



Committee on Earth Observation Satellites

Recovery Observatory (RO)

Haiti Hurricane Matthew RO Status and Next Steps

Presentation to WGD #11
Athens March 5th, 2019

Agwilh Collet, Helene de Boissezon, CNES

Jens Danzeglocke, DLR

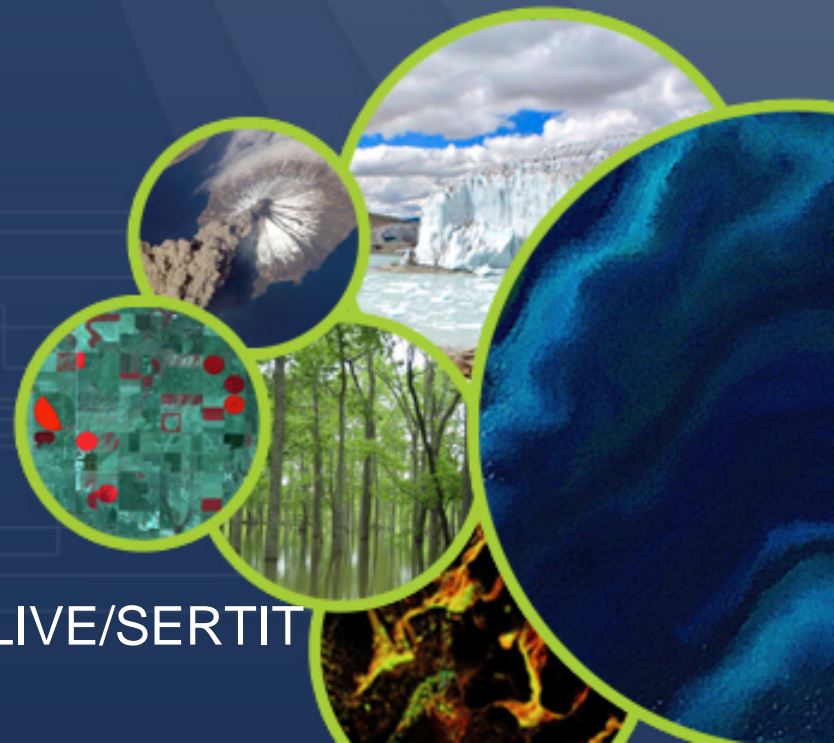
Deodato Tapete, Francesca Cigna, ASI

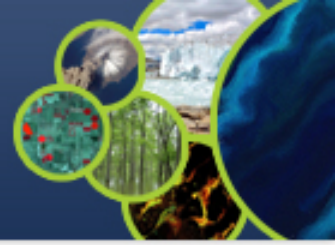
Jean Philippe Malet, CNRS / EOST

Enrico Ponte, CIMA

Andrew Eddy, RO Secretary

with contributions of Copernicus, WB Haiti, LIVE/SERTIT





□ Haiti Recovery Observatory

- Key elements since WGD10
- Mission : December 2018 training
- Next Mission : User Workshops #3
- CNES activities with LIVE / SERTIT
- EOST Terrain Motion products
- DLR / ASI – Terrain motion products
- Copernicus EMS R&R next activation
- Links WB Haiti Les Cayes, Nippes
- Next Steps

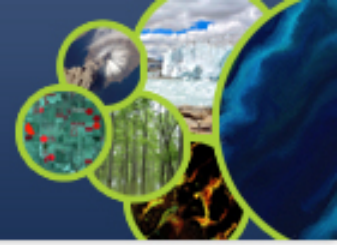


Hurricane Matthew
in Haiti
Oct 4th 2016

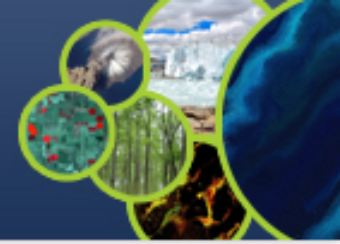
A Reminder of Haiti's diversity

- **Triggering of the RO by CEOS Chair - December 22, 2016**
- **Mission #1 to Haiti - end January 2017** Definition of activities in Haiti
- **Mission #2 to Haiti 29 May – 2 June 2017** 1st RO users workshop
- **Mission #3 to Haiti 5 Dec - 8 Dec 2017** technical review , link universities
- **Mission #4 to Haiti 8 – 11 Mai 2018** 2nd User Workshop (PàP + Les Cayes)
- **Mission #5 to Haiti 10 – 14 dec 2018** technical review, training

