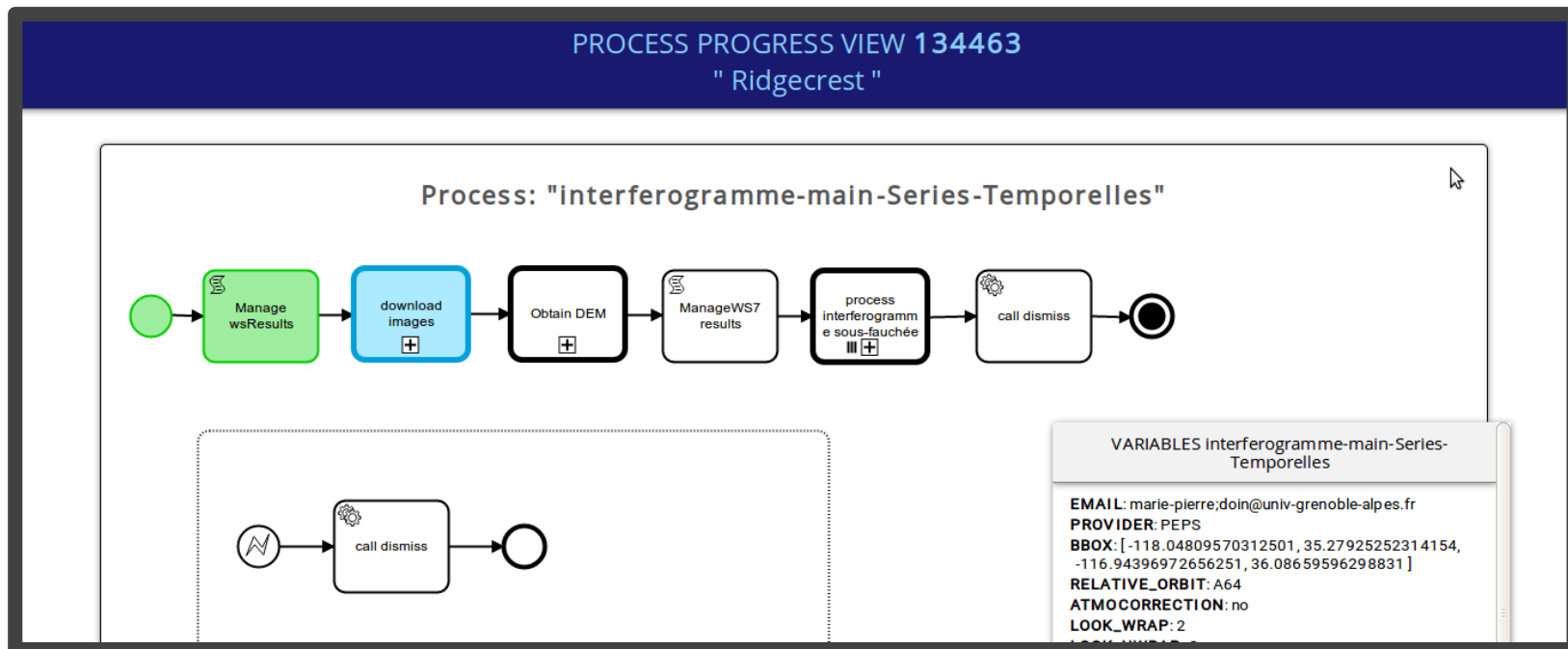
Wrap images resolution : 2-LOOKS

Unwrap images resolution : 2-LOOKS

Ridgecrest

Launch the process

Launch the interferograms'
processing
Check how it progresses



But you won't wait for the results today!

CHOOSE A CALCULATION		RESULTS OF PROCESSINGS			Log as marie-pierre;doin@univ-grenoble-alpes.fr		Log out
LIST OF PROCESS RESULTS							
↑ Instance Identifier	↑ Status	↑ Begin	↑ End	See the results	See the process progress	Parameters	(↑ email)
134463 interferogramme-main-Series-Temporelles (Ridgecrest)	🔄	Oct 10, 2019 12:59 PM		Waiting	VISUALIZE THE PROCESS	EMAIL marie-pierre;doin@univ-grenoble-alpes.fr PROVIDER PEPS RELATIVE_ORBIT A64 ATMOCORRECTION no LOOK_WRAP 2 LOOK_UWRAP 2 SUB_SWATHS ["1", "2", "3"]	
79698 interferogramme-main (apennines)	✖	Feb 21, 2019 7:25 AM	Feb 21, 2019 9:37 AM	FAILED	VISUALIZE THE PROCESS	sir@gmail.com RELATIVE_ORBIT A117 PROVIDER PEPS ATMOCORRECTION no	
77158 interferogramme-main (Anchorage1)	✔	Jan 24, 2019 9:39 AM	Jan 24, 2019 11:39 AM	SEE THE RESULTS	VISUALIZE THE PROCESS	EMAIL marie-pierre;doin@univ-grenoble-alpes.fr RELATIVE_ORBIT D131 PROVIDER PEPS ATMOCORRECTION no	
54923 interferogramme-main (MerapiDes11Janv)	✔	Jan 24, 2019 9:40 AM	Jan 24, 2019 11:39 AM	SEE THE RESULTS	VISUALIZE THE PROCESS	EMAIL Virginie.Pinel@univ-smb.fr RELATIVE_ORBIT D76 PROVIDER PEPS ATMOCORRECTION no	

Output products analysis

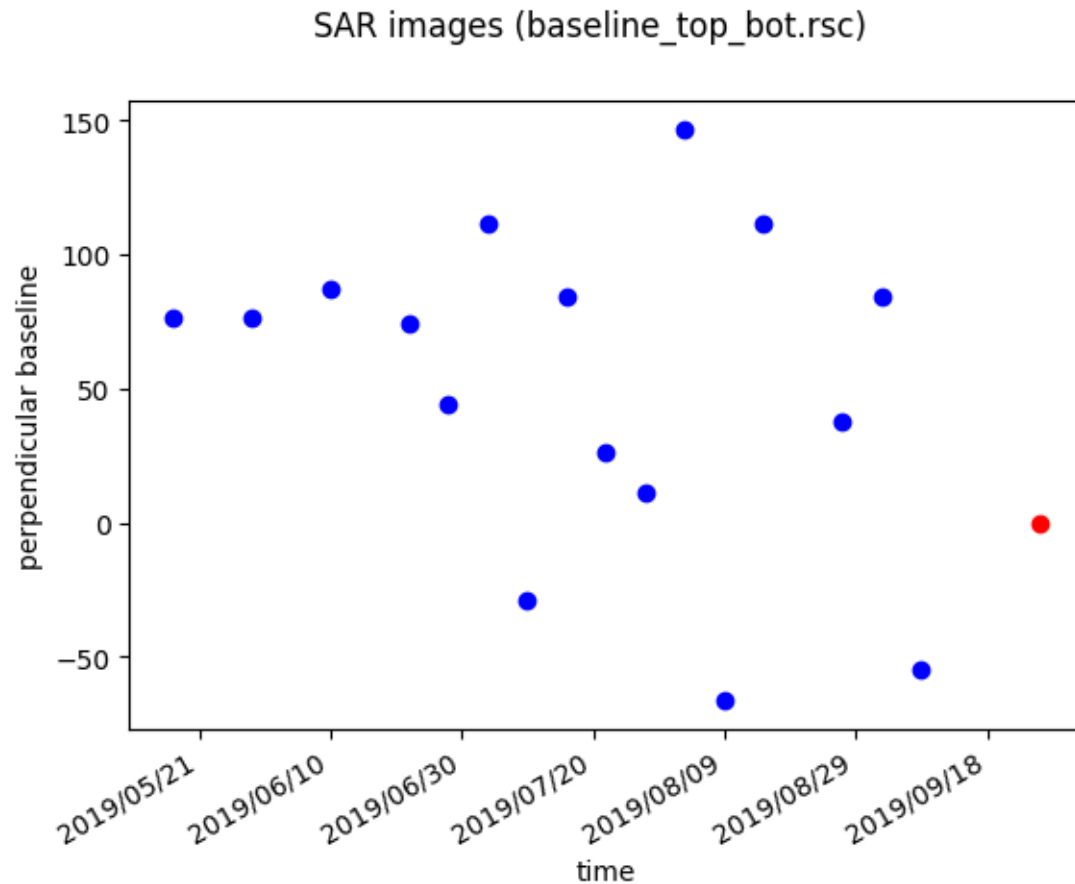
<https://formater.osug.fr/etalab/data/20191015-mdis-losangeles/>

