

Platform for Atlantic Geohazard Risk Management

# European spatial data infrastructures to improve risk management

Lídia Quental (LNEG), Isabel Montoya (IGME-CSIC), Eoghan Holohan (UCD)

# OUTLINE

- ✓ Introduction
- ✓ European Platforms - Infrastructures for geospatial information
  - EGDI | Copernicus
- ✓ Emergency platforms Copernicus EMSN, EMSR
  - Activations in the Atlantic Area
  - Uptake of the Copernicus Services in AGEO geohazards
  - citizen`s observatories
- ✓ Development of tools
  - EZ-InSAR
- ✓ Final notes



## European Geological Data Infrastructure

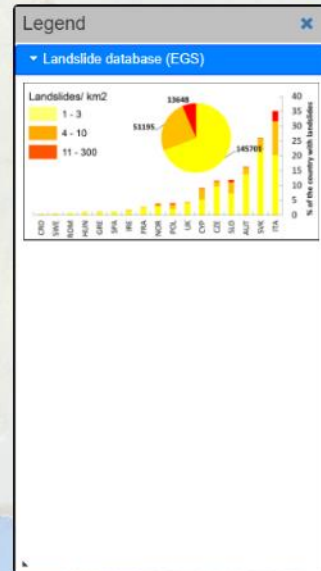
<https://www.europe-geology.eu/>



Data Tools | Scientific themes | About EGDI | English



Landslide database

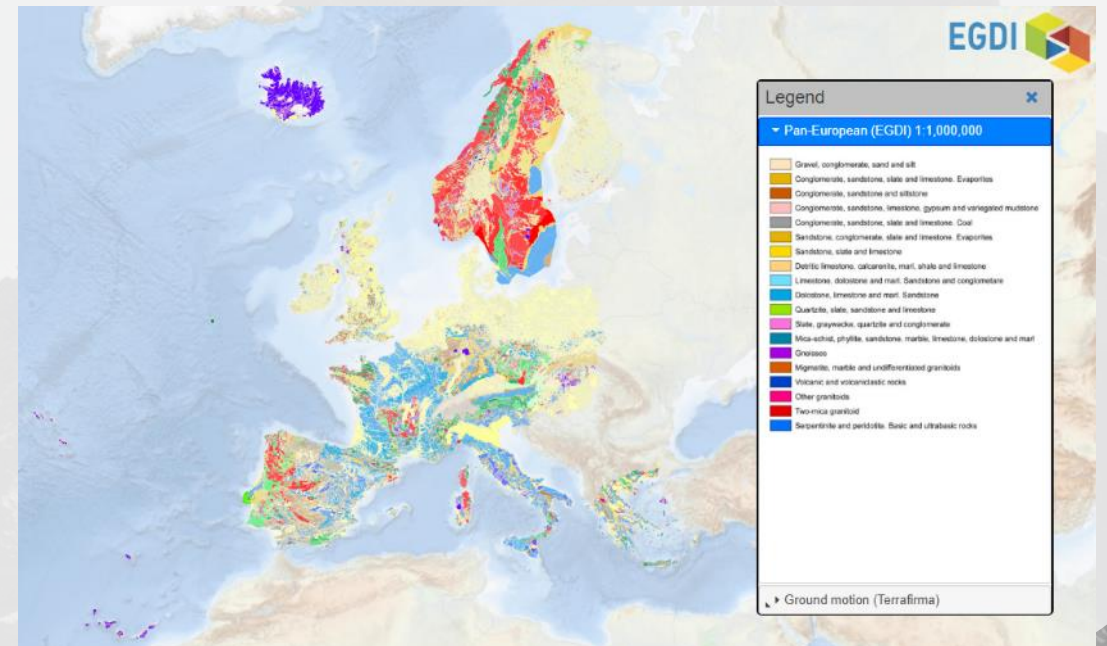


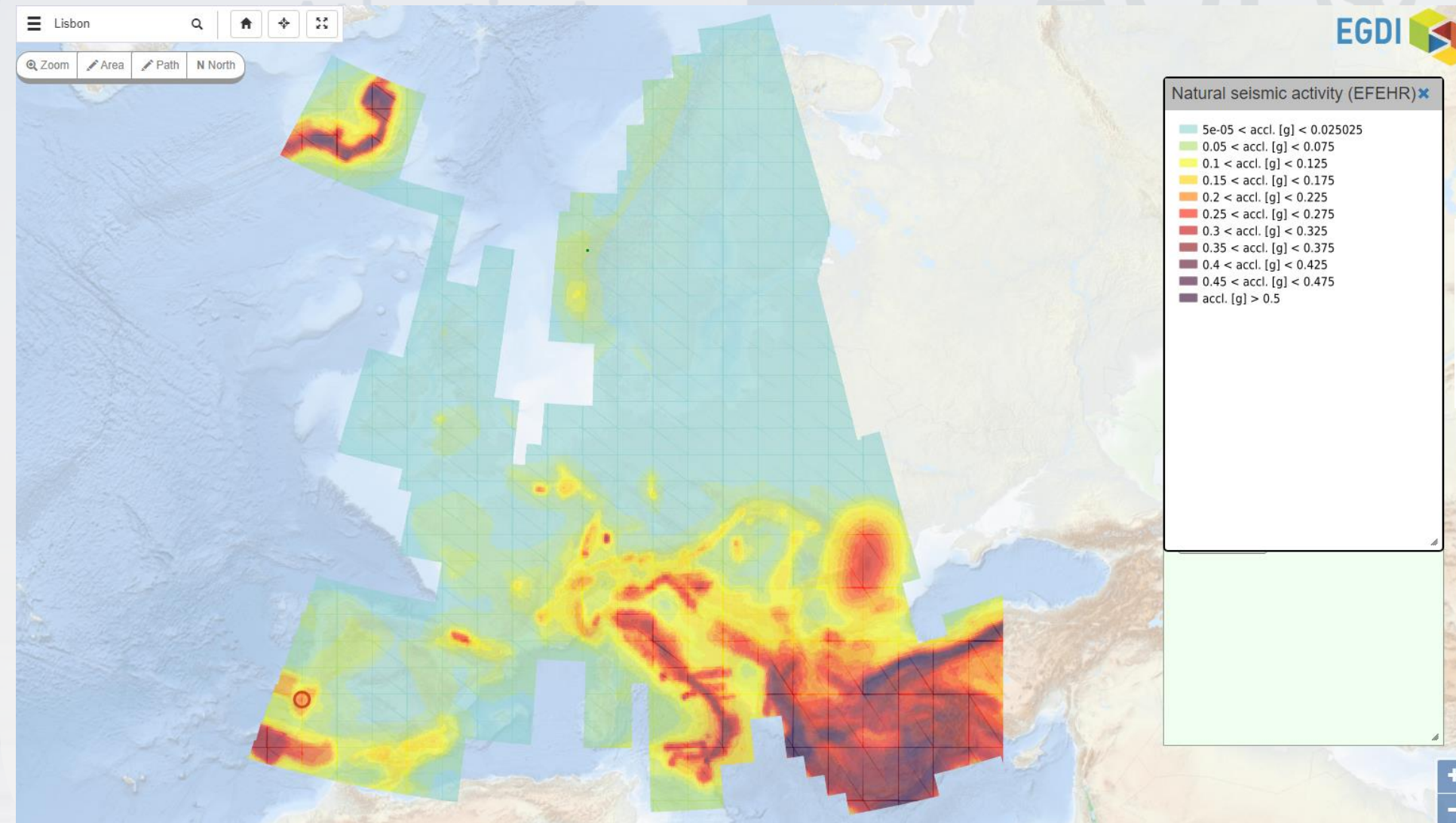
### TOOLS FOR SEARCHING AND SHOWING DATA

- Map Viewer
- Data Search
- Document Repository
- Vocabularies
- Multilingual Keyword Thesaurus
- Metadata Catalog
- Map Services and Layers

### SCIENTIFIC THEMES

- Basic Geology
- Marine Geology
- Mineral Resources
- GeoEnergy
- Water Resources
- Geochemistry
- Earth Observations and GeoHazard**
- Urban Geology





European Facilities for Earthquake Hazard and Risk.