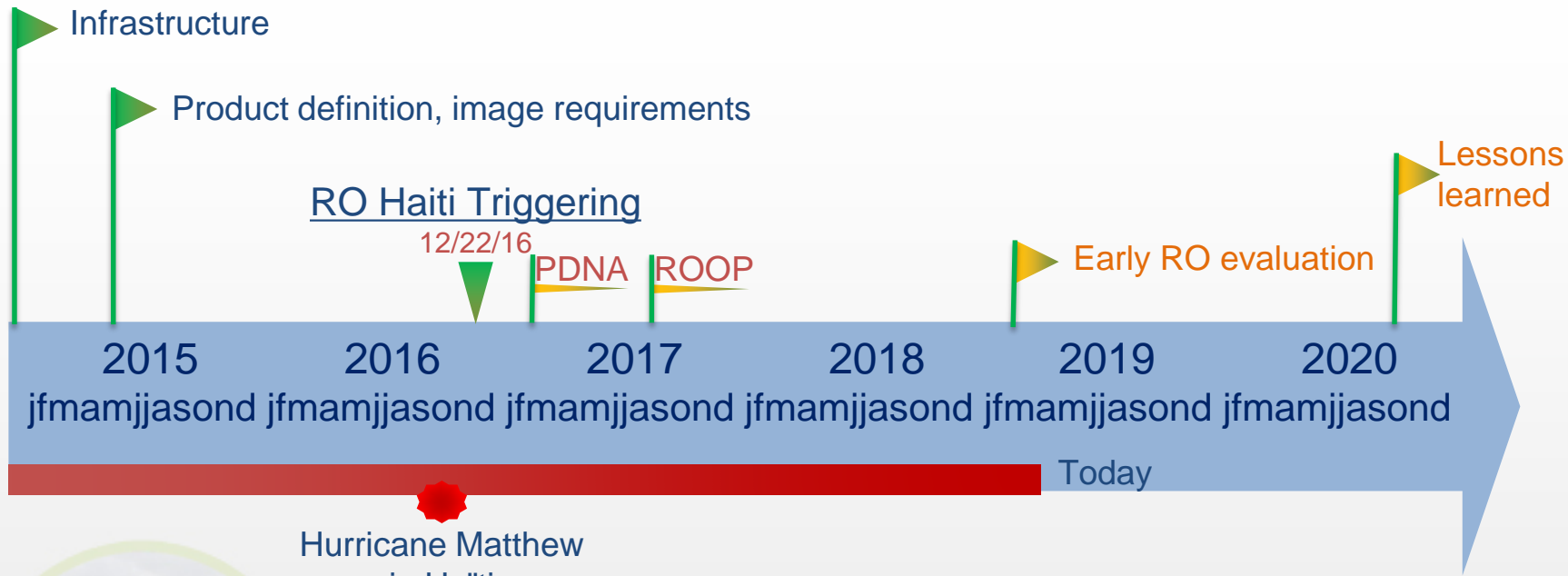
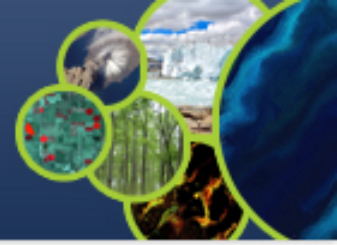
Haiti RO covers three departments: Grand'Anse, Sud, and Nippes



- Signature of the **CNIGS/CNES MOU**
- Continued **engagement of space agencies** (ASI, CNES, DLR, ESA, NASA, NOAA)
- Last release of the **Copernicus Risk and Recovery** products
- Work on the **Capacity Development Plan**
- Writing the **Thematic Products Development Plan**
- A **mission in Haiti** with **extensive training on the first products delivered**: cap building, technical work, feedback
- Holding the **Steering Committee # 4**
- Launch of the **Generic-RO ad hoc team**
- Links with **WB Haiti post Matthew projects**: Les Cayes & Nippes (on going)
- Preparing **LPS2019** and **WRC#4**
- Working on a super site CEOS / GEO proposal in geophysical hazards / landslide : medium term activity, TBC



Produit	Utilisateur-clef	Elaboration	Données satellites
Buildings	CIAT/ Planning Ministry	SERTIT, Copernicus EMS	Pléiades, WV
Land Use	ALL	CNIGS/CNES	Orthophotos, Sentinel-2
Forest	ONEV /Environnement Ministry	Copernicus EMS	S2, Spot 6/7, Optique THR
Agriculture	Agriculture Ministry	Copernicus EMS	Sentinel-2, Spot 6/7
Macaya Park Monitoring	ANAP / ONEV / Env. Min.	Copernicus EMS SERTIT	Spot 6/7, Pléiades
Watershed / Flood	ONEV/ Agriculture Ministry	CIMA Foundation	MNT 1m/20cm and radar THR
Terrain Motion / Mining quarries	BME / Public Work Ministry	EOST, ASI	CSK, Pléiades, Spot6/7
Vector Borne Disease risk	Heath Minister/ OMS	NOAA	L8, Images NOAA + statistic needs
Air pollution	ONEV / Ministère Santé	NASA	S5P Tropomi Interest pronounced



Hurricane Matthew
in Haïti
10/04/16

Malawi, Nepal
Demonstrators

Missions to Haiti
(2 to 3 per year)

External Mission



Technical Rev. Formation

1st
31 Jan – 3 Feb

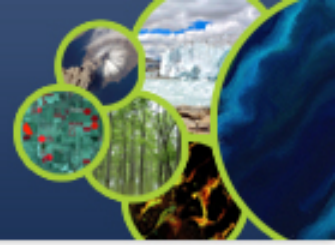
5-8 Dec

10-14 Dec

1st User Workshop
29 May – 2 June

2nd User Workshop
8 – 11 May

Generic RO
WB + UNDP DC

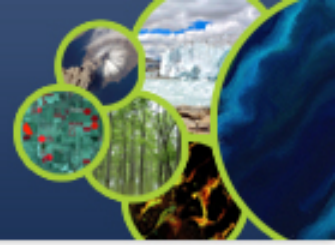


First Capacity Building Mission- 10/14 December 2018

- About 8/10 participants by thematic :
 - Urban and peri-urban
 - Forest and Macaya Park
 - Mangrove
 - Agriculture
 - Coastline
 - Land Use
- Based on deliveries of Copernicus (EC) and CNES RO products
- Clear involvement of local actors in support of the project
- Identification of training needs and capacity development on Radar (ASI/CIMA) and about enhanced Land Use classification.
- Identification of needs for new version of Copernicus RRM products
- **4th Steering Committee** held at the end of the week