Index of /etalab/data/20191015-mdis-losangeles/

GDM_20190517-20190529_8rlks.cor.meta	11-Oct-2019 11:11	25	
GDM_20190517-20190529_8rlks.cor.png	11-Oct-2019 10:50	48163	
GDM_20190517-20190529_sd_8rlks.int.meta	11-Oct-2019 11:11	25	
GDM_20190517-20190529_sd_8rlks.int.png	11-Oct-2019 10:50	48817	
GDM_20190517-20190610_8rlks.cor.meta	11-Oct-2019 11:11	25	
GDM_20190517-20190610_8rlks.cor.png	11-Oct-2019 10:50	50155	
GDM_20190517-20190610_sd_8rlks.int.meta	11-Oct-2019 11:11	25	
GDM_20190517-20190610_sd_8rlks.int.png	11-Oct-2019 10:50	50427	
GDM_20190517-20190622_8rlks.cor.meta	GDM_Stack_list_InU_sd_8rlks.csv		11-Oct-2019 10:50 2931
GDM_20190517-20190622_8rlks.cor.png	GDM_Stack_list_InU_sd_8rlks.meta		11-Oct-2019 11:11 3659
GDM_20190517-20190622_sd_8rlks.int.meta	GDM_Stack_list_InU_sd_8rlks.png		11-Oct-2019 10:50 55337
GDM_20190517-20190622_sd_8rlks.int.png	GDM_cube_20190517_20190926.meta		11-Oct-2019 11:11 3654
GDM_20190529-20190610_8rlks.cor.meta	GDM_cube_20190517_20190926.png		11-Oct-2019 10:50 1102498
GDM_20190529-20190610_8rlks.cor.png	GDM_enu_los_vector_8rlks.envi.meta		11-Oct-2019 11:11 2212
GDM_20190529-20190610_sd_8rlks.int.meta	GDM_enu_los_vector_8rlks.envi.png		11-Oct-2019 10:50 251475
GDM_20190529-20190610_sd_8rlks.int.png	GDM_filtSW_20190517-20190529_sd_8rlks.unw.meta		11-Oct-2019 11:11 2692
GDM_20190529-20190622_8rlks.cor.meta	GDM_filtSW_20190517-20190529_sd_8rlks.unw.png		11-Oct-2019 10:50 4702330
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GDM_20190529-20190622_sd_8rlks.int.meta	GDM_filtSW_20190517-20190610_sd_8rlks.unw.png		11-Oct-2019 10:51 940656
GDM_20190529-20190622_sd_8rlks.int.png	GDM_filtSW_20190517-20190622_sd_8rlks.unw.meta		11-Oct-2019 11:11 2503
GDM_20190529-20190628_8rlks.cor.meta	GDM_filtSW_20190517-20190622_sd_8rlks.unw.png		11-Oct-2019 10:51 4433761
GDM_20190529-20190628_8rlks.cor.png	GDM_filtSW_20190529-20190610_sd_8rlks.unw.meta		11-Oct-2019 11:11 2510
GDM_20190529-20190628_sd_8rlks.int.meta	GDM_filtSW_20190529-20190610_sd_8rlks.unw.png		11-Oct-2019 10:51 4963895
GDM_20190529-20190628_sd_8rlks.int.png	GDM_filtSW_20190529-20190622_sd_8rlks.unw.meta		11-Oct-2019 11:11 2618
GDM_20190610-20190622_8rlks.cor.meta	GDM_filtSW_20190529-20190622_sd_8rlks.unw.png		11-Oct-2019 10:51 1125131
GDM_20190610-20190622_8rlks.cor.png	GDM_filtSW_20190529-20190628_sd_8rlks.unw.meta		11-Oct-2019 11:11 3629
GDM_20190610-20190622_sd_8rlks.int.meta	GDM_filtSW_20190529-20190628_sd_8rlks.unw.png		11-Oct-2019 10:51 1438234
GDM_20190610-20190622_sd_8rlks.int.png	GDM_filtSW_20190610-20190622_sd_8rlks.unw.meta		11-Oct-2019 11:11 2175
GDM_20190610-20190628_8rlks.cor.meta	GDM_filtSW_20190610-20190622_sd_8rlks.unw.png		11-Oct-2019 10:51 297871
GDM_20190610-20190628_8rlks.cor.png	GDM_filtSW_20190610-20190628_sd_8rlks.unw.meta		11-Oct-2019 11:11 1862
GDM_20190610-20190628_sd_8rlks.int.meta	GDM_filtSW_20190610-20190628_sd_8rlks.unw.png		11-Oct-2019 10:51 4662649
GDM_20190610-20190628_sd_8rlks.int.png	GDM_filtSW_20190610-20190704_sd_8rlks.unw.meta		11-Oct-2019 14:17 1581
GDM_20190610-20190704_8rlks.cor.meta	GDM_filtSW_20190610-20190704_sd_8rlks.unw.png		11-Oct-2019 14:17 1581
GDM_20190610-20190704_8rlks.cor.png	GDM_filtSW_20190610-20190704_sd_8rlks.unw.png		11-Oct-2019 14:17 931
GDM_20190610-20190704_sd_8rlks.int.meta	GDM_filtSW_20190610-20190815_sd_8rlks.unw.meta		11-Oct-2019 11:20 6777
GDM_20190610-20190704_sd_8rlks.int.png	GDM_filtSW_20190610-20190815_sd_8rlks.unw.png		11-Oct-2019 11:20 6764
GDM_20190610-20190815_8rlks.cor.meta	GDM_filtSW_20190622-20190628_sd_8rlks.unw.meta		11-Oct-2019 11:20 7205
GDM_20190610-20190815_8rlks.cor.png	GDM_filtSW_20190622-20190628_sd_8rlks.unw.png		11-Oct-2019 11:20 7219
GDM_20190610-20190815_sd_8rlks.int.meta	GDM_filtSW_20190622-20190704_sd_8rlks.unw.meta		11-Oct-2019 11:20 8131
GDM_20190610-20190815_sd_8rlks.int.png	GDM_filtSW_20190622-20190704_sd_8rlks.unw.png		11-Oct-2019 11:20 6324
GDM_20190610-20190815_sd_8rlks.int.png	GDM_filtSW_20190622-20190710_sd_8rlks.unw.meta		11-Oct-2019 11:20 6850
GDM_20190622-20190628_8rlks.cor.meta	GDM_filtSW_20190622-20190710_sd_8rlks.unw.png		11-Oct-2019 11:20 6769
GDM_20190622-20190628_8rlks.cor.png	GDM_filtSW_20190622-20190827_sd_8rlks.unw.meta		11-Oct-2019 11:20 6867
	GDM_filtSW_20190628-20190704_sd_8rlks.unw.meta		11-Oct-2019 11:20 5519
	GDM_filtSW_20190628-20190704_sd_8rlks.unw.png		11-Oct-2019 11:20 6123
	GDM_filtSW_20190628-20190710_sd_8rlks.unw.meta		11-Oct-2019 11:20 8557
	GDM_filtSW_20190628-20190710_sd_8rlks.unw.png		11-Oct-2019 11:20 182
	GDM_filtSW_20190628-20190716_sd_8rlks.unw.meta		10-Oct-2019 14:17 1451
	GDM_filtSW_20190628-20190716_sd_8rlks.unw.png		11-Oct-2019 10:51 55337
			11-Oct-2019 10:51 40521
			11-Oct-2019 10:51 41285
			11-Oct-2019 10:51 40358
			10-Oct-2019 14:13 80246
			10-Oct-2019 14:13 854
			11-Oct-2019 10:50 1216
			11-Oct-2019 10:50 1216
			11-Oct-2019 10:50 1216

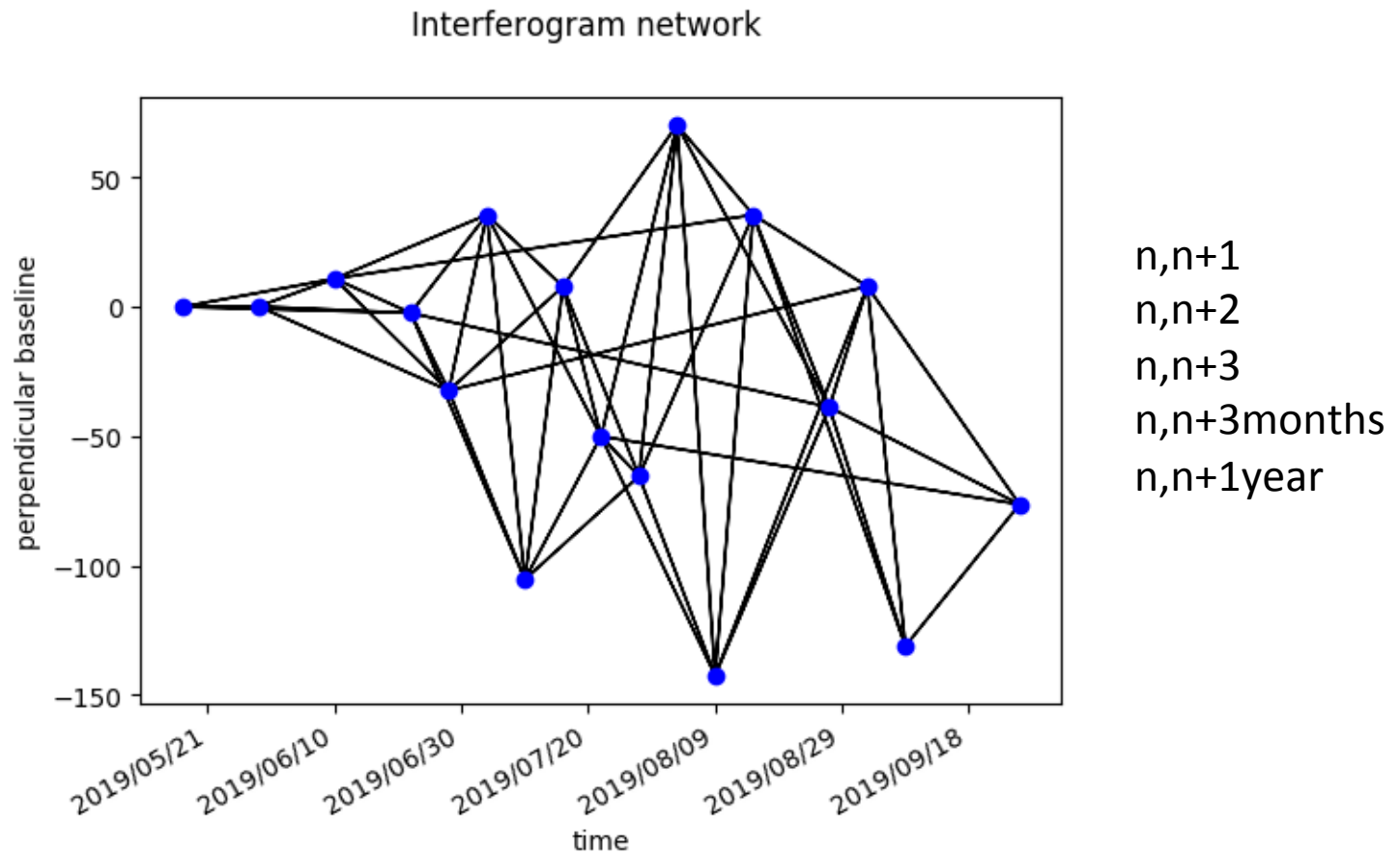
Auxiliary files

plot_baseline_top_bot.png : plot of perpendicular baseline
baseline.rsc, **baseline_top_bot.rsc** : text file with baseline
in meters relative to first date / master



Auxiliary files

plot_interferograms.png : plot of generated ifgs
interf_pair.rsc : text file with ifgs listed



Auxiliary files

success_coreg_iwX.txt

Coregistration between 20190517 and 20190926 5519 points left after culling
Coregistration between 20190529 and 20190926 5552 points left after culling
Coregistration between 20190610 and 20190926 5663 points left after culling
Coregistration between 20190622 and 20190926 5684 points left after culling
Coregistration between 20190628 and 20190926 5649 points left after culling
Coregistration between 20190704 and 20190926 5616 points left after culling
Coregistration between 20190710 and 20190926 5677 points left after culling
Coregistration between 20190716 and 20190926 5719 points left after culling
Coregistration between 20190722 and 20190926 5683 points left after culling
Coregistration between 20190728 and 20190926 5726 points left after culling
Coregistration between 20190803 and 20190926 5715 points left after culling
Coregistration between 20190809 and 20190926 5808 points left after culling
Coregistration between 20190815 and 20190926 5836 points left after culling
Coregistration between 20190827 and 20190926 5783 points left after culling
Coregistration between 20190902 and 20190926 5743 points left after culling
Coregistration between 20190908 and 20190926 5819 points left after culling

