Committee on Earth Observation Satellites

Recovery Observatory (RO)

Haiti Hurricane Matthew RO Status and Next Steps

Presentation to WGD #12
Reykjavik September 25, 2019

A Collet, H de Boissezon, Catherine Proy, CNES
Jens Danzeglocke, DLR
Deodato Tapete, Francesca Cigna , ASI
Jean Philippe Malet, CNRS / EOST
Anne Puissant, CNRS/LIVE
Enrico Ponte, CIMA
Andrew Eddy, RO Secretary
with contributions of CNIGS, Copernicus, WB Haiti

Outline

- **Haiti Recovery Observatory**
  - Progress in 2019
  - Capacity Building
  - Early Evaluation Report
  - Legacy planning and wrap-up

RO Haïti Status Overview

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 #5 to Haiti 10 – 14 Dec 2018** technical review, training
- **Mission #6 to Haiti 26 Apr - 4 May 2019** 3th User Workshop (PàP + Jérémie)

Key elements since Last WGD mtg

- **User Workshops** and **Field Mission** in April/May 2019
- Holding the **Steering Committee # 5**
- Continued **engagement of space agencies** (ASI, CNES, DLR, ESA, NASA, NOAA) for data provision and value adding products
- New **Copernicus Risk and Recovery Mapping** activations
- Finalization of the RO **Capacity Development Plan**
- **LPS-2019** and **WRC#4/Global Platform UNDRR**

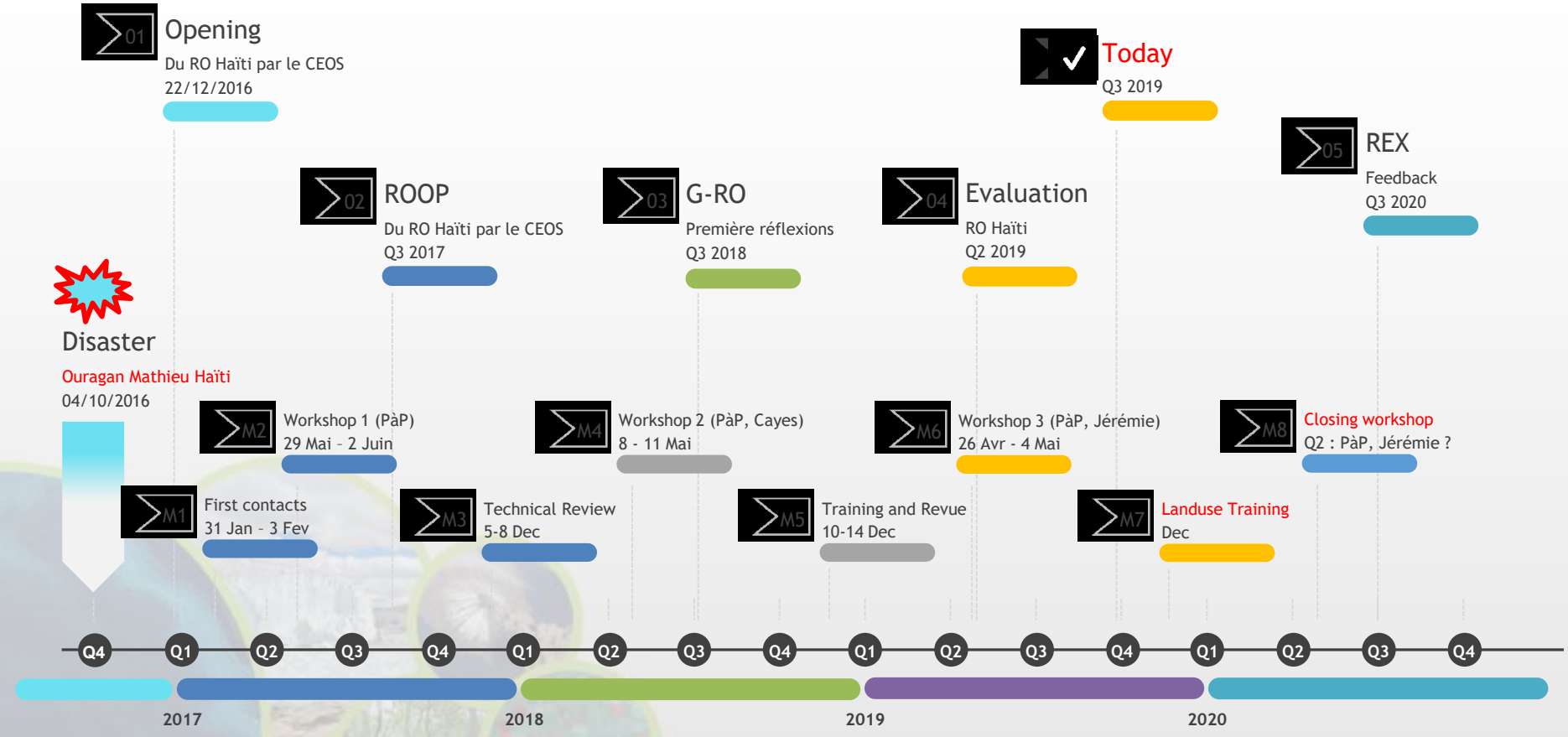
- DPC Haiti now **Authorized User of the International Charter**
- Links with **WB Haiti post Matthew projects**: Les Cayes (ended) and Nippes (on going)
- Links with **IADB Haiti projects** : Parc Macaya (on going)