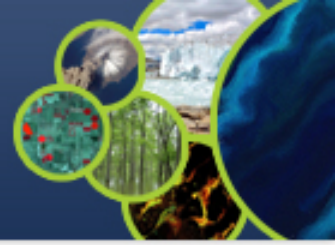


Supported by cartographic products



Third Workshop at Port au Prince and Jérémie – April 29 – Mai 3

- 2 workshops, held in Jeremie and Port au Prince
 - 1 days in Jeremie
 - o Involvement of local actors, identification of new needs (capacity development)
 - o Awareness of project objectives, analysis of products (printed maps)
 - 2 days in Port au Prince
 - o Analysis of new products
 - o Update on all topics
 - 5th Steering Committee
 - Beginning of RO evaluation reporting
- 4 days of Field mission Haiti/ASI/CNES for land use and landslide thematic
- Academic training by CNES/ASI with URGeo (Haiti state university)
- New product needs refinement – NASA : Air quality



Planned events in 2019 :

- **LPS 2019 : Session 15th May**

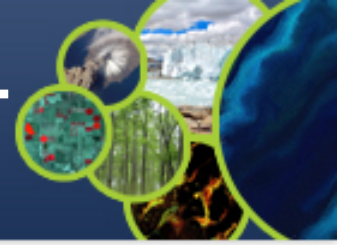
- Presentation of RO by Haitian partners (CNIGS)
- Urban, Forestry RO Products (CNES/SERTIT)
- Landslides RO optical products (EOST)
- Landslides RO SAR products (ASI/CIMA)
- Agriculture WB Les Cayes/RO (TeleScop)

- **WRC#4 : 13/14 th May Geneva**

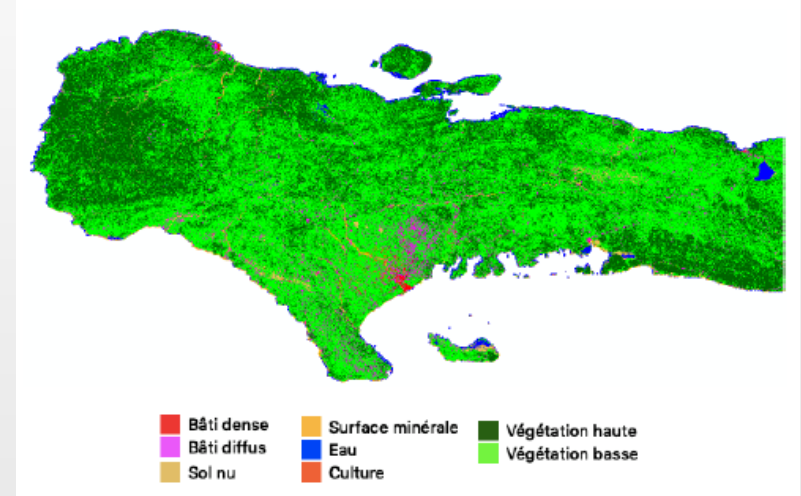
- CNES/WB to co-chair a session «**Facilitating Recovery and Inclusion through Satellite EO Technology**», including RO Haiti, UNOSAT and other TBD (Lao, Indonesia)
- Planned agenda :
 - Presentation of RO by Haitian partners (CNIGS)
 - Presentation of UNOSAT activities (PDNA and other)
 - Presentation of Generic RO reflection

UR2018 last Year ...