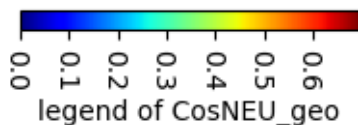
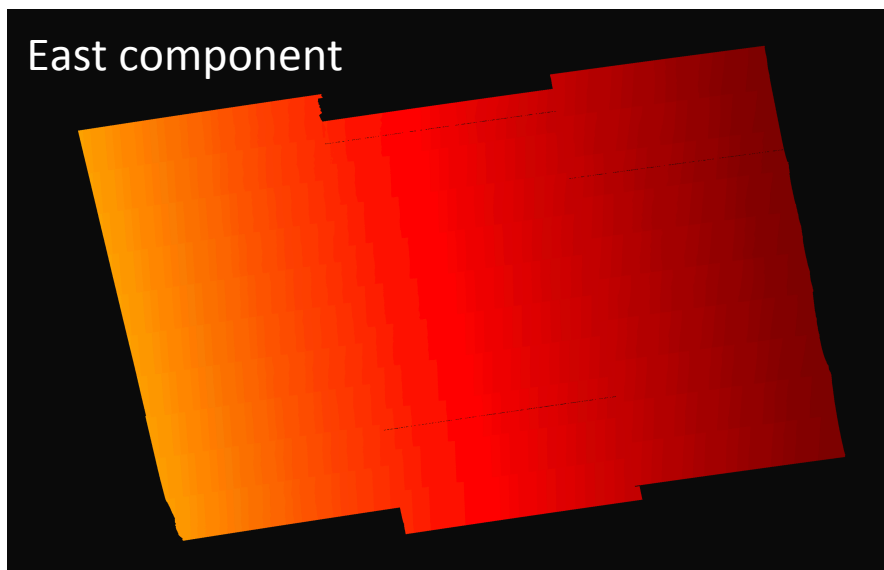
LOOKUPTABLE_RADAR2GROUND_COORDINATES

Lookup table between radar geometry and terrain geometry

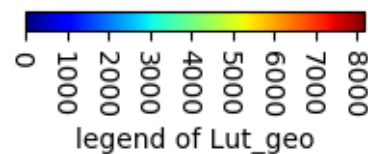
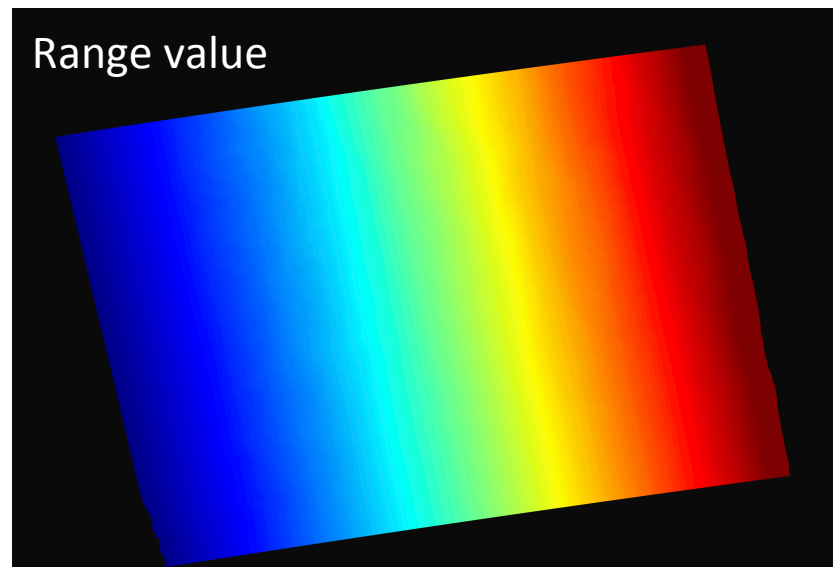
MAP_OF_LOS_VECTOR

East, North, Up components of the LOS vector, positive from ground to satellite

East component

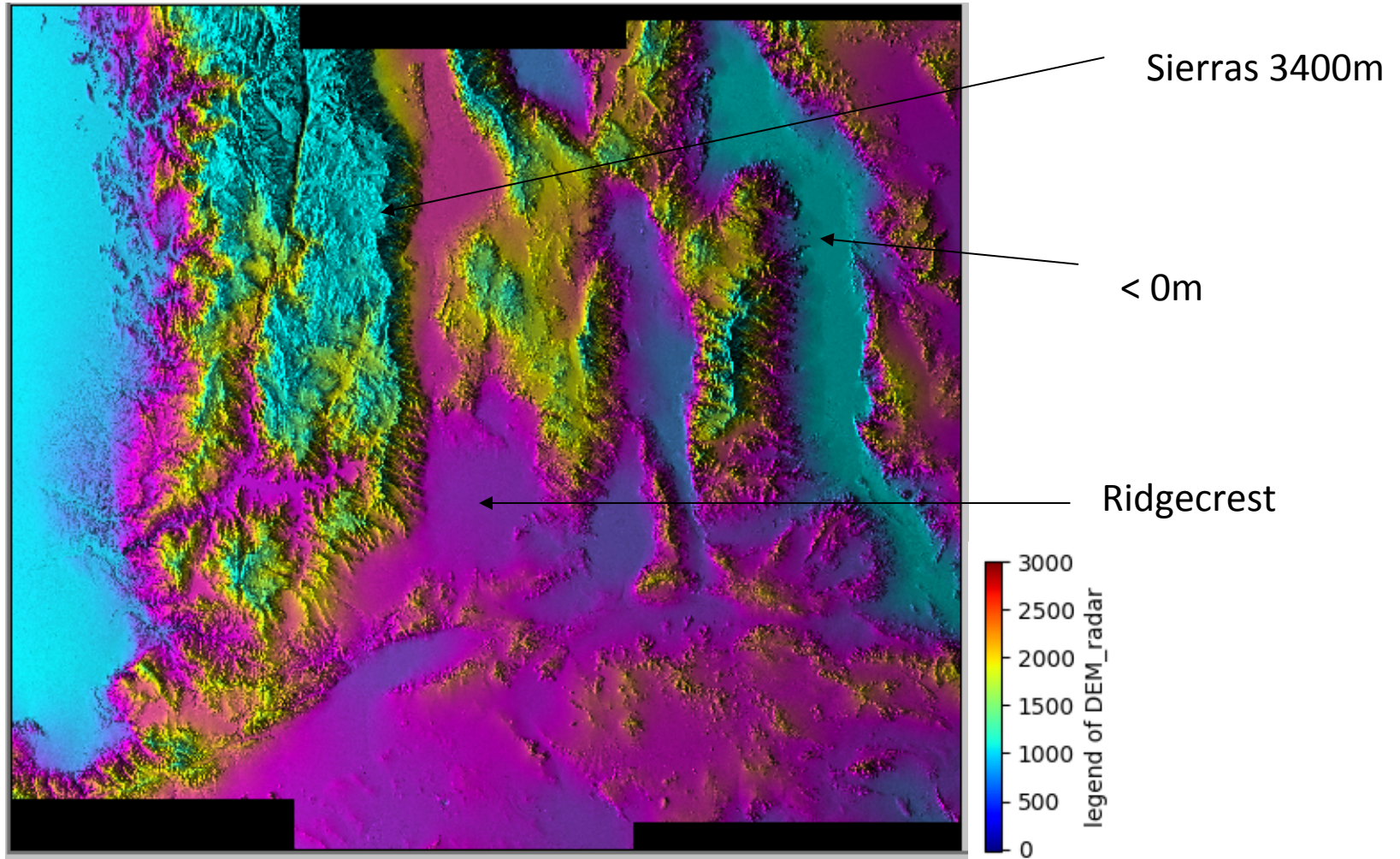


Range value



DEM

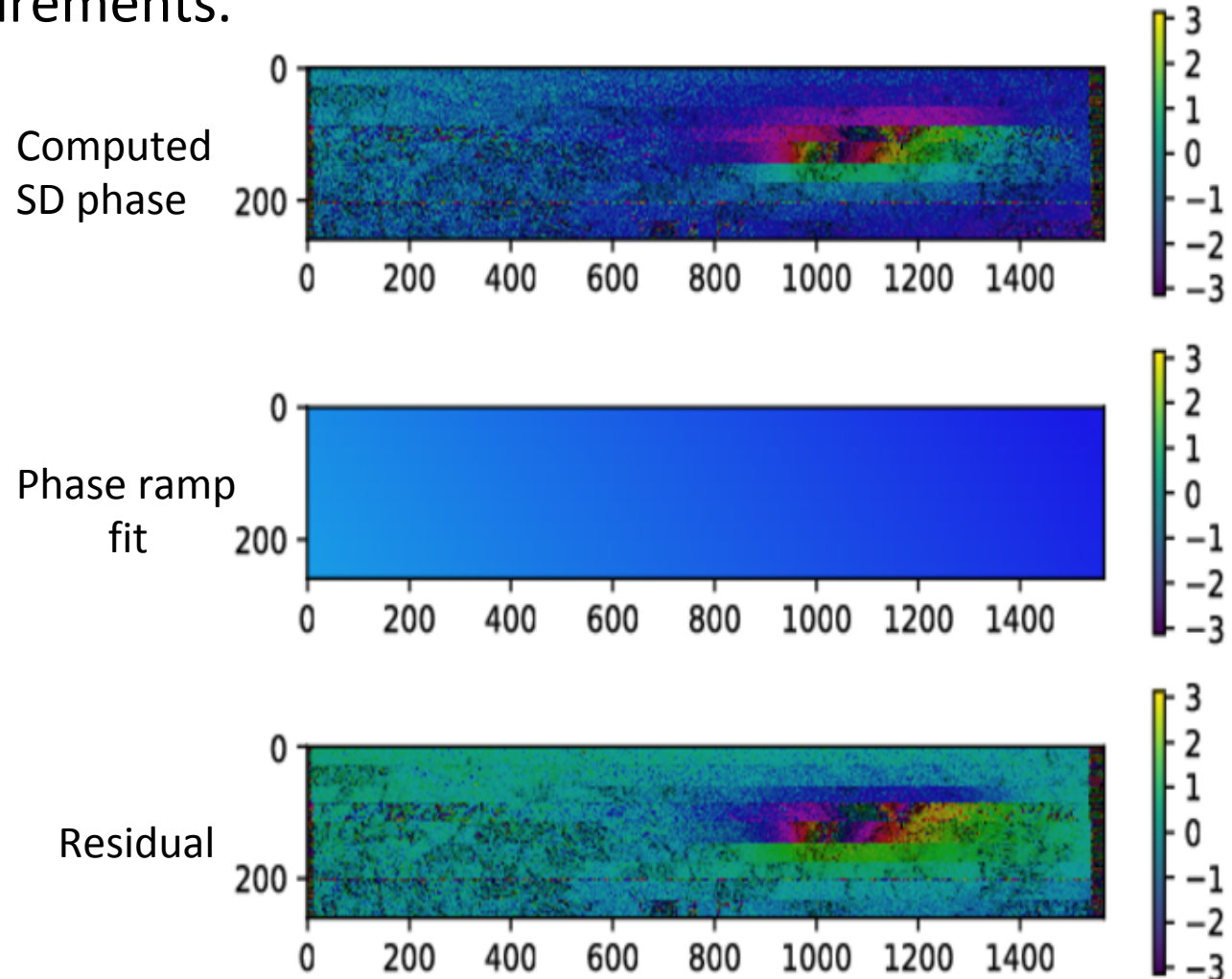
Simulation of DEM, in geocoded or radar geometries



NOT GIVEN !