RO Thematic Products

Product	Key user	CEOS	Sat. Data
Buildings Mapping	CIAT / Planning Ministry	CNES/SERTIT, Copernicus EMS R&R	Pléiades, WorldView-3
Terrain Motion Change Detection	BME / URGeo	ASI, CNES/EOST	COSMO-SkyMed, Pléiades, Spot 6/7, TerraSAR-X
Watershed / Flood	ONEV / Agriculture Ministry	ASI/CIMA Foundation	Pléiades, COSMO-SkyMed
Agriculture	Agriculture Ministry	Copernicus EMS R&R	Sentinel-2, Spot 6/7, GeoEye-1, WorldView-2
Macaya Park Monitoring	ANAP / ONEV / Environment Ministry	Copernicus EMS R&R, CNES/SERTIT	Spot 6/7
Environmental Impact	ONEV / Environment Ministry	Copernicus EMS R&R	Sentinel-2, Spot 6/7, Pléiades, WorldView-2
Land Use	All	CNIGS, CNES	Sentinel-2

Vector Borne Disease risk	**Health Minister/ OMS**	**NOAA**	**L8, Images NOAA + statistic needs**
Air pollution	**ONEV / Ministère Santé**	**NASA**	**S5P Tropomi on going discussion**

RO Timeline



RO post Matthew Definition and Implementation

RO post Matthew Commissionning

RO post Matthew Operations Lessons learnt for G-RO

RO legs G-RO specs

Local User Workshops #2

2nd Local User Workshop at Jérémie – April / May 2019

- Presence of ASI and CNES
- About 60 participants including :
  - The Mayors of Jérémie and Dame Marie (present last year)
  - Marfranc, Irois, Beaumont municipalities
  - 2 Deputy Delegate DPC (Grand'Anse and Jérémie)
  - UNDP
  - Environment Min. / UGP-Macaya
  - ….
- Number of participants x2 compared to last year
- Thematic Products Presentations
- Awareness of project objectives
- Clear commitment of local actors in support of the project
- Identification of needs for new version of Copernicus RRM products

Opening by CNIGS director

User Workshops #3

3th User Workshop at Port au Prince –May 2019

- About 40 participants including :
  - Mayor of Dame Marie,

  Coral, Marfranc, Pestel
  - CIAT, CNIGS, BME,
  - MDE, ONEV
  - UNDP, UNEP
  - EU, IDB, Universities

- Inauguration by Dr Chandler, DPC Director, with journalistic coverage
- Reaffirmation of support for the project : CNIGS, EU, CIAT
- Product analysis and update needs on all topics
- Identification of training needs and capacity development
- Progress on new thematic product tracks – vector borne diseases atmospheric pollution
- Steering Committee # 5

Field mission – Academic courses

Field Mission : ASI and CNES, CNIGS, BME

- Land Use Land Cover
- Change Detection and Ground Movement
- Three areas :
  - Jérémie
  - Camp Perrin Road <-> Jérémie
  - Macaya Park
- With BME (Change Detection) and CNIGS (LULC)

University courses (pre-Master URGEO at UEH)

- Optical remote sensing / radar comparison (CNES)
- Optical applications and Landuse (CNES)
- Radar initiation and application examples (ASI)

LPS19 / WRC#4

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)

Philémond Mondésir (CNIGS) presenting the RO at LPS

- **WRC#4 : 13/14 th May Geneva**
  - CNES/WB co-chaired a session «**Facilitating Recovery and Inclusion through Satellite EO Technology",** including RO Haiti, UNOSAT, EU, Miyamoto Global
  - Topics :
    - Main Benefits of Satellite Technology for Recovery
    - Inclusive Recovery & Satellite Technology Innovation
    - Recovery and Vulnerability
  - 60 participants, very active exchanges with the room