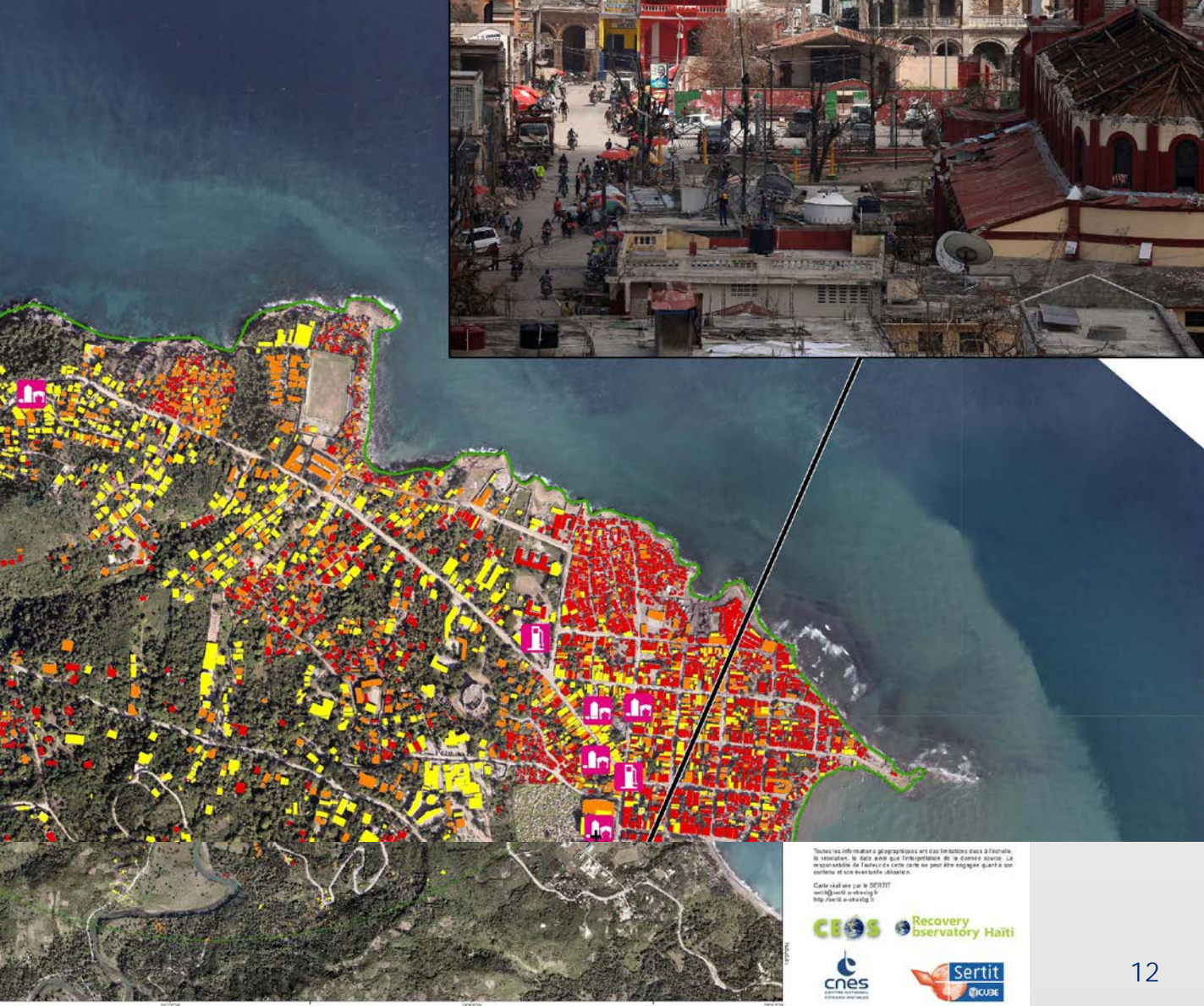
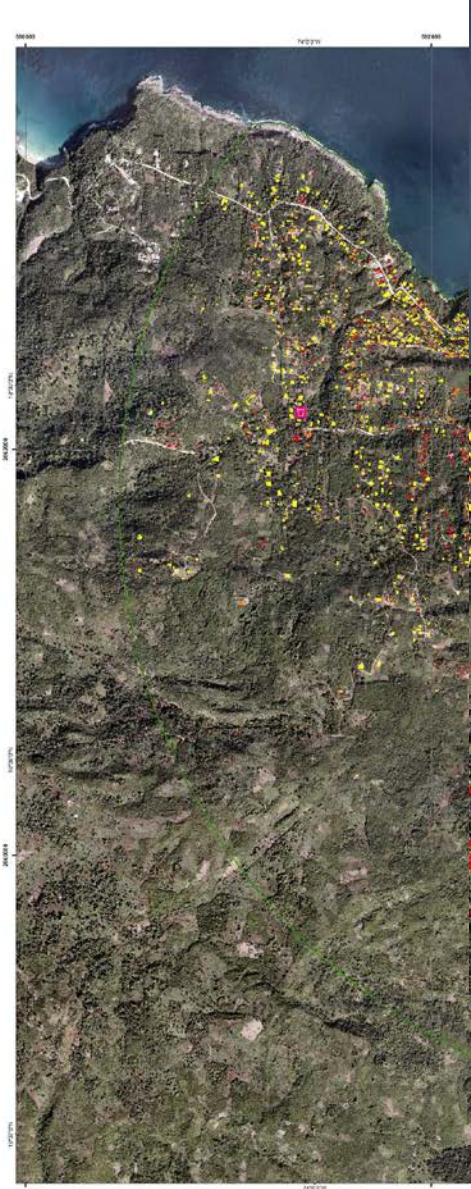




- Following Internship CNES :
 - Training on IOTA2 chain on Haiti for land use with S2 on going (first step last December)
 - Next Step : Haitian partners running chain on CNES server
 - Improvement of adaptability of the chain on Haiti by UNISTRA student (will be presented at LPS19) taking into account the eco-climatic zones.

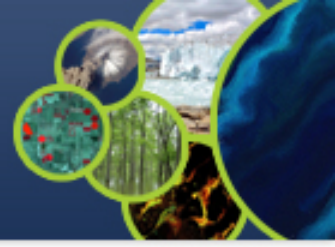


- SERTIT activities :
 - Monitoring Anthropogenic impact (feasibility study): Macaya Park
 - Enhanced building maps integrating users feedback (see next slide)



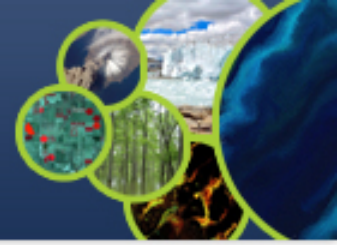
Toutes les informations géographiques ont des limitations dues à l'échelle, la résolution, le date ainsi que l'interprétation de la donnée source. La responsabilité de l'usage de cette carte ne peut être engagée quant à son contenu et son éventuelle utilisation.