The spectral diversity phase is computed for all bursts' overlaps, for each subswath.

An affine function of range and azimuth is adjusted through these SD phase measurements.



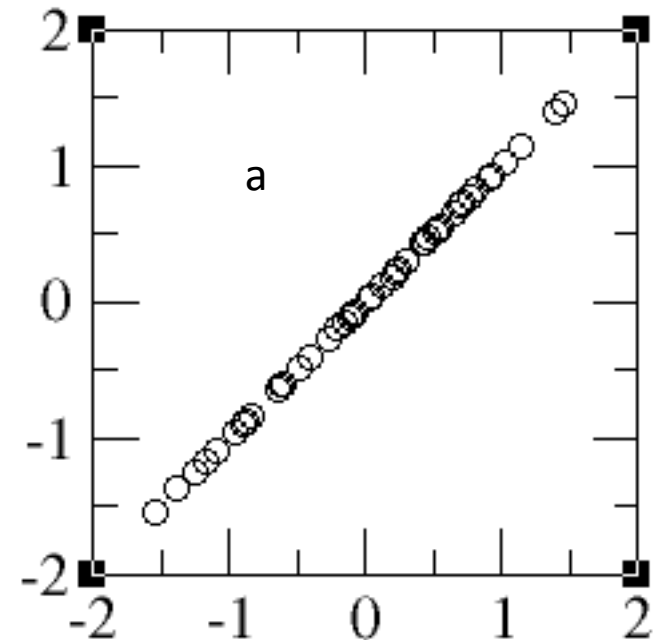
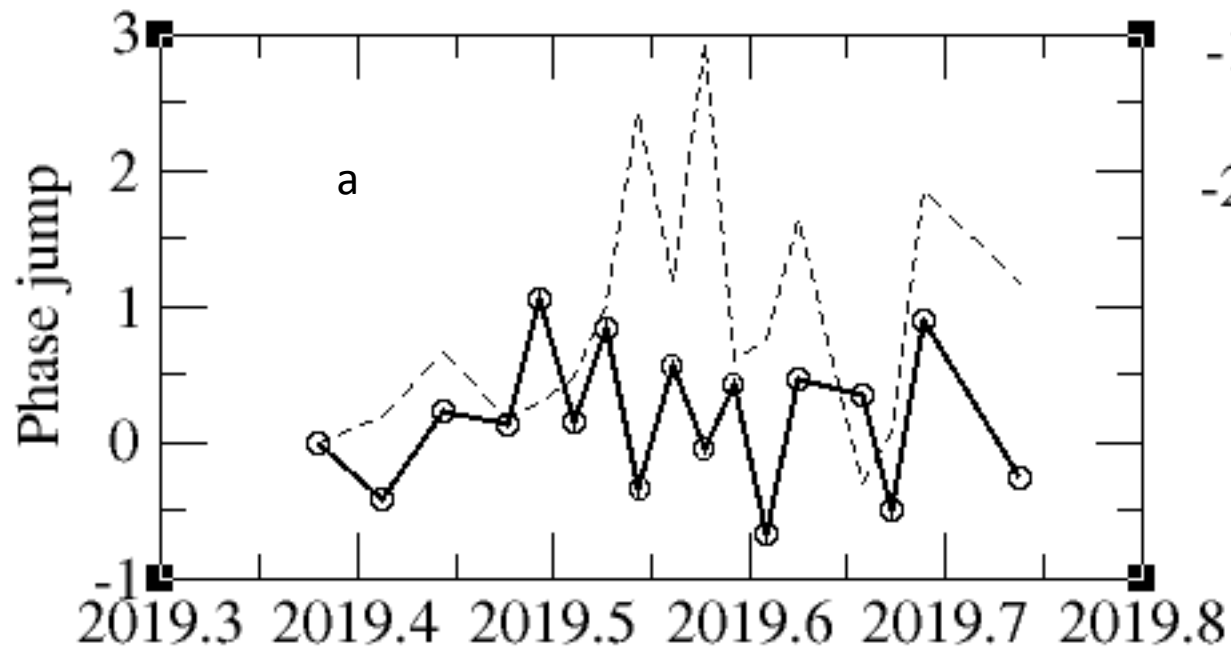
Ex : IW2

Co seismic phase
jump on overlaps

NOT GIVEN !

The affine function is inverted through time to avoid long-term drift

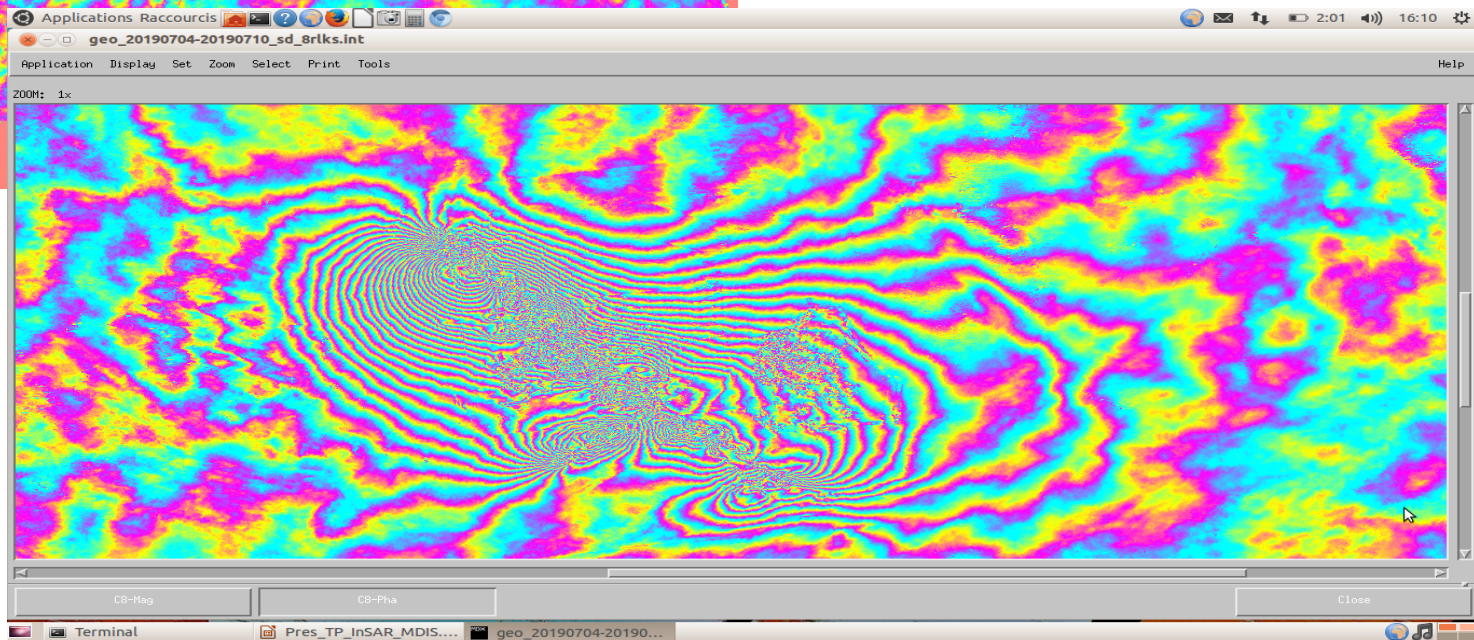
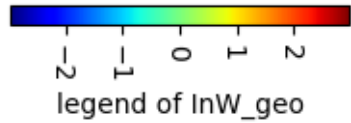
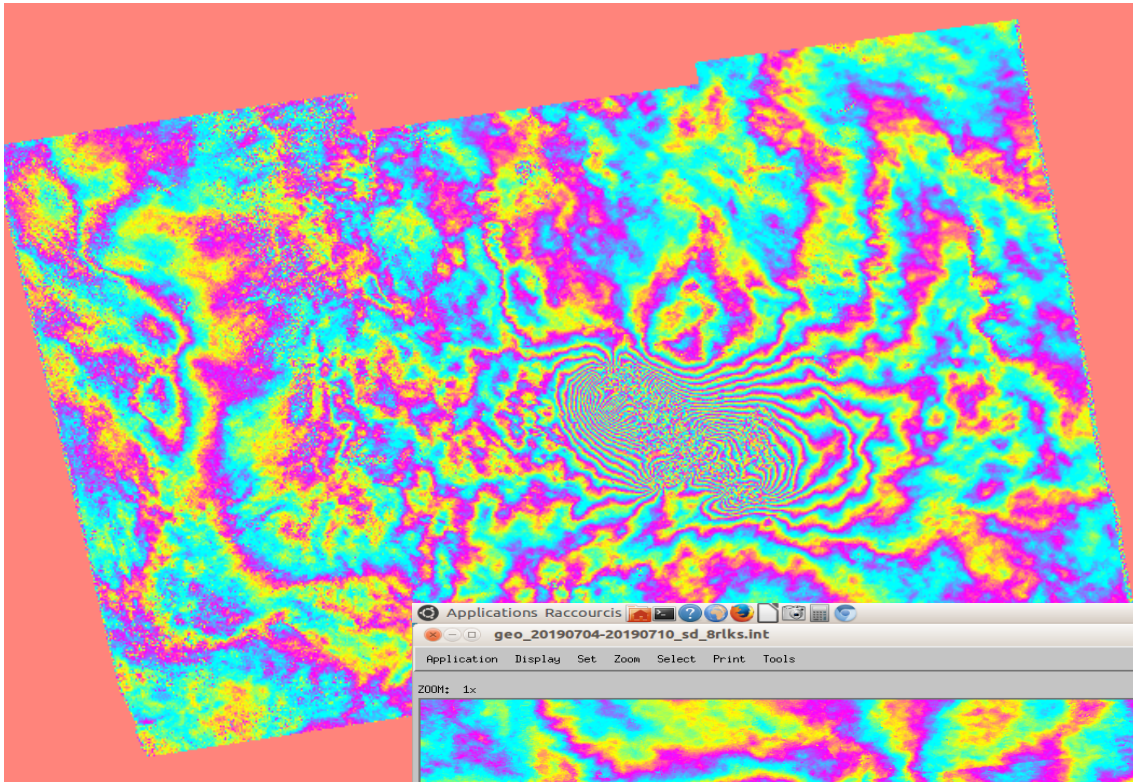
$$\Delta\Phi_{Fw-Bw} = a + bX + cY$$