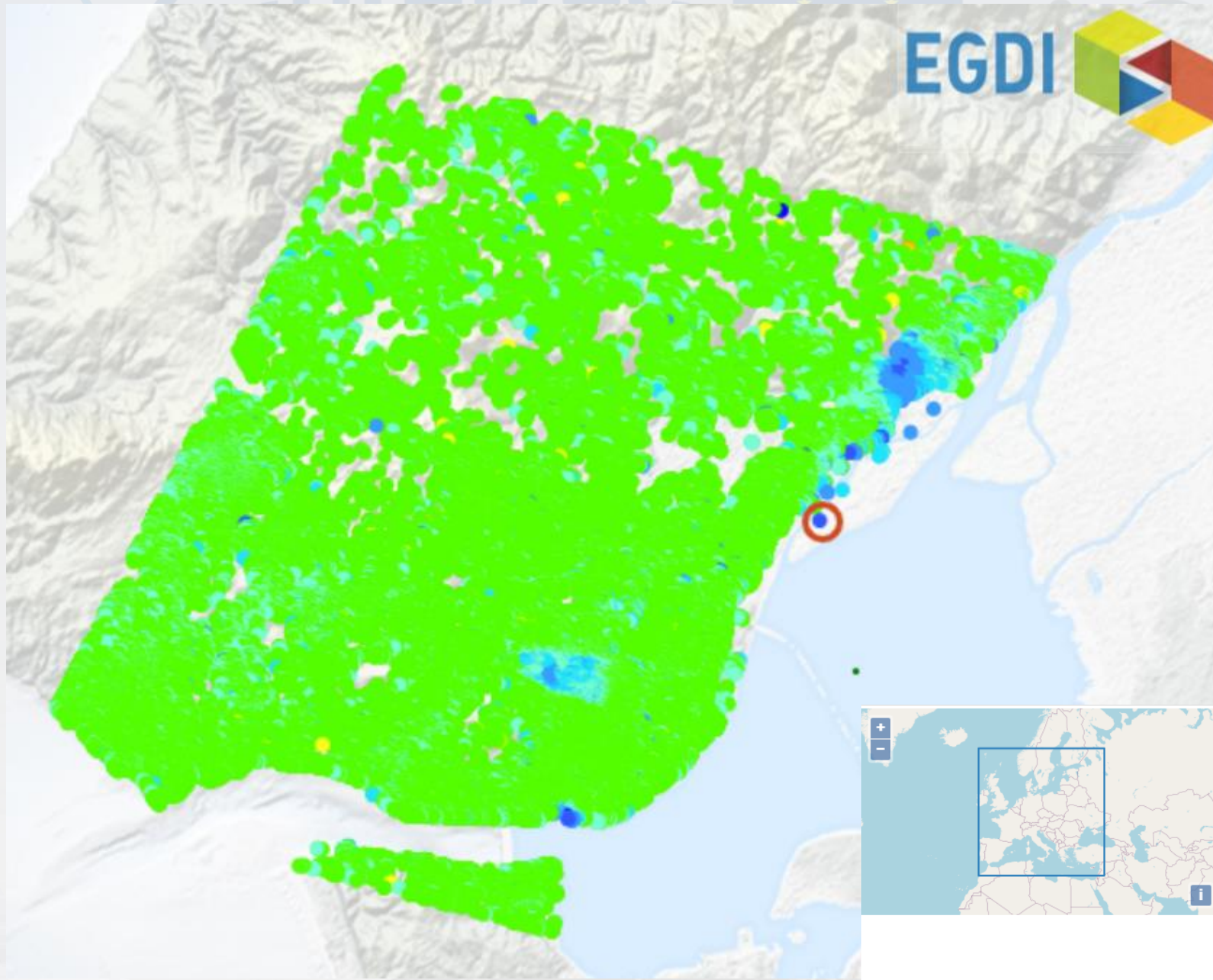
- Earth Observation - Geohazards

Landslide database (EGS)

Ground motion (Terrafirma)

Ground instability (Pangeo)

Natural seismic activity (EFEHR)




### Ground motion (TerraFirma)

- Greater than 20 mm per year
- 10 to 20 mm per year
- 5 to 10 mm per year
- 3 to 5 mm per year
- 1.5 to 3 mm per year
- -1.5 to 1.5 mm per year
- -3 to -1.5 mm per year
- -5 to -3 mm per year
- -10 to -5 mm per year
- -20 to -10 mm per year
- Less than -20 mm per year

← / Basic / Full metadata

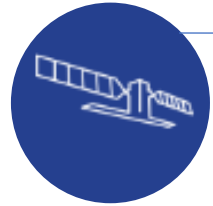
### ⚙ TerraFirma PSI legacy data service (OGC WxS)

Metadata language 

#### Abstract

This web service provides access to TerraFirma legacy data as WMS and WFS. TerraFirma is a project that originated within the GMES (Global Monitoring for Environment and Security) Service Element (GSE) programme of the European Space Agency, under the name Geohazard Land Motion (TerraFirma) Services. MapServer software is used to provide these OGC WMS and WFS services.

Type service



Space  
(ESA)

Sentinels  
Missions  
S1-S2-S3-S5P....

+

Contributing  
missions



In situ

to produce, enrich and  
validate the services,  
improving their  
accuracy and reliability.

[https://insitu.copernicus.eu/  
observations](https://insitu.copernicus.eu/observations)



Land  
Monitoring



Marine  
Environment  
Monitoring



Atmosphere  
Monitoring



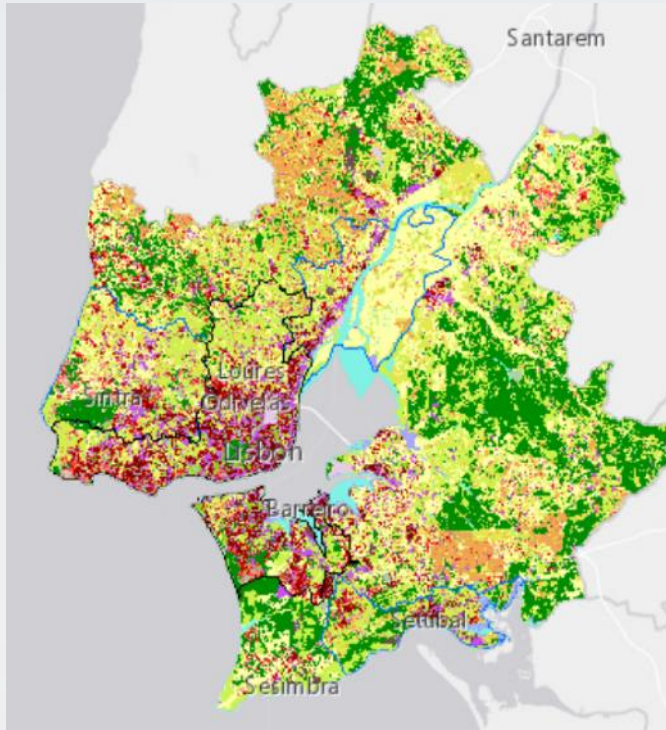
Emergency  
Management



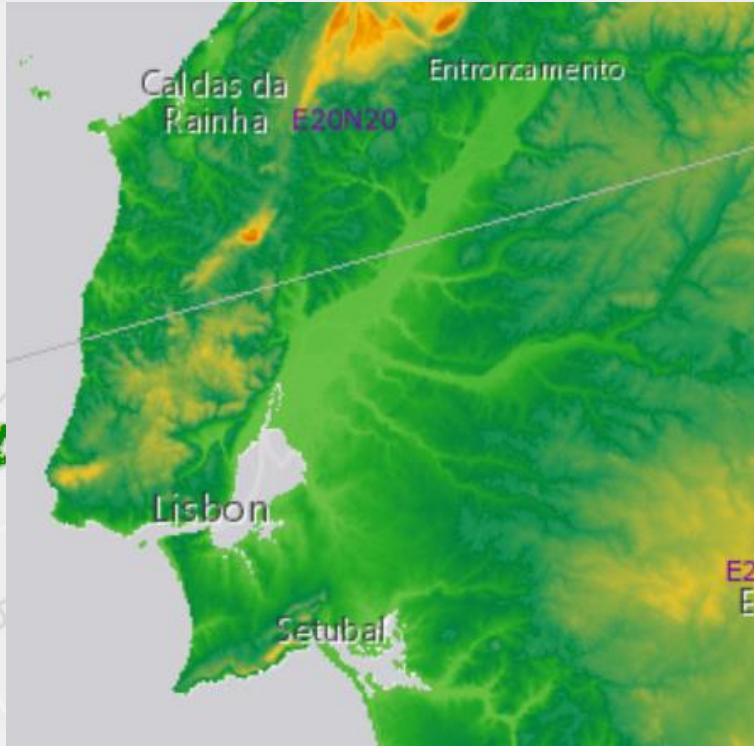
Security



Climate  
Change



Urban Atlas



EU-DEM

Product portfolio ▾ News and e

- Overview
- Land Cover & Land Use Mapping ▶
- Thematic Hotspot Mapping ▶
- Biophysical Parameters ▶
- Imagery, In situ and Reference Data ▶
- European Ground Motion Service ▶
- Related Products ▶

Providing base data and elements for exposure and vulnerability



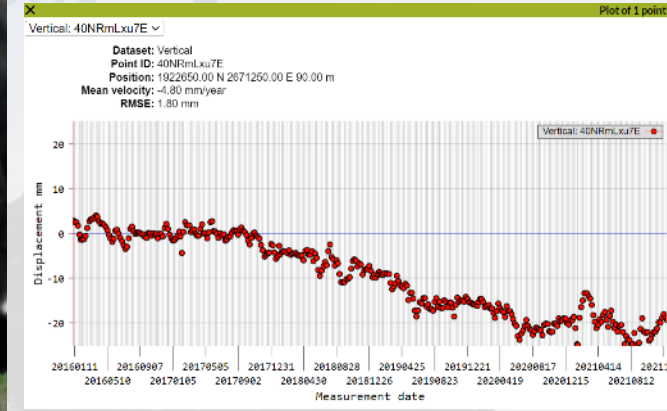
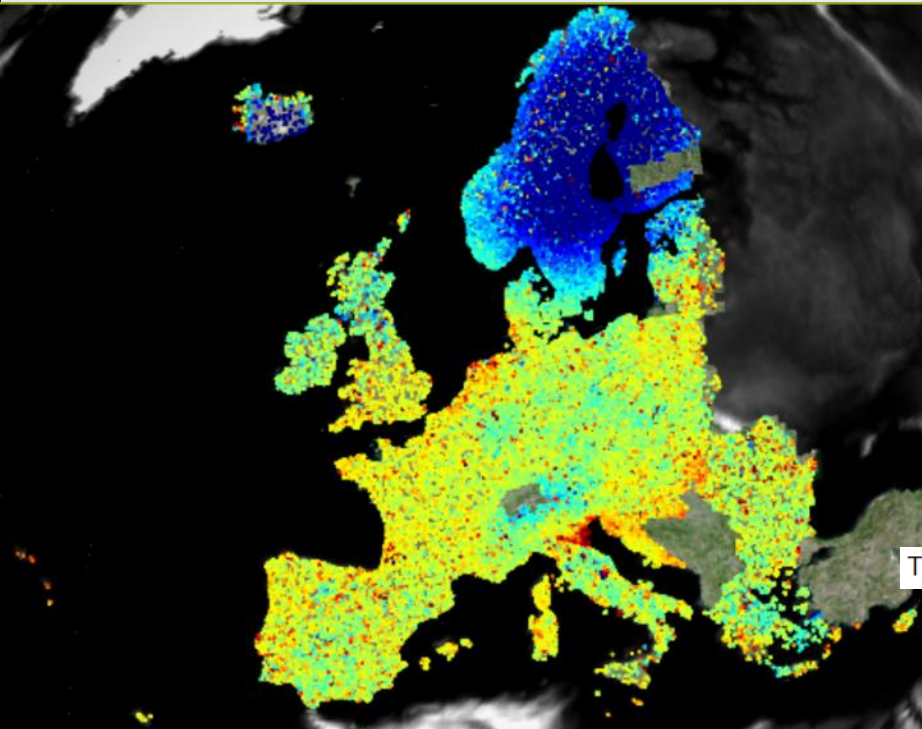
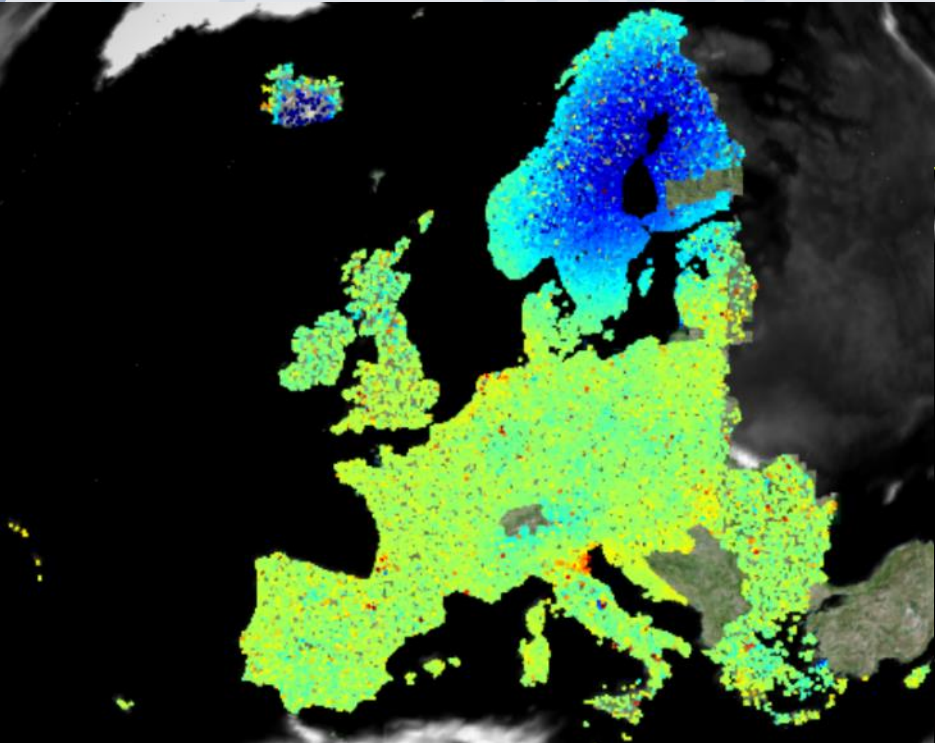
Place/coordinates (lat lon)