Carte réalisée par le DFRTT
www.dfgttt.haiti
<http://www.irs-obs.org/>



EOST RO activities on landslides : JP Malet





ASI's scientific goal → To develop experimental scientific products tailored to obtain useful information on ground stability and motions for target areas of the RO

Sentinel-1 InSAR processing within ESA Geohazards Exploitation Platform (GEP)

✓ Consolidated activities

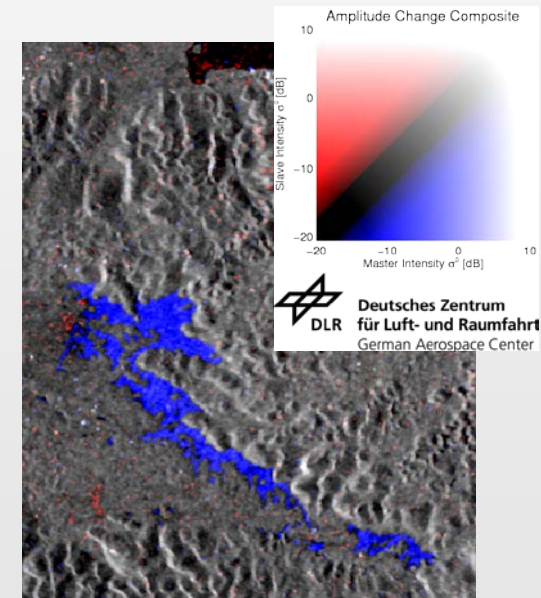
- SNAP InSAR to generate interferograms, coherence maps, amplitude change maps from pairs of Sentinel-1 TOPS IW data
- DLR's Sentinel-1 Medium Resolution InSAR service, systematic generation of InSAR products based on pairs of Sentinel-1 TOPS IW data [*products for Haiti only since Feb 2017*]

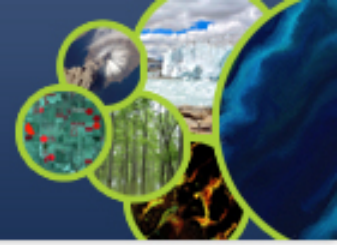
✓ News

- **Nov 2018:** Qualified Haiti as target area for DLR's Sentinel-1 High Resolution InSAR service – **systematically producing high resolution interferograms, coherence and change maps**
- **Feb 2019:** received access to TRE-ALTAMIRA's advanced InSAR service for Sentinel-1 TOPSAR IW time series to **identify persistent scatterers (PS) and estimate motion velocities**

✓ Next steps

- P-SBAS to be released to project by GEP team (*due in Feb 2019*)
- SNAP+StaMPS combined service (*release date TBC*)



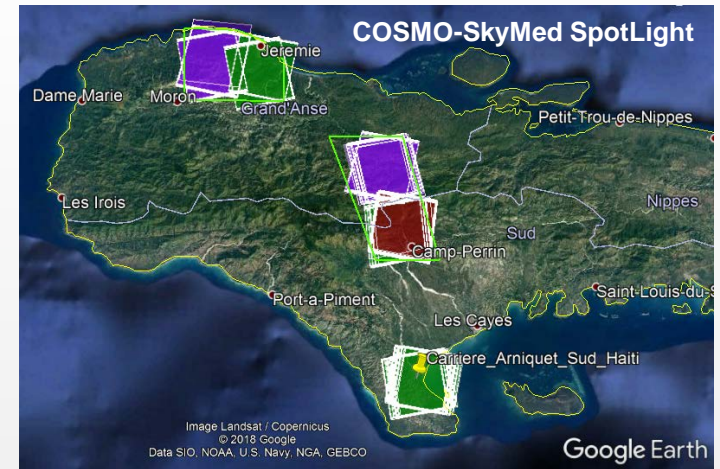


ASI's scientific goal → To develop experimental scientific products tailored to obtain useful information on ground stability and motions for target areas of the RO

COSMO-SkyMed campaign with VHR X-band SAR

✓ Consolidated activities

- 3-year long bespoke campaign over 3 hotspots with COSMO-SkyMed SpotLight at 1 m resolution started in Dec 2017 – now **more than 250 scenes acquired, i.e. > 25 scenes per stack** (enough for PS/SBAS!)
- COSMO-SkyMed data regularly uploaded in GEP



✓ Next steps

- **GEP processing services for COSMO-SkyMed and TerraSAR-X are needed**
- BRGM, ESA & Terradue are developing SNAP COSMO-SkyMed StripMap service – *release date TBC* (but currently **NOT** planned for COSMO-SkyMed SpotLight)
- SNAP archetype (to be developed), DORIS or other tools for TerraSAR-X? – *release date TBC*
- P-SBAS service for COSMO-SkyMed – *feedback from ESA discussions with IREA-CNR?*
Can this be included in the Geohazards Lab agenda?

ASI's scientific goal → To develop experimental scientific products tailored to obtain useful information on ground stability and motions for target areas of the RO

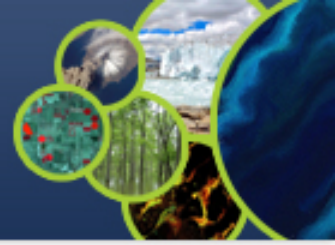
Other research and dissemination activities

✓ Data analysis and ground truth

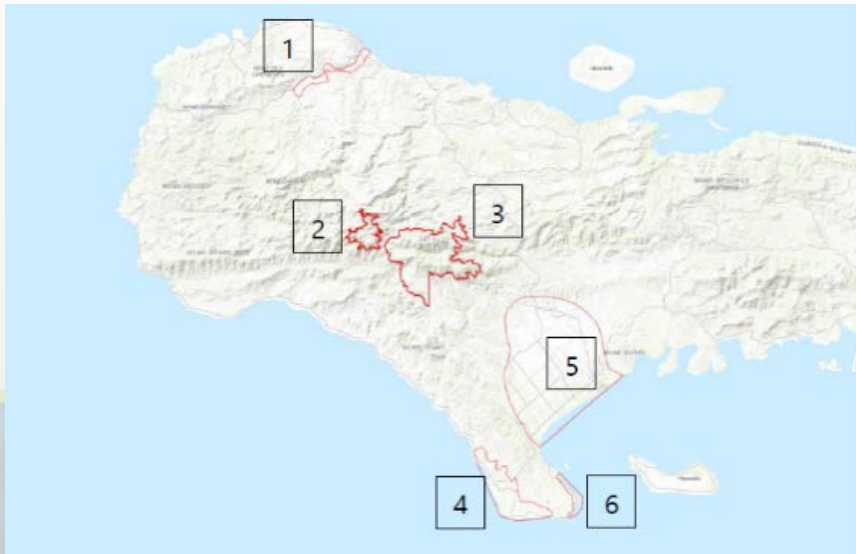
- Offline analysis of COSMO-SkyMed and TerraSAR-X data is ongoing i.e. analysis outside GEP, due to current unavailability of InSAR services for X band data (*see previous slide*)
- Technical field mission in Haiti will be carried out in Apr-May 2019, led by CNES