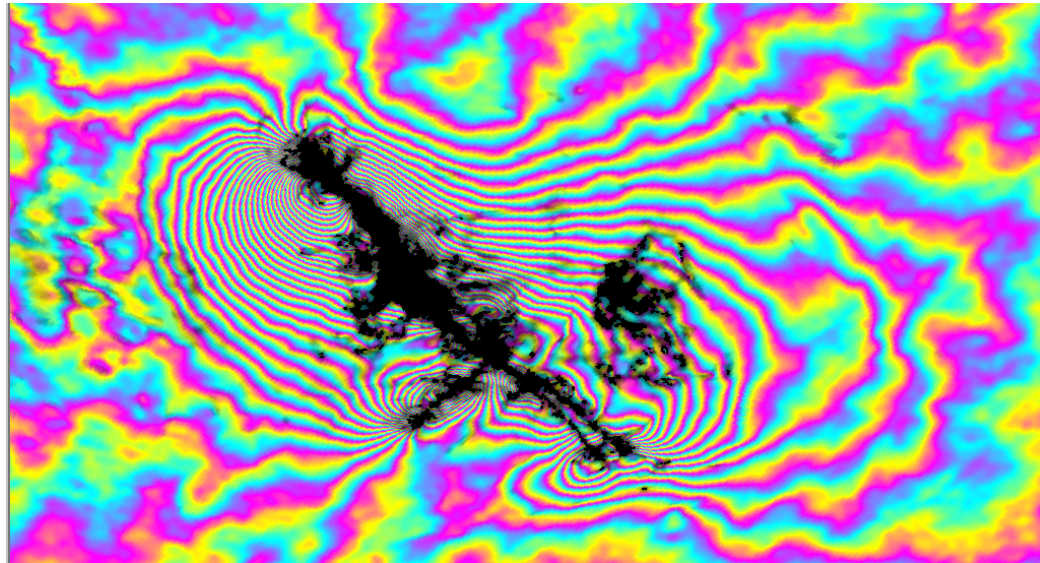
WRAPPED_INTERFEROGRAM

Wrapped unfiltered
interferogram

Co_seismic ifg
July04 to July10

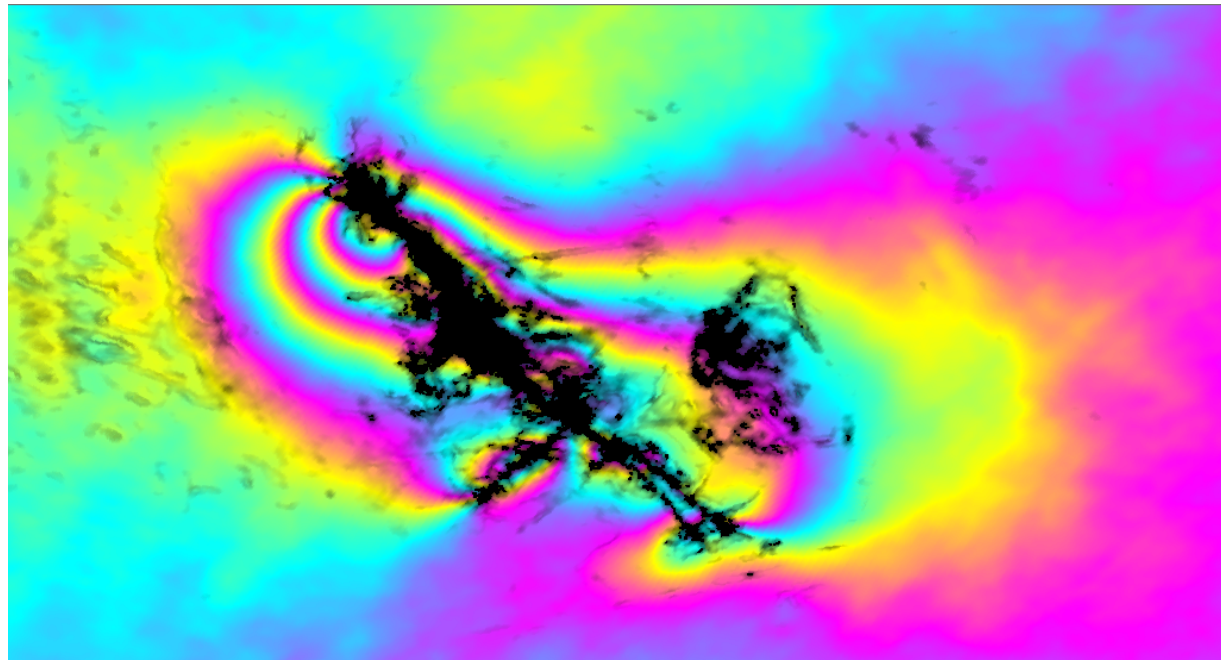
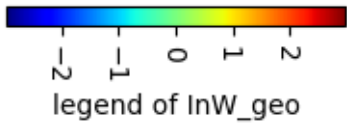


UNWRAPPED_INTERFEROGRAM



Unwrapped filtered
interferogram

Co_seismic ifg
July04 to July10



SPATIAL_COHERENCE



Co_seismic ifg
July04 to July10

Zoom on EQ

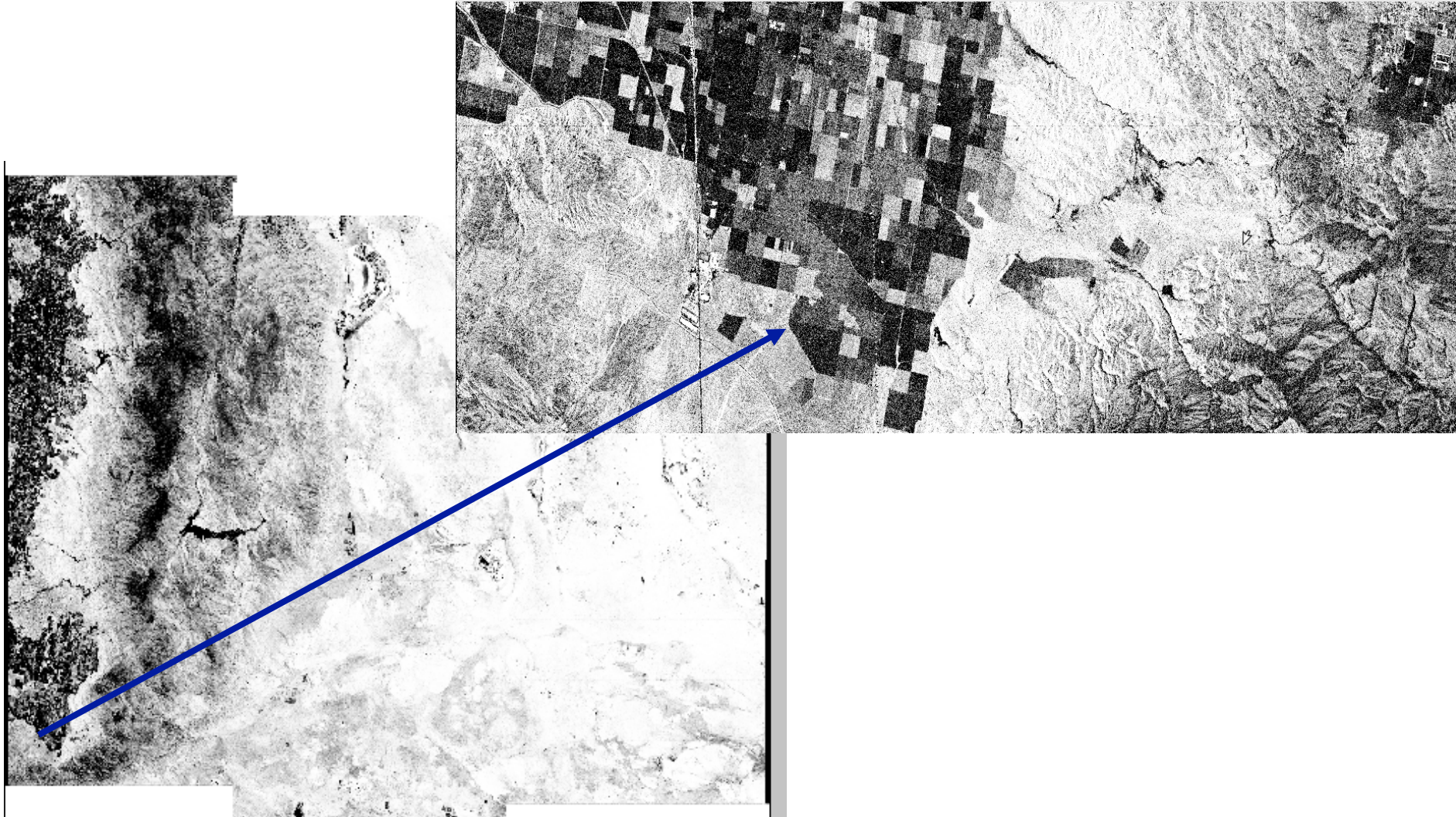


Superimposed on
amplitude

See faults !