Sentinel 1 from 2015 -2021 and updates

<https://land.copernicus.eu/pan-european/european-ground-motion-service>

TERRITORIAL



The service contains modified Copernicus Sentinel data (202

Legend

Legend across all datasets. Limits are in mm/year.

-10 10

100%

2.5 pixels

Fine (-10 to 10) -10 10

InSAR default

Legend across all datasets. Limits are in mm/year.

-5 5

100%

2.5 pixels

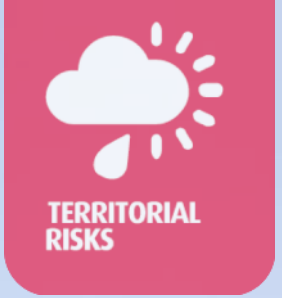
Very Fine (-5 to 5) -5 5

InSAR default





EUROPEAN UNION



# Platform for Atlantic Geohazard Risk Management

Emergency platforms



# Emergency platforms – Copernicus-EMS

## On demand mapping

Copernicus EMS On Demand Mapping provides on-demand detailed information for selected emergency situations that arise from natural or man-made disasters anywhere in the world.

### Rapid Mapping

**Rapid Mapping** provides geospatial information within hours or days of a service request in order to support emergency management activities in the immediate aftermath of a disaster.

### Risk and Recovery Mapping

**Risk & Recovery Mapping** supplies geospatial information in support of Disaster Management activities including prevention, preparedness, risk reduction and recovery phases.

## Exposure mapping

The Copernicus EMS exposure mapping component provides highly accurate and continuously updated information on the presence of human settlements and population with the Global Human Settlement Layer (GHSL).

### Population grids

**Population grids** are effective datasets to assess the amount of resident population at fine spatial resolution. Population counts per grid cell quantify the amount of people exposed to hazards.



### Built-up surface

**Built-up surface** grids are essential information to map human settlements and their characteristics (like land use and density). The amount of built-up surface per grid cell is useful to estimate settlement typologies and is used as covariate for population disaggregation.



## Early Warning & Monitoring

Copernicus EMS Early Warning and Monitoring offers critical geospatial information at European and global level through continuous observations and forecasts for floods, droughts and forest fires.

### Floods

The European Flood Awareness Systems (EFAS) and Global Flood Awareness Systems (GloFAS) provide complementary flood forecast information to relevant stakeholders that support flood risk management at the national, regional and global level.



### Fires

The European Forest Fire Information System (EFFIS) monitors forest fire activity in near-real time. EFFIS supports wildfire management at the national and regional level for EU member states and across the Middle East and North Africa.



### Droughts

The Drought Observatory (DO) provides drought-relevant information and early-warnings for Europe (EDO) and globally (GDO). The service publishes short analytical reports (Drought News) in anticipation of an imminent drought.



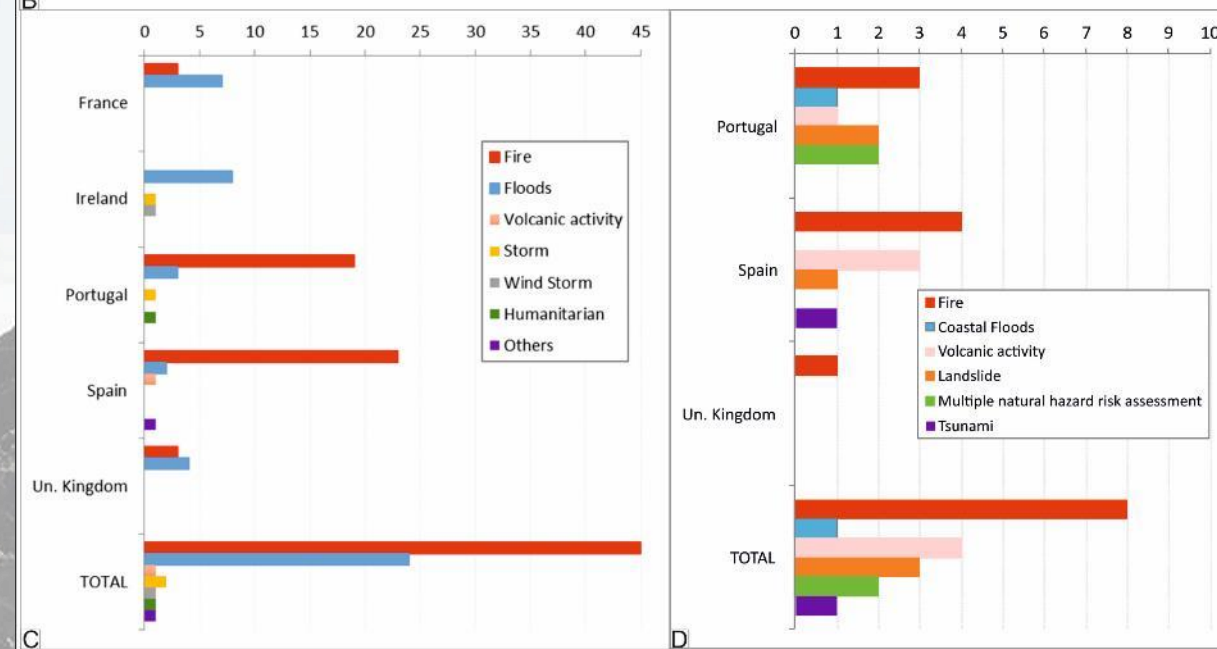
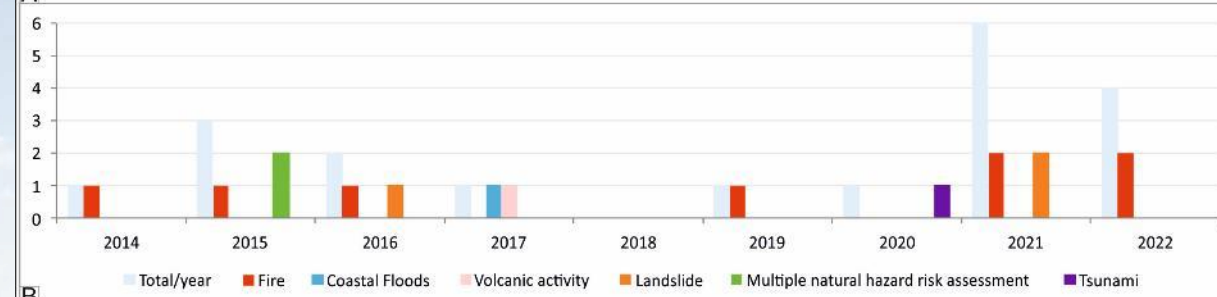
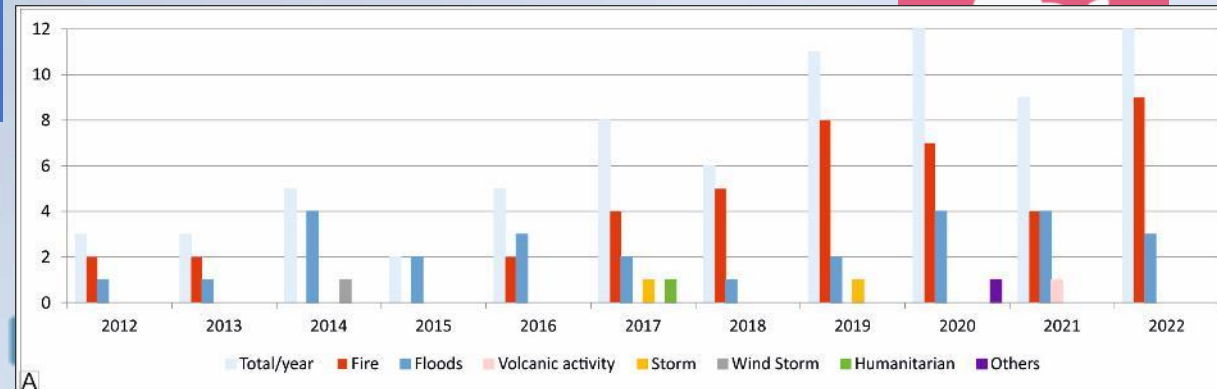
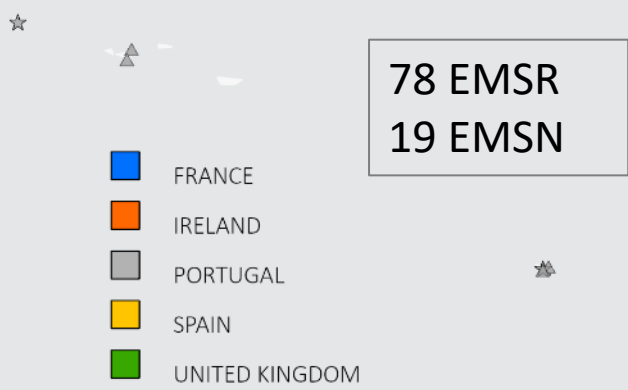
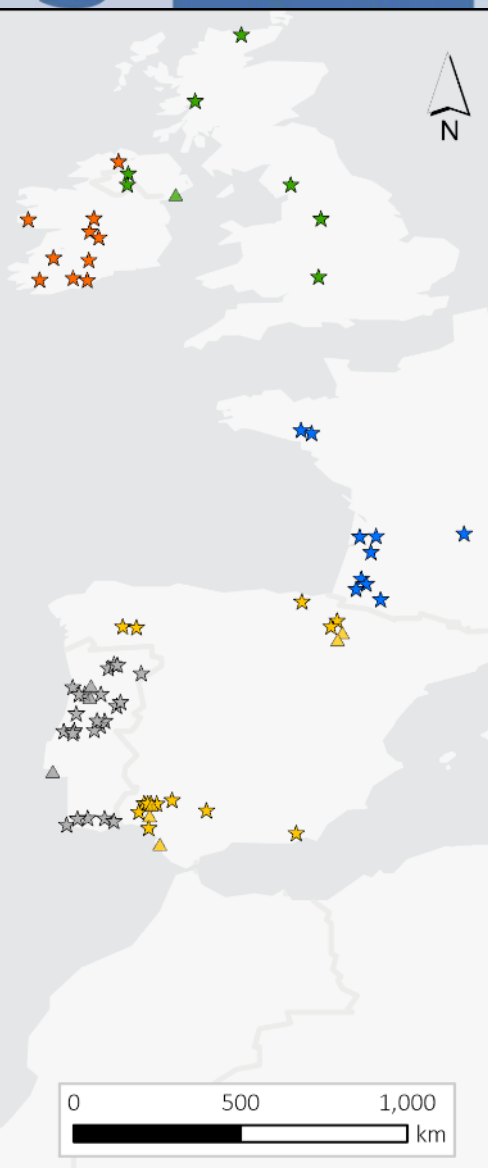
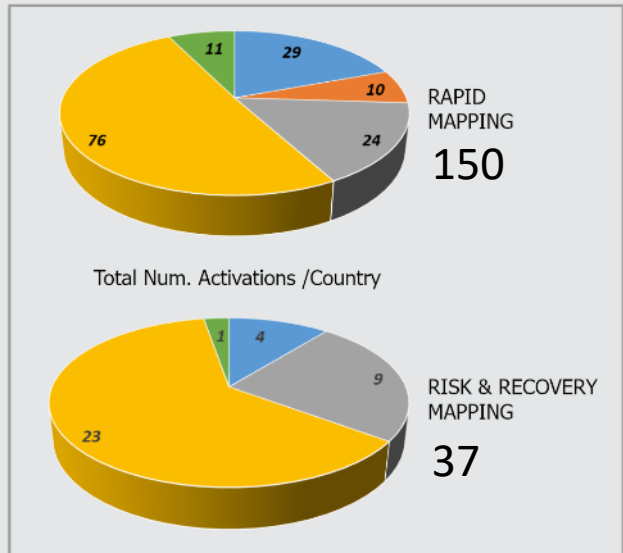
Copernicus  
Europe's eyes on Earth