✓ Dissemination and capacity building

- Presentation of GEP trials at ESA Φ-week EO Open Science event (**Nov 2018**)
- Presentation at ESA Living Planet Symposium (May 2019), in collaboration with Geohazards Lab
- Future training of Haitian partners to use GEP with Sentinel-1 data, and possibly X-band imagery by COSMO-SkyMed and TerraSAR-X (*provided development of services – see previous slide*)



- EMSN051 “ Environment” new Release (V2) and publication on website.
Area : Macaya Park, Port Salut, Les Cayes, Jérémie, Pointe Abacou and Costal line.



- Agricultural activities
- Coastal Line evolution
- Macaya Park classification and monitoring forest damage
- Mangrove monitoring

- The goal for CNIGS/CIAT/ONEV will be to ask for **another RRM activation at mid 2019** (confirmation of needs last December) on two products :
 - **Agricultural activities**
 - **Macaya Park** land use map and monitoring forest damage



Glide Number: (N/A) Activation ID: DMGR/05
Product N: GDMAR/EA/ST_V2_Englis

Makaya Park (East) - HAITI
Vegetation - 23/12/2016
Damage Assessment Map - Overview



Cartographic Information
1:25 000 Full color A1, high resolution (300dpi)
Full color A1, high resolution (300dpi)

- Legend**
- Damage assessment of forest stands**
 - Partially damaged
 - Damaged
 - Not Analyzed
 - Vegetation classification**
 - Woodland
 - Shrub
 - Herbaceous vegetation
 - Open areas with little or no vegetation
 - Area of interest**
 - Area of interest
 - Administrative boundary**
 - Region
 - Province
 - Physiography**
 - Spot Elevation Point
 - Elevation Contour (m)
 - Transport network
 - Local road