Planned events in late 2019

- **Training Session in December**
  - Training for Land Use Land Cover from S2 data based on IOTA2 tool
    - The IOTA2 chain should be completely understood by the haitian team
    - After this training they should be able to operate IOTA2 S2 chain by themselves
    - Planned for next year : LULC map made by haitian, with a light tutorate from CNES
  - Half-day for GEP and ALADIM (from EOST)
  - Extra : Charter PM training

- **Training at ASI / CIMA for 2 CNIGS experts**
  - Official letter sent by CNIGS to ASI

LIVE / SERTIT/ CNES activities

- Land Use Land Cover (LULC) activities :
  - Improvement of LULC chain for Haïti (IOTA 2 tool)
  - Automatic quarry detection (IMCLASS tool)

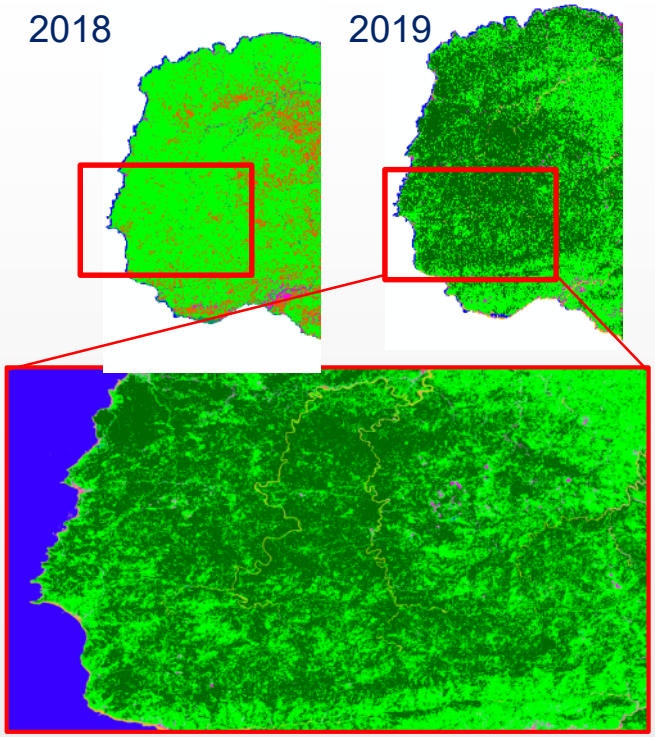
- Products generated for the Haitians End Users
  - “End User oriented” maps for general public users (not accustomed to geographic info)
  - Inventory of visible trails within the Macaya Park (Request during the 2019 Workshop in order to access Park and population area)

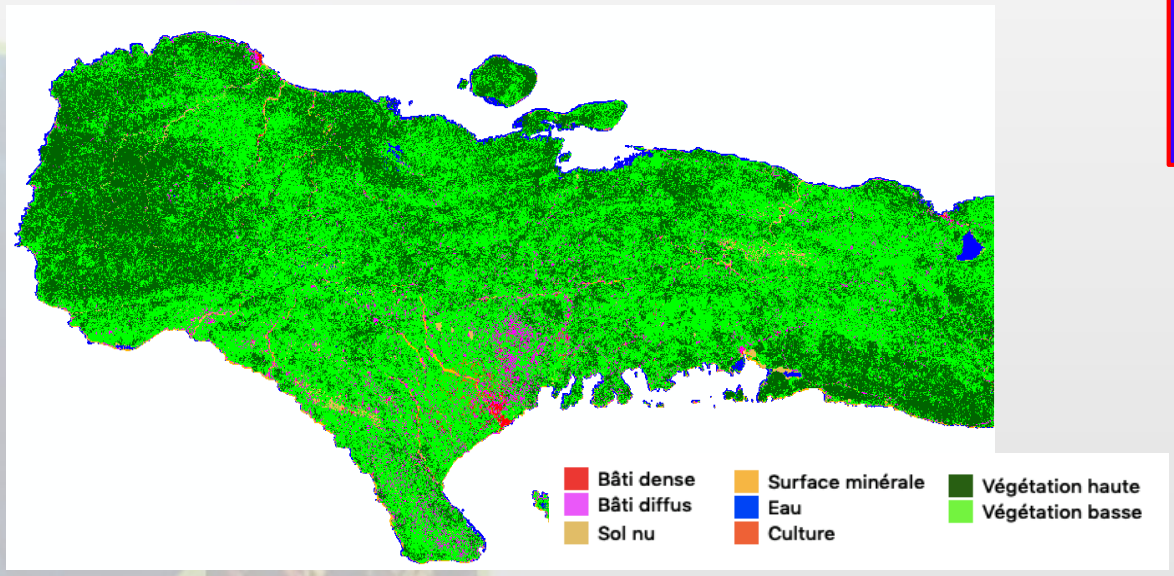
- Updating of “RO Thematic Products technical report” (method, examples)