Emergency  
Management Service

<https://emergency.copernicus.eu/>

# On Demand Mapping Services Activations



Example of Copernicus use, through different services\*, in each risk analysis stage for each specific hazard.



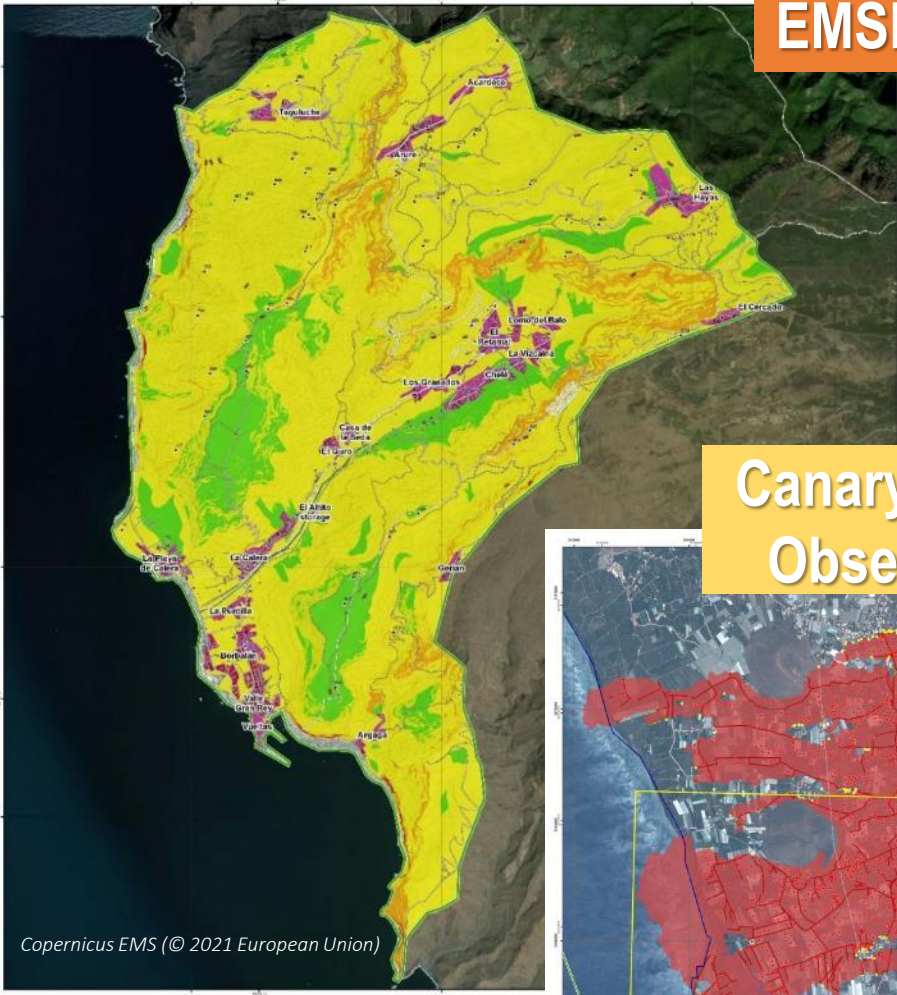
Geohazard	Pre-event stage	During-event stage	Post-event stage
<b>Floods</b>	Precipitation, vegetation, weather forecast, EFAS, digital elevation model (slope), elements throughout the sensitivity area, sea level, waves	Affected areas, elements for crisis management	Affected areas map with different levels of characterization, maps
<b>Rockfalls</b>	Precipitation, vegetation, new constructions (update landcover), fires burning (loss vegetation, temperature), land use, geomorphology, digital elevation model, deformation, settlements, landscape dynamics monitoring in coastal zones, soil moisture index, exposed elements	Precipitation	Affected area map
<b>Coastal erosion</b>	Exposed elements, settlements, landscape dynamics monitoring in coastal zones, Digital Elevation Model, water and wetness, land cover, riparian zones	Wave height, wind, sea level	Affected area map
<b>Earthquakes</b>	Area prone to deformation, tectonic plate movement	Tectonic plate movement, wave height, sea-level, affected areas, elements for crisis management, deformation	Affected area map (access for rescue teams)
<b>Landslides</b>	Area prone to deformation, precipitation, vegetation cover, weather forecast, new construction, land use, geomorphology, digital elevation model, settlements, soil moisture index, exposed elements	Precipitation, deformation, affected areas, elements for crisis management	Affected area map
<b>Volcanic eruptions</b>	Area prone to deformation, satellite images, digital elevation model, temperature, gas emissions, exposed elements	Deformation, wind, temperature, emissions, affected areas, elements for crisis management	Affected area map
<b>Geotechnical risks</b>	Area prone to deformation, tectonic plate movement, satellite images, precipitation, vegetation cover, weather forecast, new construction	Precipitation, deformation, affected areas, elements for crisis management	Affected area map

\* Copernicus (Marine Environment Monitoring Service-CMEMS, Land Monitoring Service-CLMS, Atmosphere Monitoring Service-CAMS, Emergency