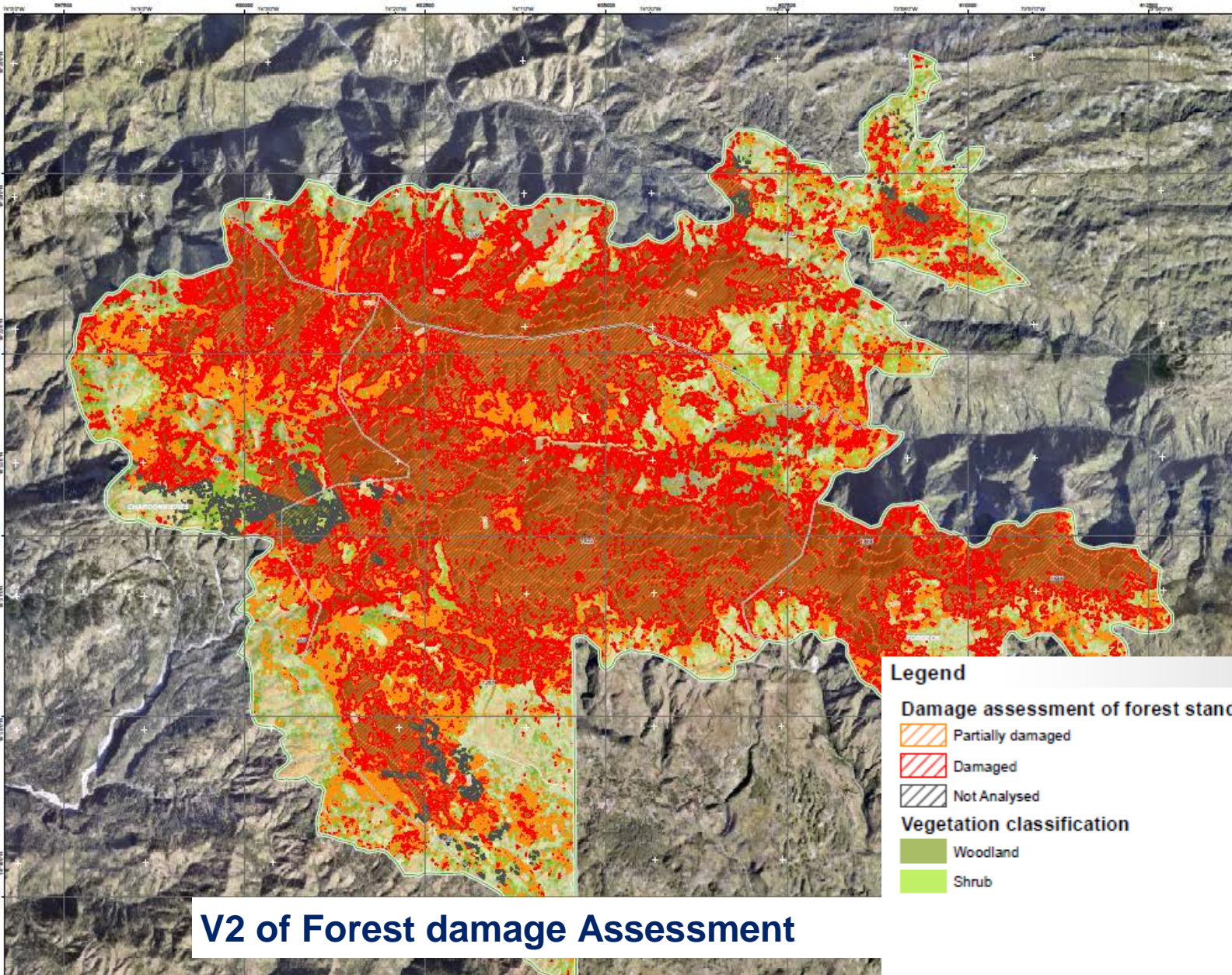
Map Information

This project was created using data from the Emergency Management Service Map 3 Recovery activation (EMSR/03/15). This map was created on 23/12/2016. The data was collected from satellite imagery acquired in 2010. The map was created using the Emergency Management Service Map 3 Recovery activation (EMSR/03/15). The map was created using the Emergency Management Service Map 3 Recovery activation (EMSR/03/15). The map was created using the Emergency Management Service Map 3 Recovery activation (EMSR/03/15).

Product name and title	Version	Revision	Product ID
Map	04/03/2016	001	04/03/2016
Map production	04/03/2016	001	04/03/2016

Data Sources

Map: High resolution satellite imagery (Sentinel-1, Sentinel-2, Landsat-8, etc.)
 Administration: Administrative boundaries (EMSR/03/15)
 Physiography: Spot Elevation Points (EMSR/03/15), Elevation Contours (EMSR/03/15)
 Road Network: Road Network (EMSR/03/15)



V2 of Forest damage Assessment

- Legend**
- Damage assessment of forest stands**
 - Partially damaged
 - Damaged
 - Not Analyzed
 - Vegetation classification**
 - Woodland
 - Shrub
 - Area of interest**
 - Area of interest
 - Administrative boundary**
 - Region
 - Province
 - Physiography**
 - Spot Elevation Point
 - Elevation Contour (m)
 - Transport network
 - Local road

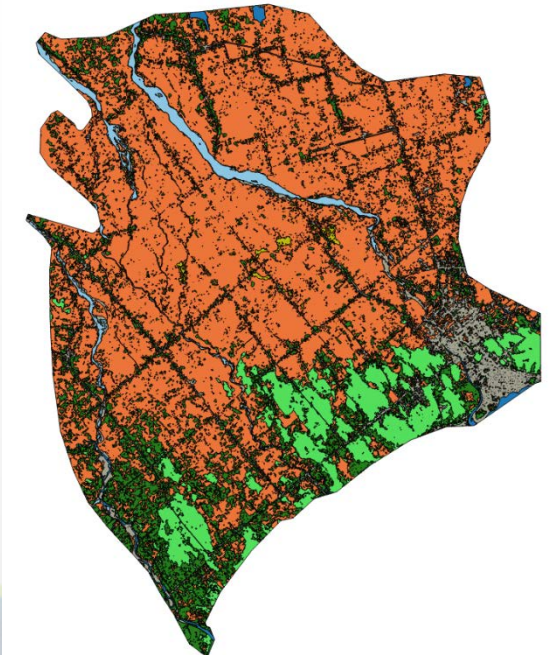
Consequences within the AOI

	Unit of measurement	Damaged	Partially damaged	Not analyzed	Total affected	Total in AOI
Land use	Woodland	ha	3925,8	684,3	94,5	4810,1
						4704,8

WB Haiti - Les Cayes Agriculture

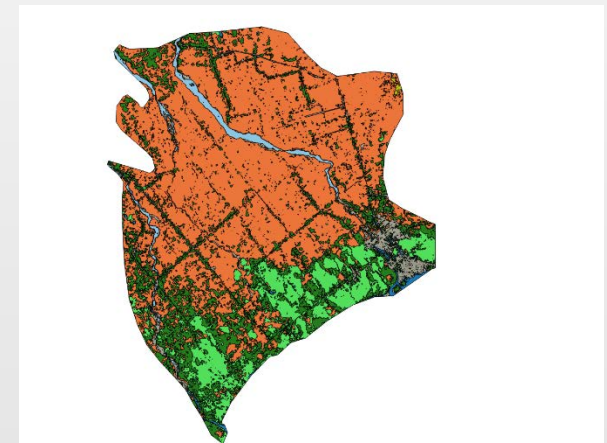
Links with a recent WB « post Irma » agriculture study in Les Cayes

- Using Matthew hurricane as case study :
- How does Climate Change impact agriculture?
- Understand local impact of Climate Change
- Pioneering work on how one could make a sustainable plain irrigation system