TEMPORAL_COHERENCE

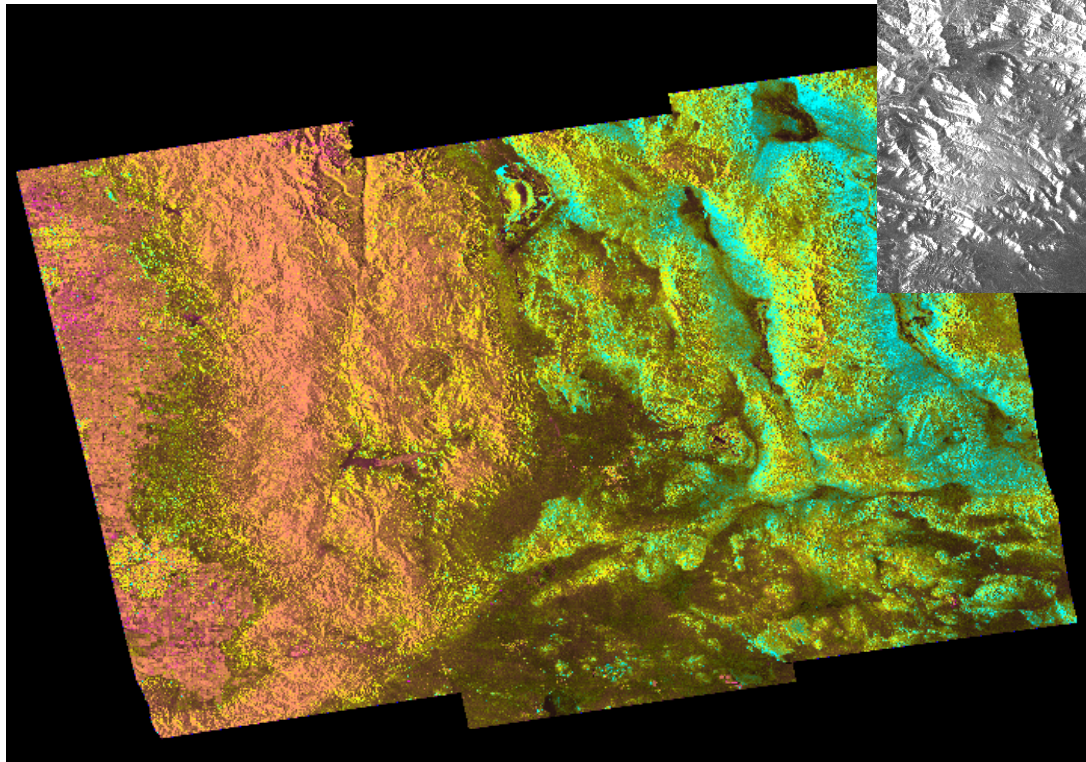
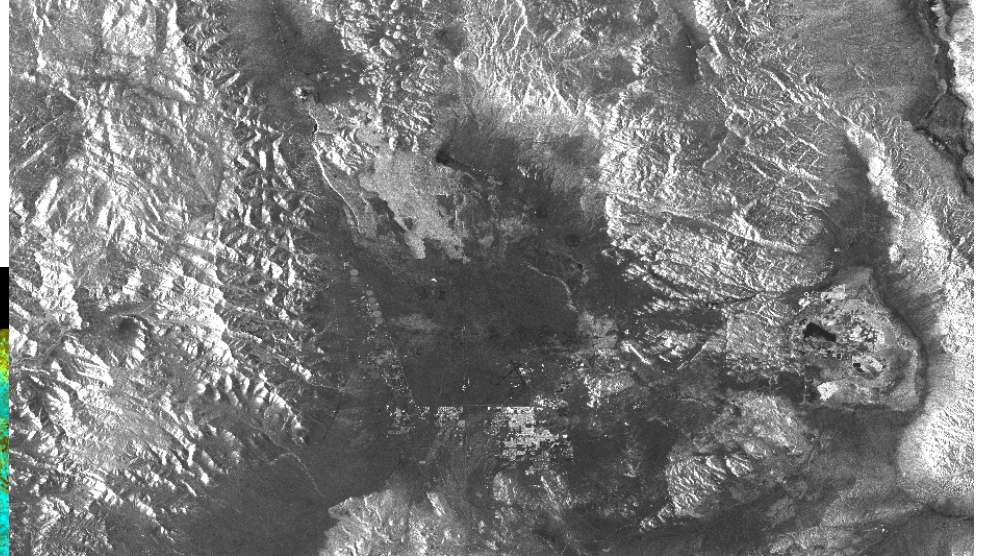
4 bands' product including a Temporal coherence proxy



TEMPORAL_COHERENCE

4 bands' product including :

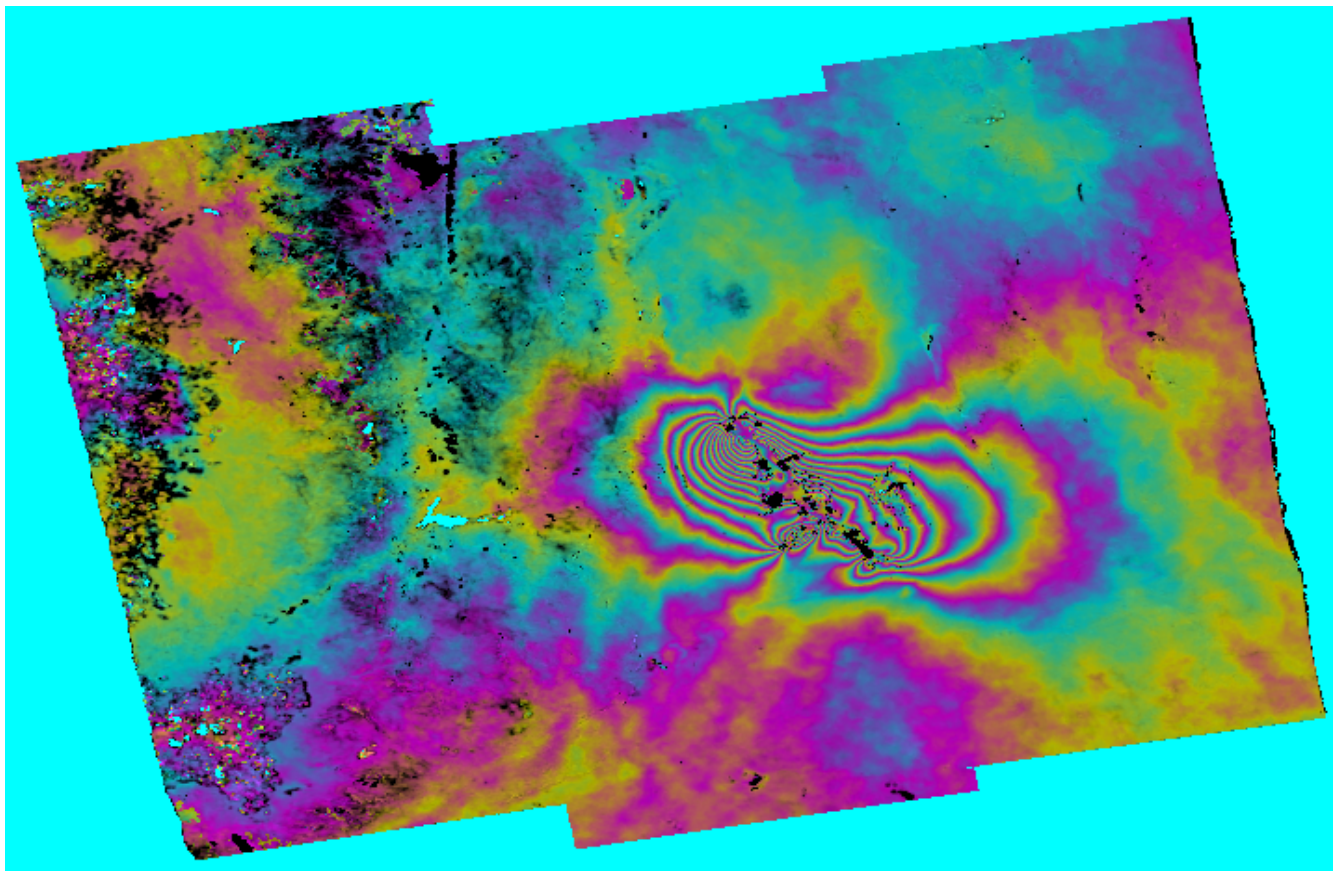
Stack of amplitude of SLC data, and relative dispersion



Dispersion shows
EW gradient in aridity

MEAN_LOS_VELOCITY

LOS velocity map



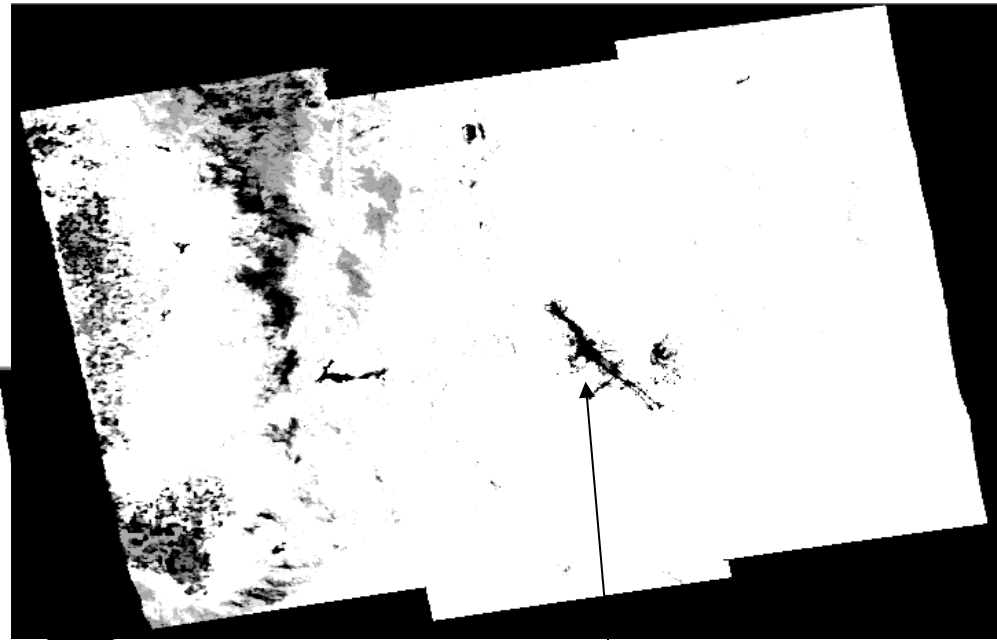
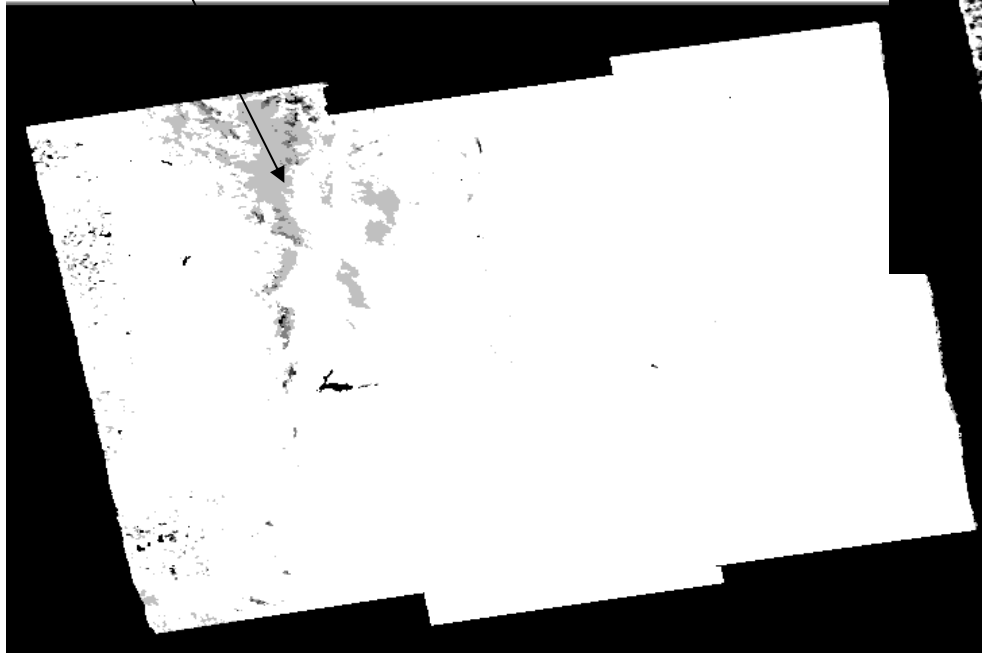
NETWORK_MISCLOSURE

(quality indicators)

3 bands' product including :

Number of images and number of interferograms per pixel

One missing date :
Snow on mountain ?