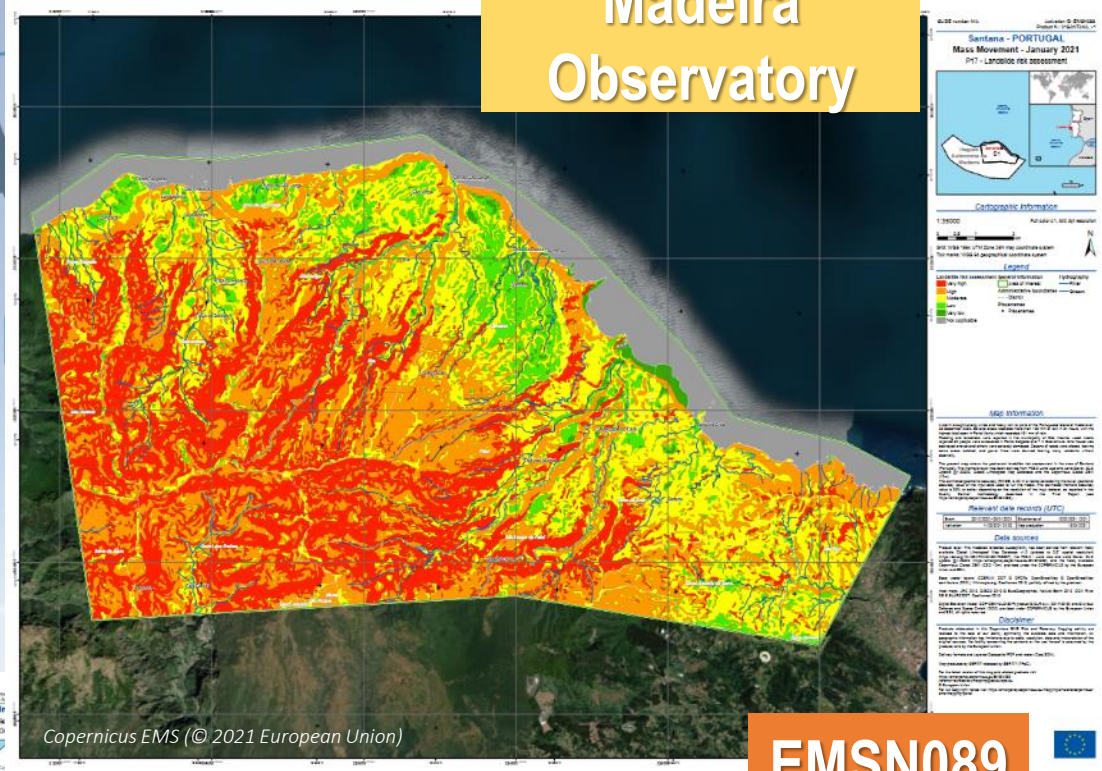
Management Service-EMS, service for Security, Climate Change Service-C3S)

# Copernicus EMS Activations requested from the AGEO pilots

**EMSN093**

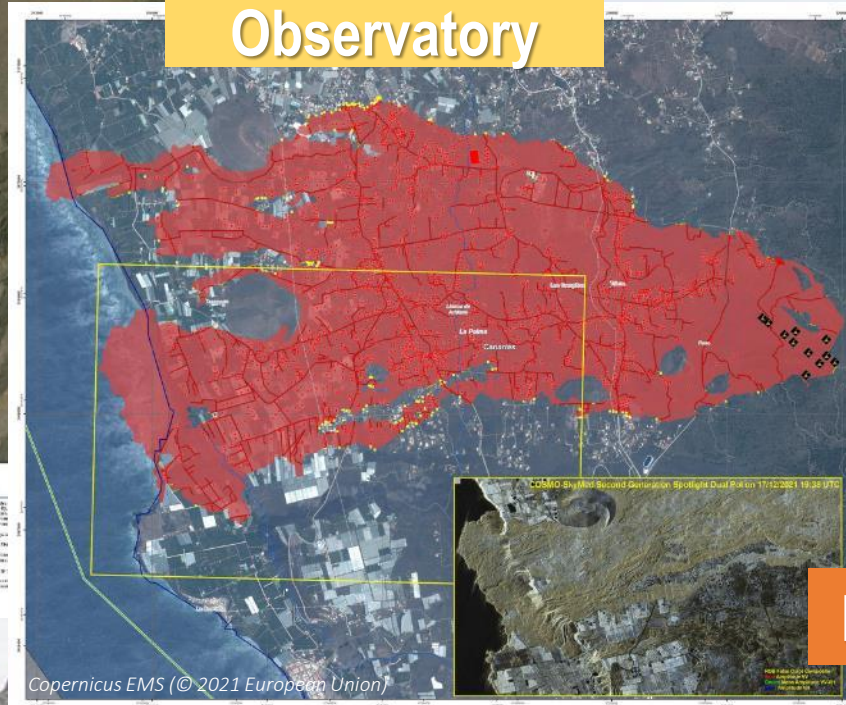


**Madeira Observatory**



**EMSN089**

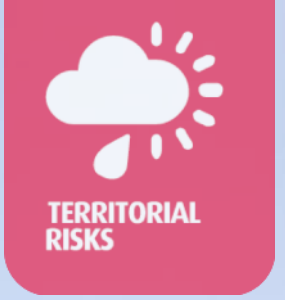
**Canary Islands Observatory**



**EMSR546, EMSN112/124 and EMSN119**







## Platform for Atlantic Geohazard Risk Management

### Development of tools

**EZ-InSAR: a Matlab-based toolbox for processing satellite radar images to map ground motion**



# Overview of current InSAR processing tools



- Commercial software**

MTI: Multi-temporal InSAR  
 Y: YES  
 N: NO

	Platform	Language	GUI	InSAR	MTI-PS	MTI-SBAS
GAMMA	Unix	C/C++ /Shell/Python	N	Y	Y	Y
ENVI SARscape	Win/Unix	IDL	Y	Y	Y	Y
SARproz	Win	MATLAB	Y	Y	Y	Y

- Free/Open-source software (most popular)**

	Platform	Language	GUI	InSAR	MTI-PS	MTI-SBAS
SNAP	Win/Unix	Python	Y	Y	N	N
ISCE2	Unix	C/C++/Python	N	Y	N	Y
GMTSAR	Unix	C/C++/Shell	N	Y	N	Y
MintPy	Unix	Python	N	N	N	Y
StaMPS	Unix	Matlab	N	N	Y	Y

<b>New toolbox: EZ-InSAR</b>	Y	Y	Y	Y
------------------------------	---	---	---	---



# Pain points of running InSAR on current open-source software

TERRITORIAL RISKS

```
File Edit View Search Terminal Help
[xwang@xues-roba:~$ cd /mnt/570b5cb2-2bb2-476b-bd03-ed196f0b54a1/Data_XiaoWen_Wang/Madeira_DT164_ISCF/stack_SraMPS/INSAR_20190717
stack_cpx.py stack stackOverview stackSentinel.py
[xwang@xues-roba:~$ cd /mnt/570b5cb2-2bb2-476b-bd03-ed196f0b54a1/Data_XiaoWen_Wang/Madeira_DT164_ISCF/stack_SraMPS/INSAR_20190717$ stackSentinel.py -h
This is the Open Source version of ISCE.
Some of the workflows depend on a separate licensed package.
To obtain the licensed package, please make a request for ISCE
through the website: https://download.jpl.nasa.gov/ops/request/2/index.cfm.
Alternatively, if you are a member, or can become a member of WINSAR
you may be able to obtain access to a version of the licensed software at
https://winsar.unavco.org/software/isce
usage: stackSentinel.py [-h] [-M] [-s SLC_DIRNAME] [-o ORBIT_DIRNAME] [-a AUX_DIRNAME] [-w WORK_DIR] [-d DEM] [-r REFERENCE_DATE] [-c NUM_CONNECTIONS] [-n SWATH_NUM] [-b BBOX] [-t TEXT_CMD] [-x EXCLUDE_DATES]
[-i INCLUDE_DATES] [-z START_DATE STARTDATE] [-Z STOP_DATE STOPDATE] [-r RANGELOOKS] [-f FILTERSTRENGTH] [-snr snrreq_threshold SNRTHRESHOLD] [-p POLARIZATION]
[-C [geometry, NESD]] [-O NUM_OVERLAP_CONNECTIONS] [-e ESDCOHERENCETHRESHOLD] [-M [slc_correlation, interferogram, offset]] [-V [True, False]] [-useGPU] [--num_proc NUMPROCESS]
[-num_proc_topo NUMPROCESS4TOPD] [-u [icu, snaphu]] [-mFilter] [--paras_ioon PARAM_IOON] [--num_connections_ioon NUM_CONNECTIONS_IOON]

Preparing the directory structure and config files for stack processing of Sentinel data

optional arguments:
-h, --help show this help message and exit
-H, --hh Display detailed help information.
-s SLC_DIRNAME, --slc_directory SLC_DIRNAME Directory with all Sentinel SLCs
-o ORBIT_DIRNAME, --orbit_directory ORBIT_DIRNAME Directory with all orbits.
-a AUX_DIRNAME, --aux_directory AUX_DIRNAME Directory with all aux
-w WORK_DIR, --working_directory WORK_DIR Working directory for
-d DEM, --den DEM Directory with the DEM
-r REFERENCE_DATE, --reference_date REFERENCE_DATE List of swaths to be
-c NUM_CONNECTIONS, --num_connections NUM_CONNECTIONS number of interferograms
-n SWATH_NUM, --swath_num SWATH_NUM A list of swaths to be
-b BBOX, --bbox BBOX Lat/Lon bounding box.
-t TEXT_CMD, --text cmd TEXT_CMD text command to be added
-x EXCLUDE_DATES, --exclude_dates EXCLUDE_DATES List of the dates to exclude
-i INCLUDE_DATES, --include_dates INCLUDE_DATES List of the dates to include
--start_date STARTDATE Start date for stack processing
--stop_date STOPDATE Stop date for stack processing
-z AZIMUTHLOOKS, --azimuth_looks AZIMUTHLOOKS Number of looks in azimuth
-r RANGELOOKS, --range_looks RANGELOOKS Number of looks in range
-f FILTERSTRENGTH, --filter_strength FILTERSTRENGTH Filter strength for LR
-snr snrreq_threshold SNRTHRESHOLD SNR threshold for estimating
-p POLARIZATION, --polarization POLARIZATION SAR data polarization
```

Current Folder

- mean\_amp.ftl
- no\_ps\_info.mat
- patch.in
- patch\_noover.in
- pscands.1.da
- pscands.1.hgt
- pscands.1.ij
- pscands.1.ij.int
- pscands.1.ij.0
- pscands.1.ll
- pscands.1.ph
- STAMPS.log

Command Window

```
New to MATLAB? See resources for Getting Started.
STAMPS: ##### StaMPS/MTI Version 4.0b6 #####
STAMPS: ##### Beta version, Jun 2018 #####
STAMPS: #####

STAMPS: Will process current directory only

STAMPS: #####
STAMPS: ##### Step 1 #####
STAMPS: #####
STAMPS: Directory is PATCH_1

PS_LOAD_INITIAL_GAMMA: Starting
PS_LOAD_INITIAL_GAMMA: Loading data into matlab...

master_master_flag =
0

READPARAM: heading=350.0383689483256
SETPARAM: heading = 350.0384
READPARAM: radar_frequency=5.40500045433435E9
SETPARAM: lambda = 0.055466
READPARAM: sensor=SENTINEL-1A
SETPARAM: platform = SENTINEL-1A
READPARAM: range_pixel_spacing=2
READPARAM: near_range_slc=877868.5683539497
READPARAM: sar_to_earth_center=7071106.240524065
READPARAM: earth_radius_below_sensor=6356756.040772353
READPARAM: center_range_slc=877868.5683539497
READPARAM: azimuth_lines=1364
READPARAM: prf=1717.128973878037
Index exceeds matrix dimensions.

Error in ps_load_initial_gamma (line 108)
rg=rgn+ij(:,3)*rps;

Error in stamps (line 263)
ps_load_initial_gamma;
```

- **Command line** running (needs a professional understanding of the software)
- **Non-intuitive** way of parameter setting
- **Difficult to compare** the results retrieved from different methods
- **Switching between software packages** needed to access different processing tools from SAR interferometry to displacement time series analysis



# Developing of new toolbox: EZ-InSAR (Easy-to-use InSAR)



**Aim:** Developing a toolbox with easy-use GUI and open-source for SAR data processing from RAW level to multi-temporal displacement analysis in one flowchart.