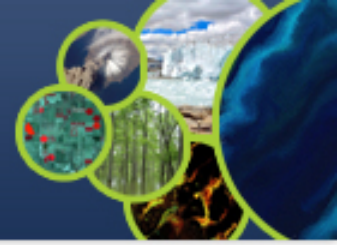


Status on 2018

Exchanges of Data (satellite images / ground observations) and sharing results



Stats on 2014

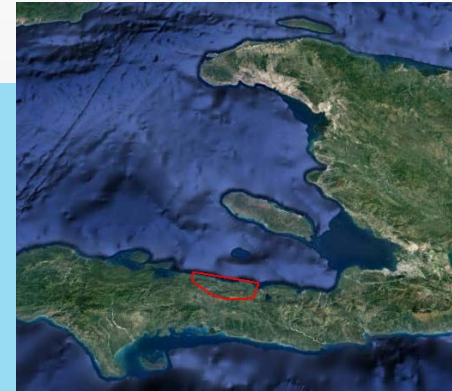
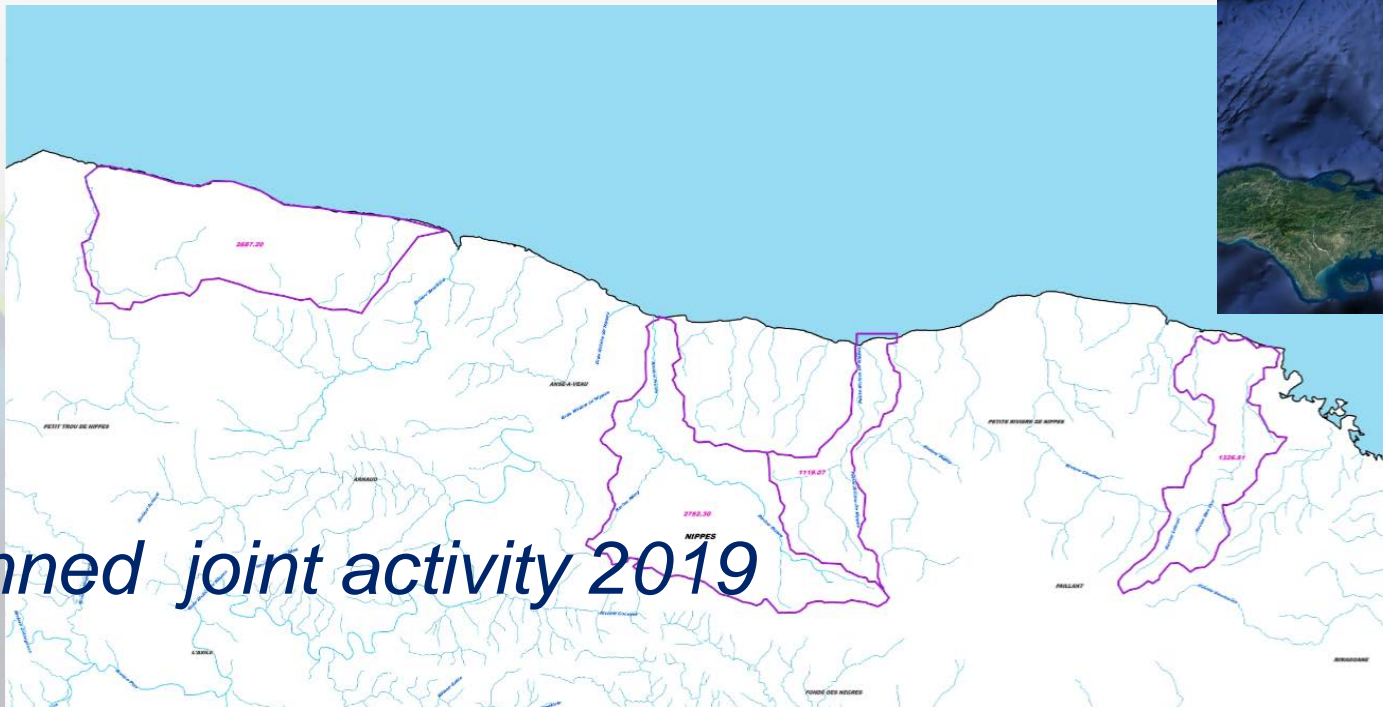


WB Haiti - Nippes

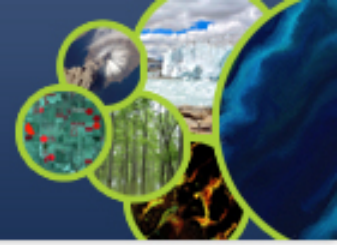
Links with a new WB agroforestry study in Nippes

- 3 Watershed to be analysed : Baconnois, Bondeau and Rivière Froide.
- Capacity building plan to be made

Goal : Exchanges of Data (satellite images / ground observations) and sharing results



Planned joint activity 2019



Jan - Sept 2017 – Haiti RO Definition

RO post Matthew definition mission with local authorities and WB

First Users Workshop RO

MOU discussions between Haitian users (lead CNIGS) and CNES

Implementation of the IT infrastructure

Oct 2017- End of 2018 – Start-Up Haiti RO

Incorporation of the first RO products in the infrastructure

User Animation: Technical Seminar, 2nd Workshop (Local, PAP)

Development of a “capacity building plan” and of a “thematic products plan”

RO Products validation by Haitian users

2019 - 2020 – Haiti RO Operations – Definition and specification of Generic RO

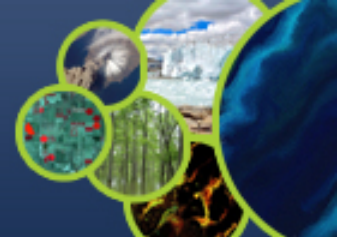
Haiti RO "early evaluation" ; report to Steering Committee and WB / UN / UE / CEOS

Users Workshop May 2019 Final Users Workshop 2020

Regular images acquisitions and product generation, infrastructure updates, community animation, capacity building setting up

Preparation of the closing of the RO Haiti, evaluation and transfer strategies

Analysis of RO Haiti to derive Generic RO specifications



Thank you
Merci
Mesi