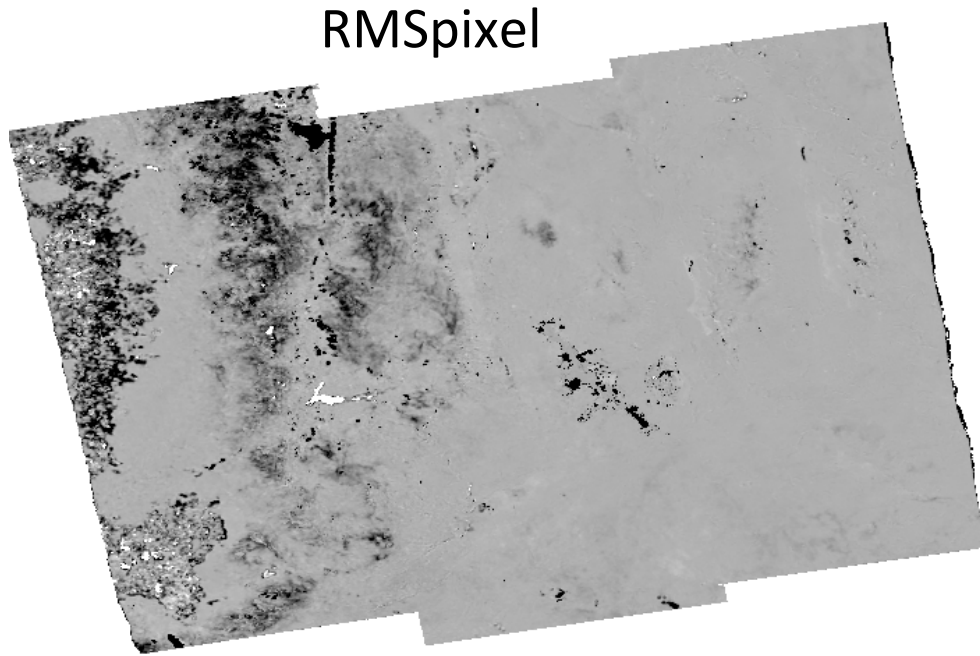


Missing ifgs:
Near field EQ area not unwrapped

NETWORK_MISCLOSURE

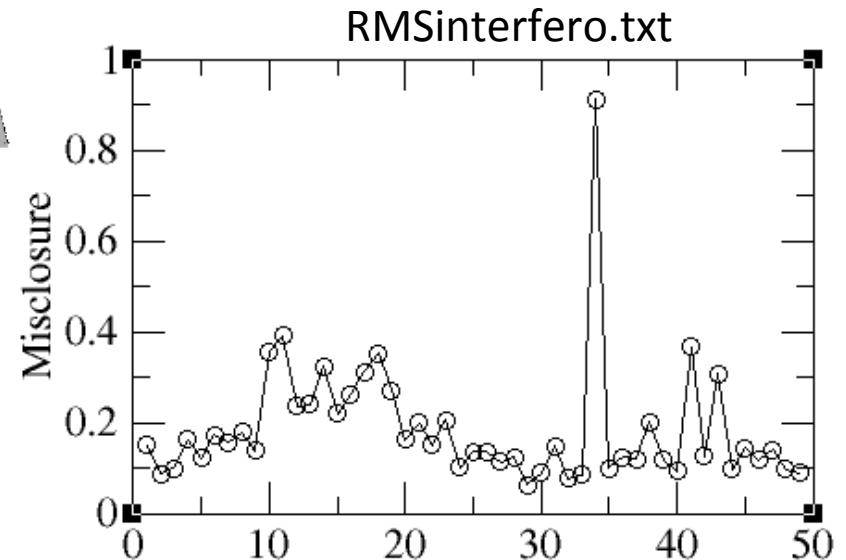
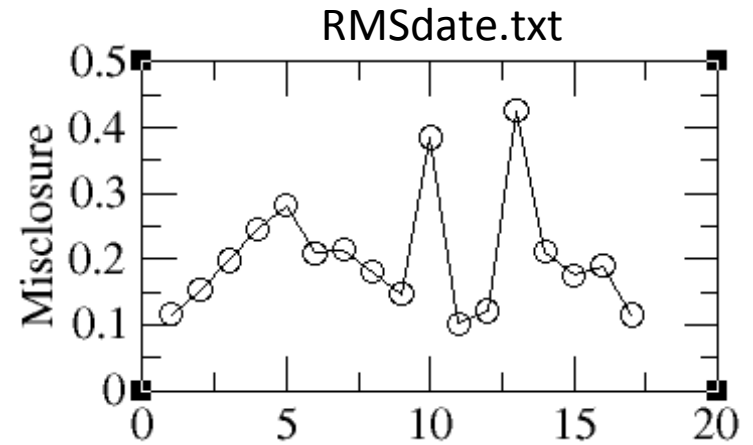
(quality indicators)

3 bands' product including :
Misclosure map RMSpixel



Misclosure map (between 0.14 and 0.8 rad)