## Three-in-one

*Interferometric synthetic aperture radar  
Scientific Computing Environment (ISCE)*

- NASA's Jet Propulsion Laboratory (JPL)
- Processing data from the **RAW level**
- Processing for nearly all SAR sensors

*Stanford Method for  
Persistent Scatterers  
(StaMPS)*

- Selecting pixels with rigorous statistical analysis
- PSI/SBAS processing with 3D phase unwrapping
- Combined (PS+SBAS) processing

*Miami INsar Time-series  
software in PYthon  
(MintPy)*

- 4 type of SBAS processing algorithms
- Various tools for error correction (unwrapping error, solid earth tides correction, & tropospheric error)



# EZ-InSAR (Easy-to-use InSAR)



EZ-InSAR Application (on ses-toba)

Help Quit

**EZ-InSAR**

### EZ-InSAR Paths

Set work directory

#### Preparation of SAR data

Manage data directory

Selection of study area

**Parameters of SLCs**

Mode: S1\_IW Satellites (For S1)  
Path: 125  Sentinel-1 A  
Pass: Descending  Sentinel-1 B  
Date 1: 2015-03-31  
Date 2: 2022-07-29

Check the SLCs Show the SLC list

Check the SLC extension

Download the Sentinel-1 SLCs

#### ISCE Processing

Check the IPF versions

Select the DEM Visualize the DEM

**Selection of the processing:**

SLC stack  
Interferogram stack

Select the best reference date

Pre-run of ISCE processing

**ISCE Steps**

Step 1  
Run the selected step  Parallelisation  
Run all the steps

Geocode the results Visualize the interferograms

#### InSAR Time Series Analysis

StaMPS Processing MintPy Processing

**Selection of InSAR Time Series processor:**

-> StaMPS processor:  
Please, select the "StaMPS Processing" tab.

-> MintPy processor:  
Please, select the "MintPy Processing" tab.

Processing in progress:

Information:  
The SLC list is displayed.

Developed by UCD's team  
Release: 2.0.1 Beta

Data preparation module

ISCE InSAR processor module

InSAR time series analysis module



EZ-InSAR Application (on ses-toba)

Help Quit

**EZ-InSAR**

### EZ-InSAR Paths

Set work directory

### Preparation of SAR data

Manage data directory

Selection of study area

### Parameters of SLCs

Mode: S1\_IW  
Path: 125  
Pass: Descending  
Date 1: 20...  
Date 2: 20...

Satellites (For S...)  
 Sentinel-1 A  
 Sentinel-1 B

Check the SLCs    Show the SLC list

Check the SLC extension

Download the Sentinel-1 SLCs

### Web Map 1 (on ses-toba)

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

### Time Series Analysis

Processing    MintPy Processing

of InSAR Time Series processor:

S processor:  
select the "StaMPS Processing" tab.

processor:  
select the "MintPy Processing" tab.

Processing in progress:

Information:  
The WMS is opened.

Developed by UCD's team  
Release: 2.0.1 Beta



Help Quit

UCD DUBLIN iCRAG IRISH CENTRE FOR RESEARCH IN APPLIED GEOSCIENCES EZ-InSAR Interreg Atlantic Area EUROPEAN REGIONAL DEVELOPMENT FUND EUROPEAN UNION AGEO Platform for Atlantic Geohazard Risk Management

### EZ-InSAR Paths

Set work directory

### Preparation of SAR data

Manage data directory

Selection of study area

### Parameters of SLCs

Mode: S1\_IW Satellites (For S1):  Sentinel-1 A  Sentinel-1 B

Path: 125

Pass: Descending

Date 1: 2015-03-31

Date 2: 2022-07-29

Check the SLCs Show the SLC list

Check the SLC extension

Download the Sentinel-1 SLCs

### Processing in progress:

Information: The SLC list is displayed.

Developed by UCD's team Release: 2.0.1 Beta

#### List of available SLCs (on ses-toba)

```
S1B_IW_SLC__ISDV_20161114T063749_20161114T063816_002951_005024_EC5C 2016-11-14T06:37:49.000000 2016-11-14T06:38:16.000000
S1A_IW_SLC__ISDV_20161120T063822_20161120T063850_014022_0169A7_C234 2016-11-20T06:38:22.000000 2016-11-20T06:38:50.000000
S1A_IW_SLC__ISDV_20161120T063847_20161120T063914_014022_0169A7_39A7 2016-11-20T06:38:47.000000 2016-11-20T06:39:14.000000
S1B_IW_SLC__ISDV_20161126T063749_20161126T063816_003126_00550B_ACCD 2016-11-26T06:37:49.000000 2016-11-26T06:38:16.000000
S1A_IW_SLC__ISDV_20161202T063821_20161202T063848_014197_016F0E_A61E 2016-12-02T06:38:21.000000 2016-12-02T06:38:48.000000
S1A_IW_SLC__ISDV_20161202T063846_20161202T063914_014197_016F0E_B88C 2016-12-02T06:38:46.000000 2016-12-02T06:39:14.000000
S1B_IW_SLC__ISDV_20161208T063748_20161208T063815_003301_005A17_9015 2016-12-08T06:37:48.000000 2016-12-08T06:38:15.000000
S1A_IW_SLC__ISDV_20161214T063821_20161214T063848_014372_0174A8_60B1 2016-12-14T06:38:21.000000 2016-12-14T06:38:48.000000
S1A_IW_SLC__ISDV_20161214T063846_20161214T063914_014372_0174A8_E4C2 2016-12-14T06:38:46.000000 2016-12-14T06:39:14.000000
S1B_IW_SLC__ISDV_20161220T063748_20161220T063815_003476_005F05_1C35 2016-12-20T06:37:48.000000 2016-12-20T06:38:15.000000
S1A_IW_SLC__ISDV_20161226T063821_20161226T063848_014547_017A0E_DA82 2016-12-26T06:38:21.000000 2016-12-26T06:38:48.000000
S1A_IW_SLC__ISDV_20161226T063845_20161226T063913_014547_017A0E_FD13 2016-12-26T06:38:45.000000 2016-12-26T06:39:13.000000
S1B_IW_SLC__ISDV_20170101T063746_20170101T063813_003651_00642B_2356 2017-01-01T06:37:46.000000 2017-01-01T06:38:13.000000
S1A_IW_SLC__ISDV_20170107T063819_20170107T063847_014722_017F65_9978 2017-01-07T06:38:19.000000 2017-01-07T06:38:47.000000
S1A_IW_SLC__ISDV_20170107T063845_20170107T063912_014722_017F65_DE86 2017-01-07T06:38:45.000000 2017-01-07T06:39:12.000000
S1B_IW_SLC__ISDV_20170113T063746_20170113T063813_003826_006945_B4CF 2017-01-13T06:37:46.000000 2017-01-13T06:38:13.000000
S1A_IW_SLC__ISDV_20170119T063818_20170119T063846_014897_0184D9_99E3 2017-01-19T06:38:18.000000 2017-01-19T06:38:46.000000
S1A_IW_SLC__ISDV_20170119T063844_20170119T063911_014897_0184D9_9CF4 2017-01-19T06:38:44.000000 2017-01-19T06:39:11.000000
S1B_IW_SLC__ISDV_20170125T063746_20170125T063813_004001_006E85_F326 2017-01-25T06:37:46.000000 2017-01-25T06:38:13.000000
S1A_IW_SLC__ISDV_20170131T063818_20170131T063846_015072_018A2A_77A6 2017-01-31T06:38:18.000000 2017-01-31T06:38:46.000000
S1A_IW_SLC__ISDV_20170131T063844_20170131T063911_015072_018A2A_AF39 2017-01-31T06:38:44.000000 2017-01-31T06:39:11.000000
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S1B_IW_SLC__ISDV_20170314T063745_20170314T063812_004701_008340_7CD2 2017-03-14T06:37:45.000000 2017-03-14T06:38:12.000000
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S1B_IW_SLC__ISDV_20170407T063746_20170407T063813_005051_008D50_D931 2017-04-07T06:37:46.000000 2017-04-07T06:38:13.000000
S1A_IW_SLC__ISDV_20170413T063818_20170413T063845_016192_01A1A7_2017 2017-04-13T06:38:18.000000 2017-04-13T06:38:45.000000
```



EZ-InSAR Application (on ses-toba)

Help Quit

**EZ-InSAR**

### EZ-InSAR Paths

Set work directory

### Preparation of SAR data

Manage data directory

Selection of study area

### Parameters of SLCs

Mode: S1\_IW Satellites (Sentinel-1)

Path: 125  Sentinel-1

Pass: Descending  Sentinel-1

Date 1:

Date 2:

Check the SLCs Show the SLCs

Check the SLC extension

Download the Sentinel-1 SLCs

### Processing in progress:

Display the extension of SLCs ...