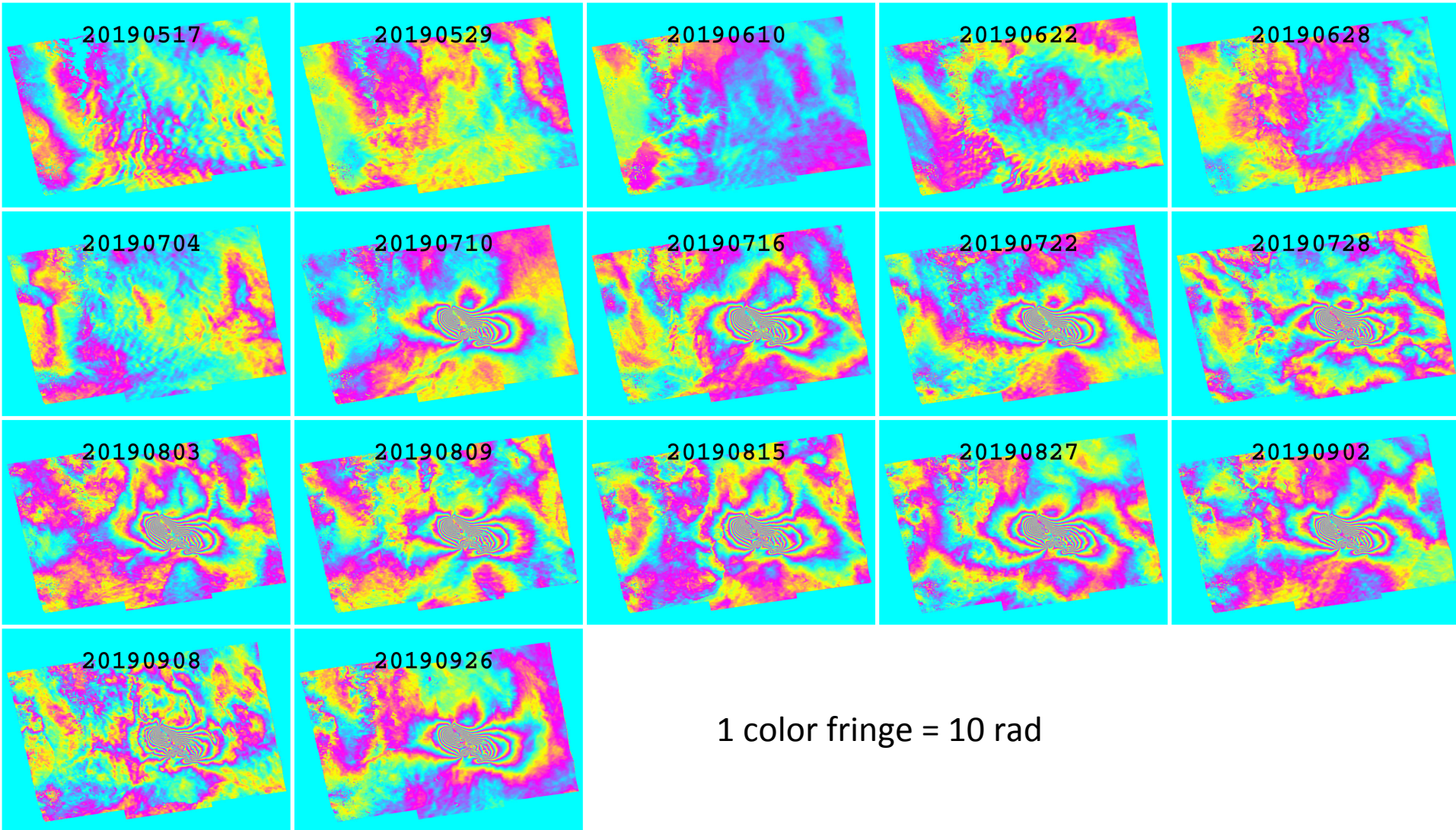
+ Auxiliary files



LOS_DISPLACEMENT_TIMESERIES

Data cube

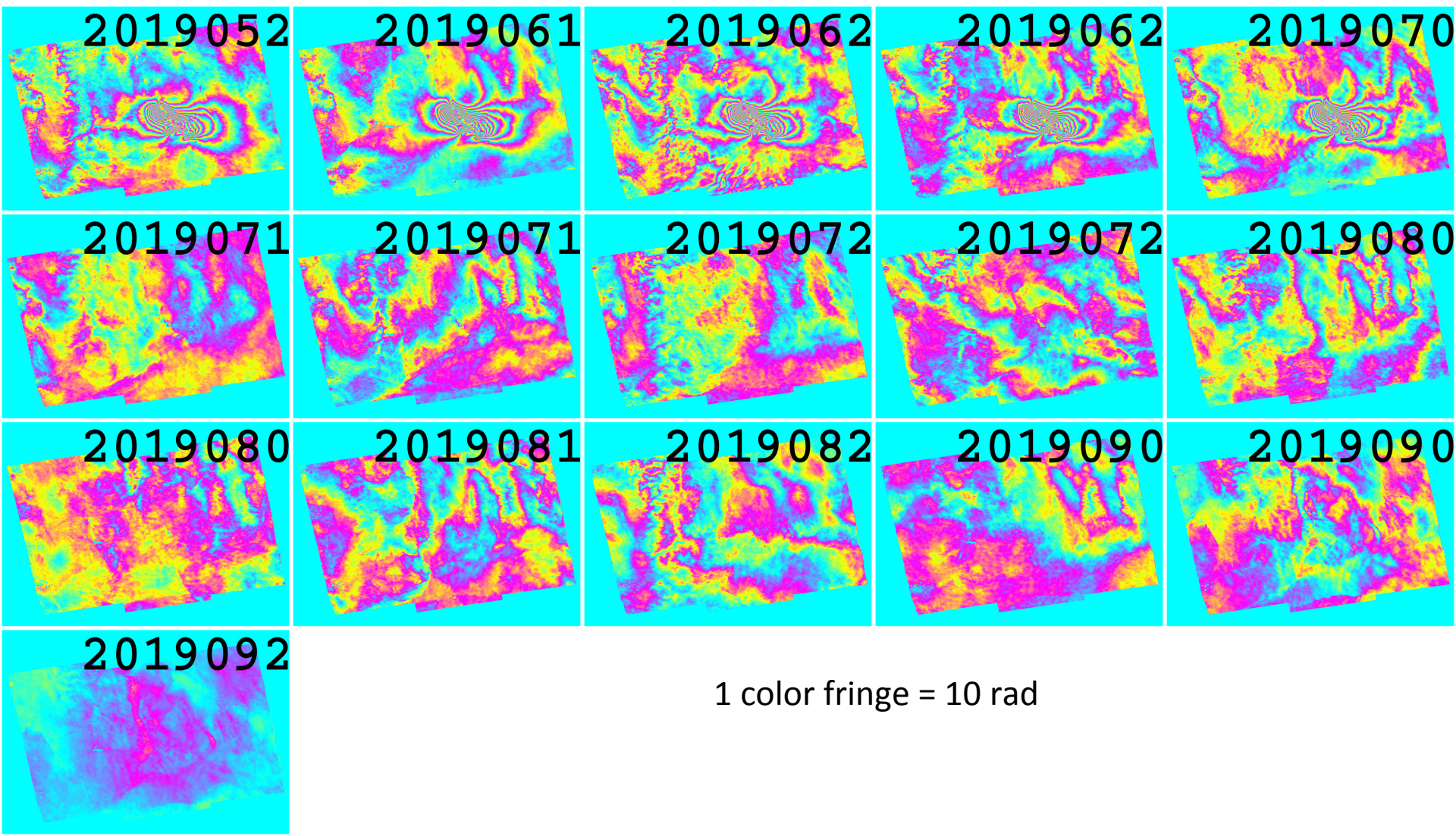
1- Relative to third date



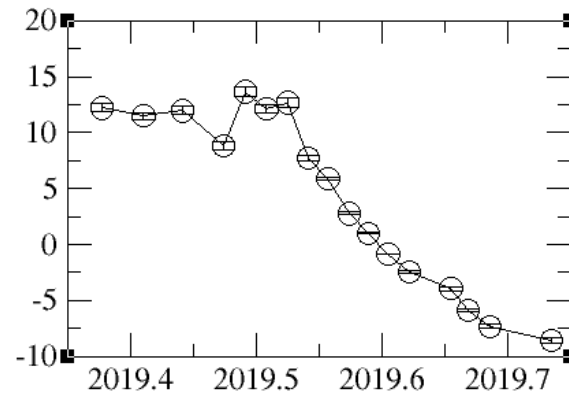
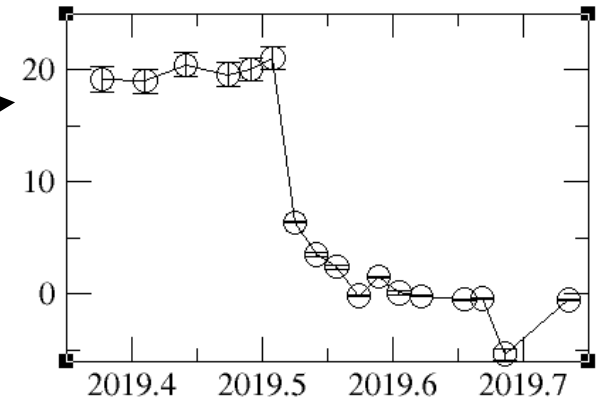
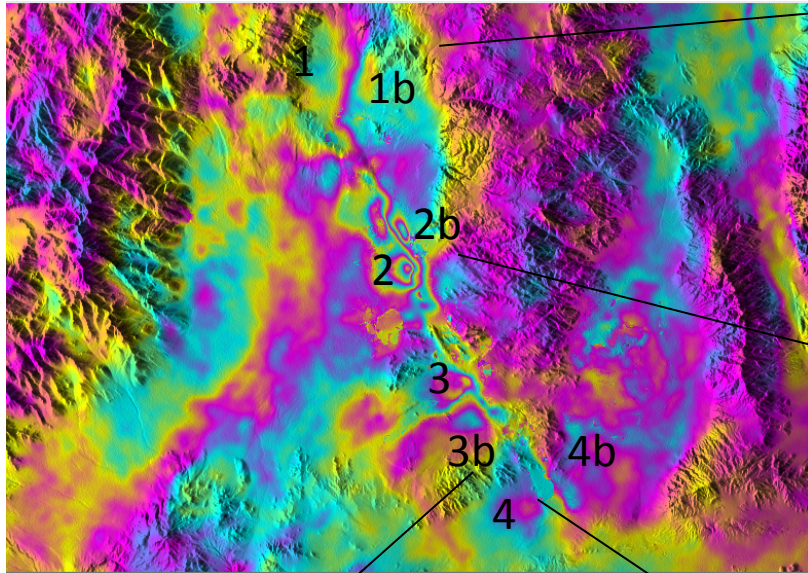
LOS_DISPLACEMENT_TIMESERIES

Data cube

1- Relative to last date : highlights post-seismic deformation

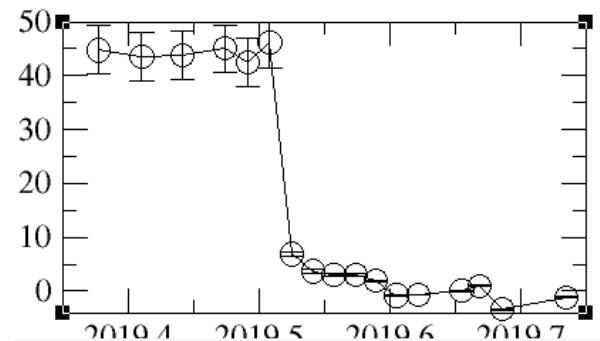
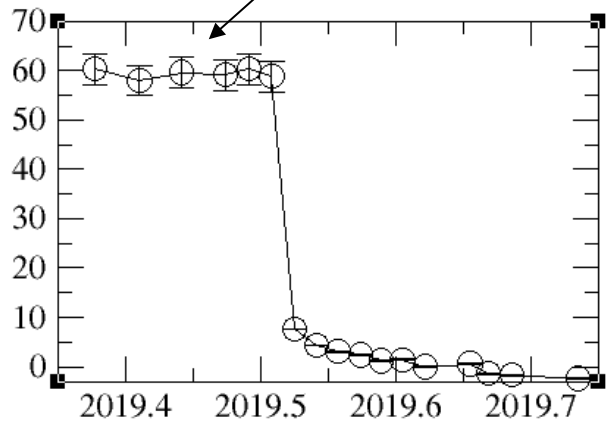


Zoom on cumulated post-seismic deformation



Co-seismic masked in near field

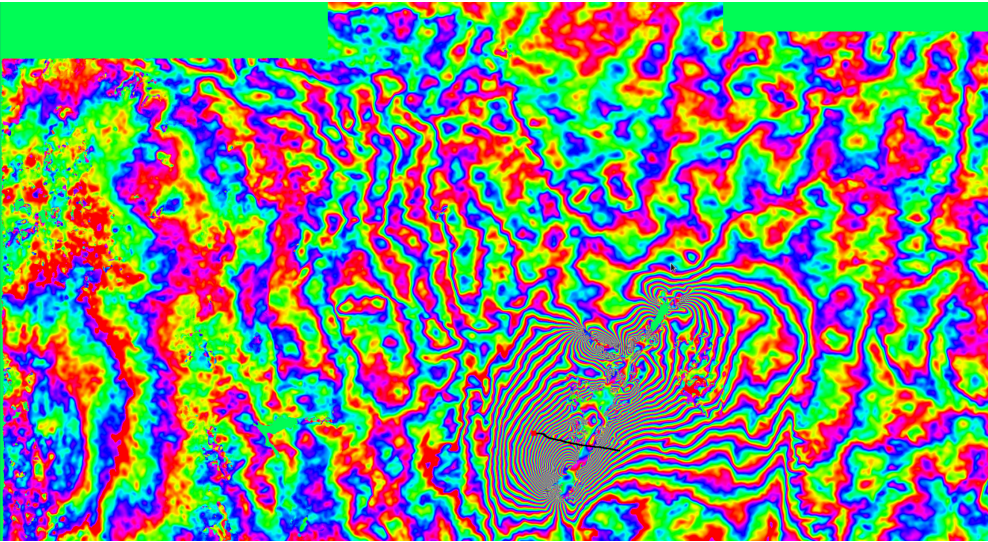
1 color fringe = 10 rad



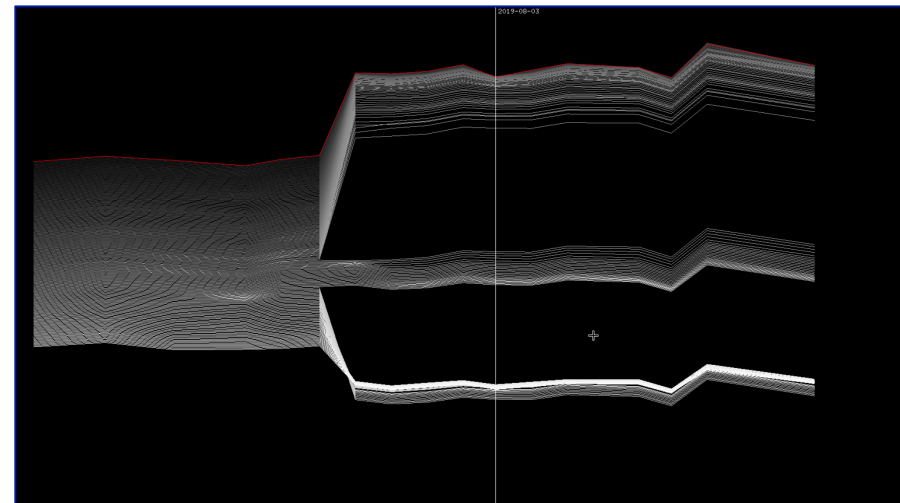
Products visualization

Web user interface

But see also F. Thollard's poster on InsarViz project



Distance along profile



Time

Perspectives

- ETALAB :
a successful prototype
- EPOS GDM-SAR :
an going project

- User Web interface and Products publication :
« quasi operational »
- Solutions are being discussed for perennial and
dedicated HPC for processing