0% 99.9%

### Coverage of SLCs (on ses-toba)

File Edit View Insert Tools Desktop Window Help

56°N  
55°N  
54°N  
53°N

10°W 8°W 6°W 4°W 2°W

Longitude

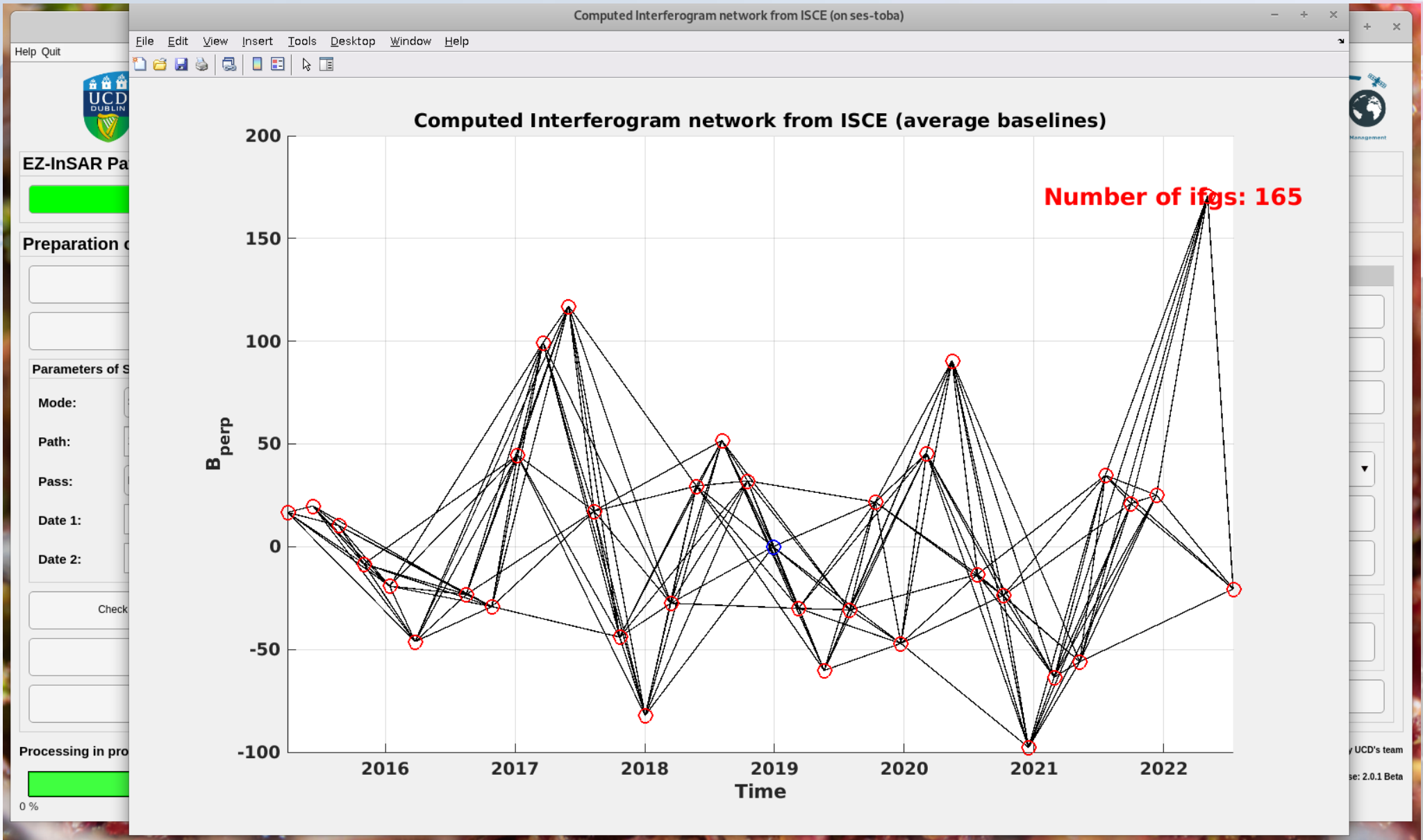
Latitude

50 km  
50 mi

Earthstar Geographics

Developed by UCD's team

Release: 2.0.1 Beta



Help Quit
EZ-InSAR Application (on ses-toba)

**Parameters for StaMPS processing (on ses-toba)**

**Preparation**

Mode:

Path:

Pass:

Date 1:

Date 2:

Check

**SBAS approach**

**Step 2: Estimate Noise Phase**

max_topo_err	20	clap_alpha	1
filter_grid_size	50	clap_beta	0.3
filter_weighting	P-square	gamma_change_converg	0.005
clap_win	32	gamma_max_iterations	3
clap_low_pass_wavelen	800		

**Step 3: PS selection**

select_method	DENSITY	percent_rand	1
density_rand	2		

**Step 4: PS weeding**

weed_standard_d	1.5	weed_time_win	730
weed_max_noise	Inf		

**Step 5: Phase correction**

merge_resample_size	25	merge_standard_	Inf
---------------------	----	-----------------	-----

**Step 6: Phase unwrapping**

unwrap_method	2D	unwrap_gold_n_	32
unwrap_prefilter	y	unwrap_time_wi	730
unwrap_patch_p	n	unwrap_gold_alpha	0.8
unwrap_grid_size	50	unwrap_hold_good_valu	n

**Step 7: Estimate spatially-correlated look angle error**

scla_drop_index		sb_scla_drop_ind	
scla_deramp	y		

**Drop Parameter**

drop\_ifg\_index

**Tropo Correction**

subtr\_tropo

tropo\_method

**Reference Parameters**

ref\_centre\_lonlat

ref\_lat

ref\_lon

ref\_radius

ref\_velocity

**Computation Parameter**

n\_cores

**Validation**

**Default values**

**Processing in progress:** StaMPS Processing: SBAS **Information:**

It seems that the StaMPS SBAS processing is done.


0 % 100.0%

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Help Quit



**icf**  
IRISH CENTRE FOR  
IN APP

### EZ-InSAR Paths

Set work dire

### Preparation of SAR data

Manage data dire

Selection of study

### Parameters of SLCs

**Mode:** S1\_IW

**Path:** 125

**Pass:** Descending

**Date 1:**

**Date 2:**

Check the SLCs

Check the SLC ex

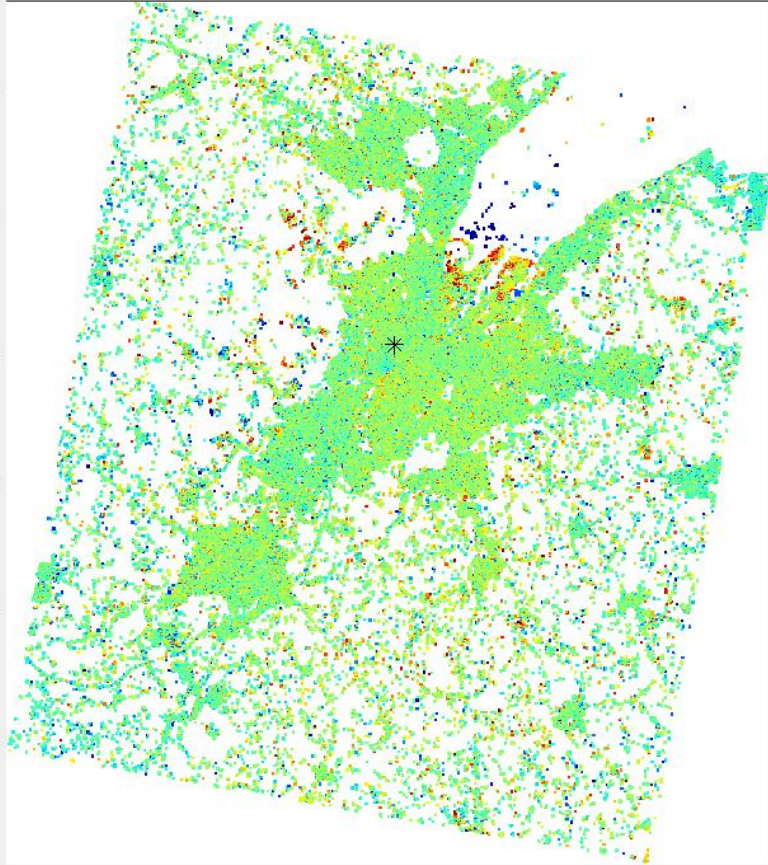
Download the Sentin

### Processing in progress:

0%

Figure 1: v-do (on ses-toba)

File Edit View Insert Tools Desktop Window Help



5.9

mm/yr

-5.7

54.7

54.65


54.6

54.55

54.5

54.45

-6.2 -6.15 -6.1 -6.05 -6 -5.95 -5.9 -5.85 -5.8 -5.75 -5.7



Atlantic Geohazard Risk Management

### approach

network

interferograms

aration

parameters

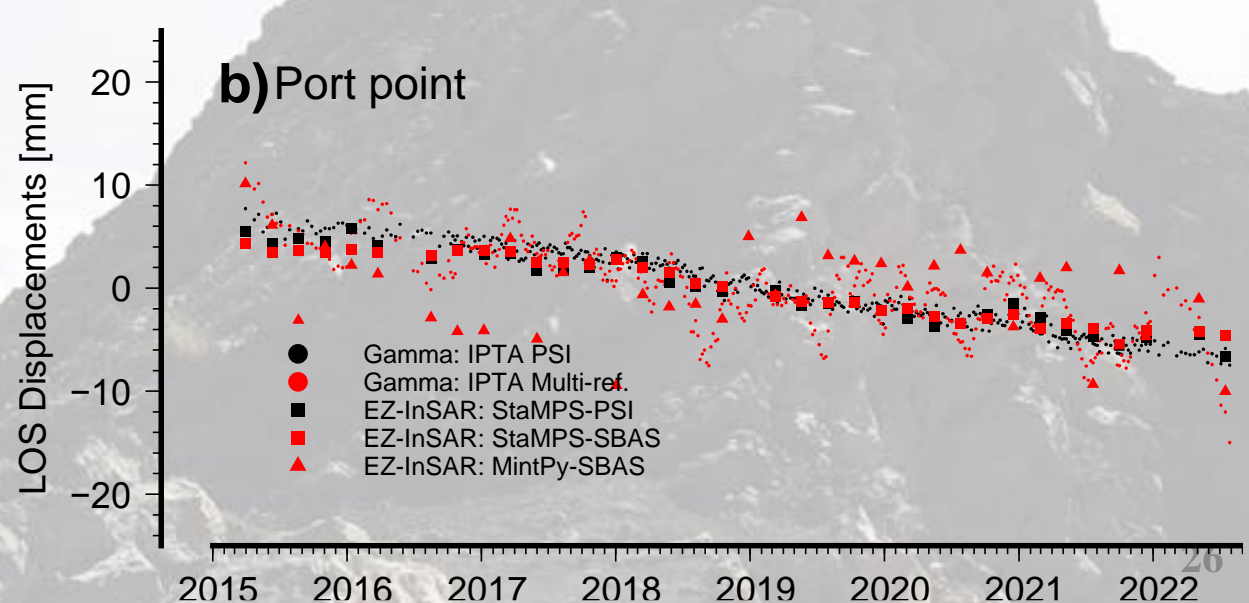
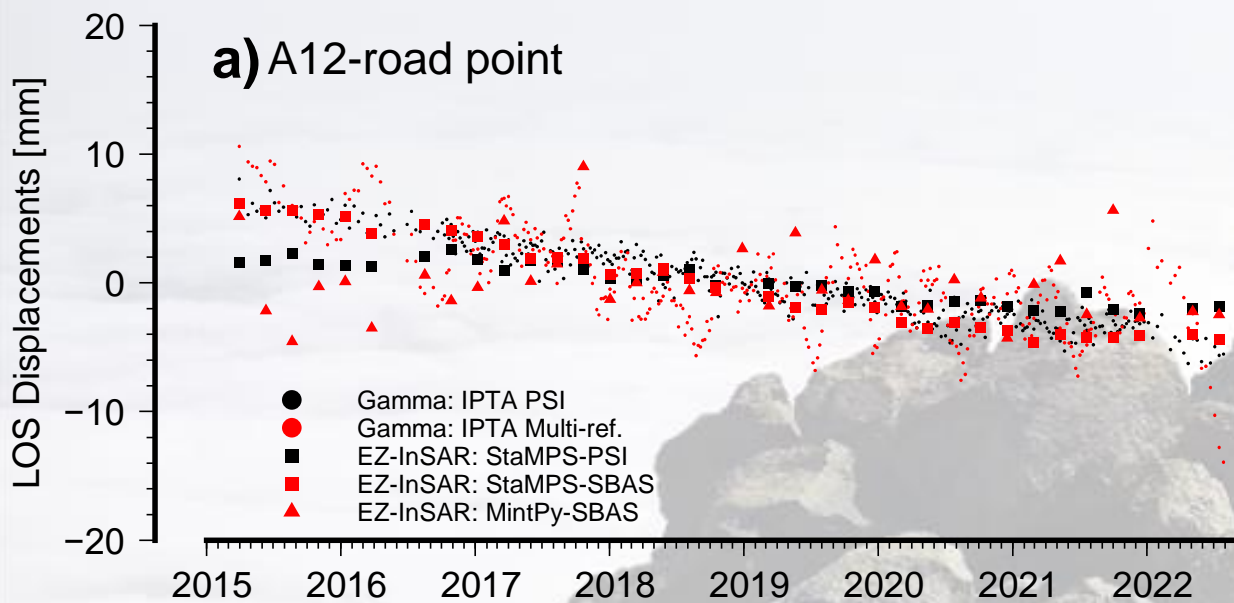
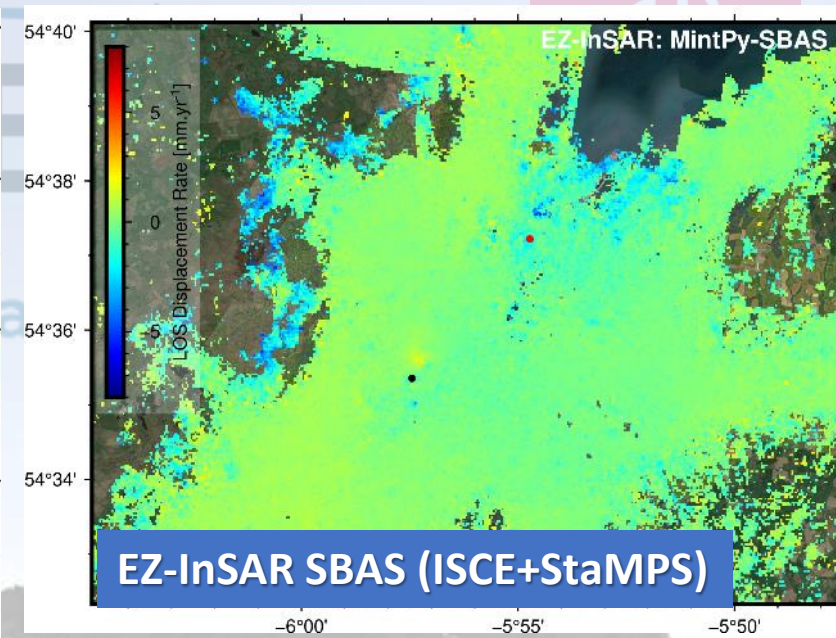
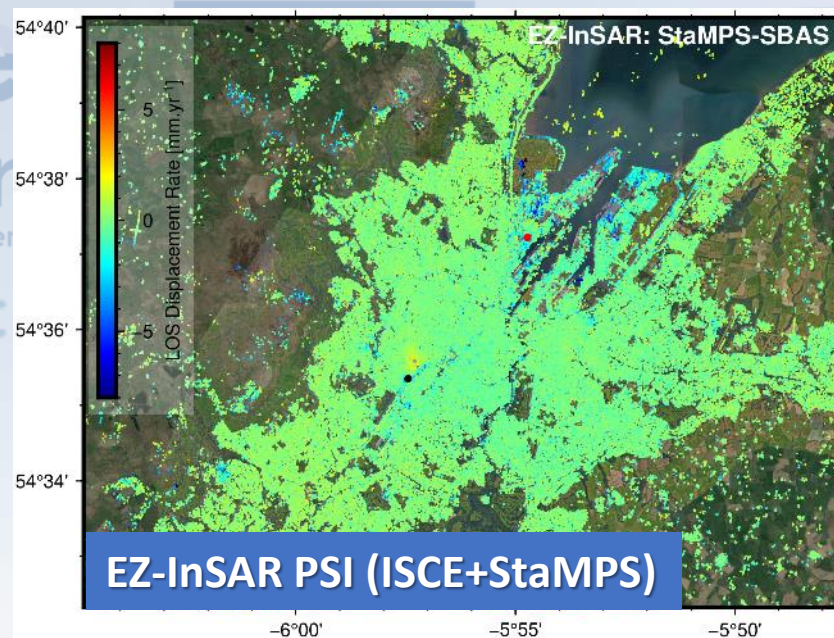
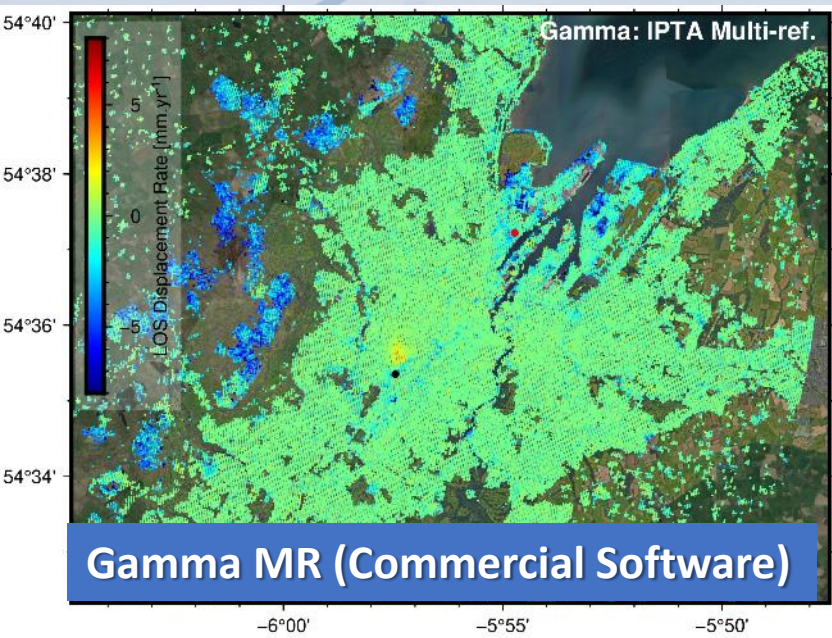
tun

Developed by UCD's team

Release: 2.0.1 Beta

# EZ-InSAR (Easy-to-use InSAR)

## Results on Belfast



# Why use EZ-InSAR?

## Complementary to European Ground Motion Service:

- **Bespoke processing** for your area of interest
- **Higher spatial resolution** (potentially) → EGMS at 100m resolution
- **More up-to-date time series** → EGMS updated only annually – data are 18 months out of date already)

## Compared to Commercial or Open-source Software:

- **It is FREE!** (Matlab license needed currently to run it, but development to Python is our ambition)
- **It is easy to use!**



The screenshot shows the GitHub repository page for 'alexisInSAR / EZ-InSAR'. The repository is public and has 16 commits. The file list includes: EZINSAR\_BIN (Add files via upload), LICENSE (New version), README.md (Update README.md), and startup.m (New version). Below the file list, the README.md content is visible, featuring the EZ-InSAR logo (a globe with a satellite) and the URL <https://github.com/alexisInSAR/EZ-InSAR>.

The screenshot shows the Springer Link article page for 'EZ-InSAR: An easy-to-use open-source toolbox for mapping ground surface deformation using satellite interferometric synthetic aperture radar'. The article is published in 'Earth Science Informatics' (2023) and is available under Open Access. The authors listed are Alexis Hrysiwicz, Xiaowen Wang, and Eoghan P. Holohan. The article has 531 accesses and a metrics link is provided.



- ✓ **European Open Data platforms** → advance geohazards knowledge based on characterisation and time series
- ✓ **Copernicus EMS** → many components & possibilities to improve risk management.
- ✓ **EZ-InSAR, AGEO App & AGEO Citizen Observatory Platform** → new tools developed in AGEO for user tailored geohazard monitoring
- ✓ **Citizens Observatories** → can take advantage of many freely available spatial data infrastructures for geohazard monitoring



# Platform for Atlantic Geohazard Risk Management

Thank you for your attention