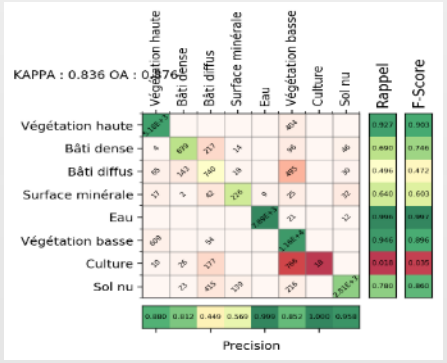
- Mentoring of 4 agronomy students internships with CNIGS in RO area

Land Use Land Cover Mapping

- ✓ Exploitation of S2A times series to produce a LULC map using Iota2 (first map in 2018 by Cesbio / CNES)
- ✓ In 2019, developments to improve LULC map with automatic sampling strategies to discriminate vegetation - high and low - or urban classes - dense or sparse
- ✓ Objective : production of an annual landcover/use map

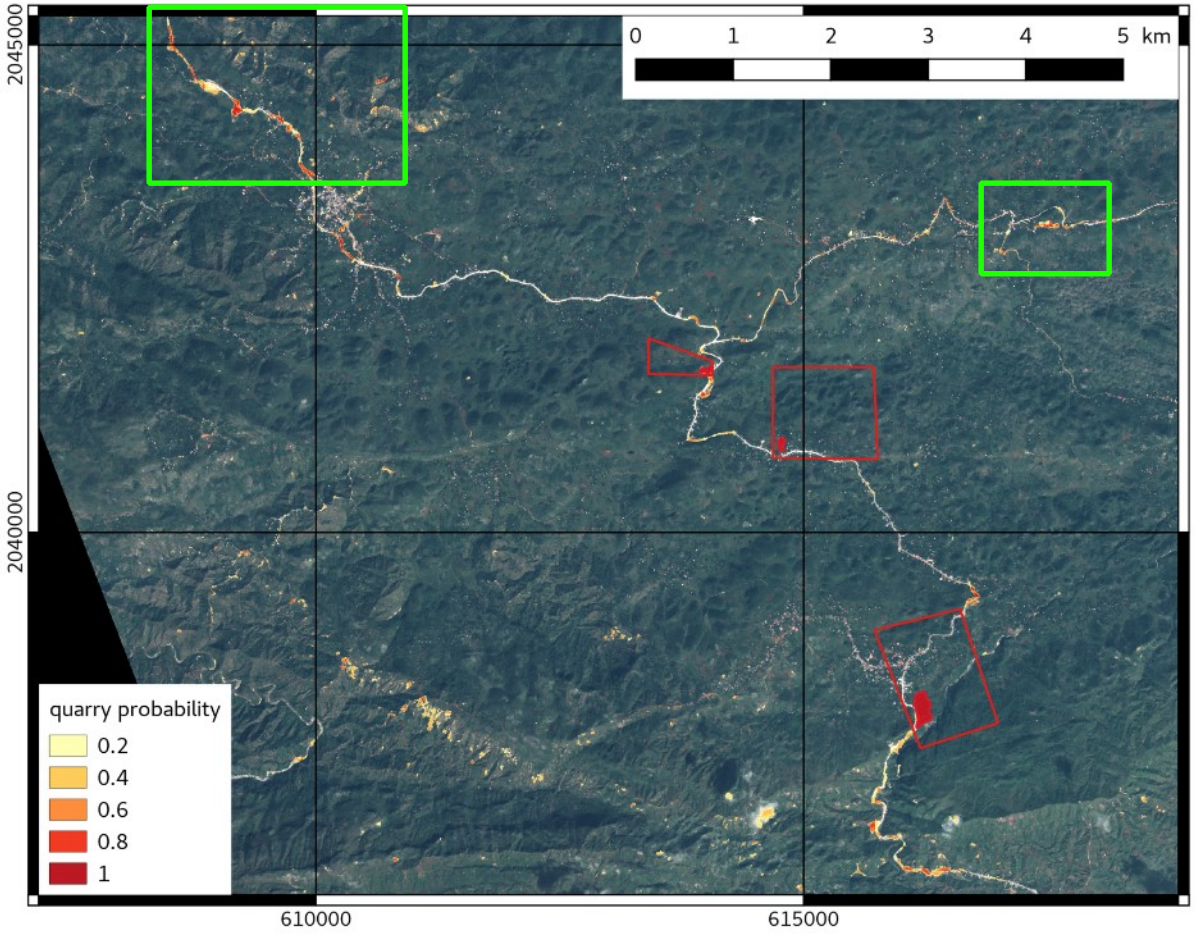


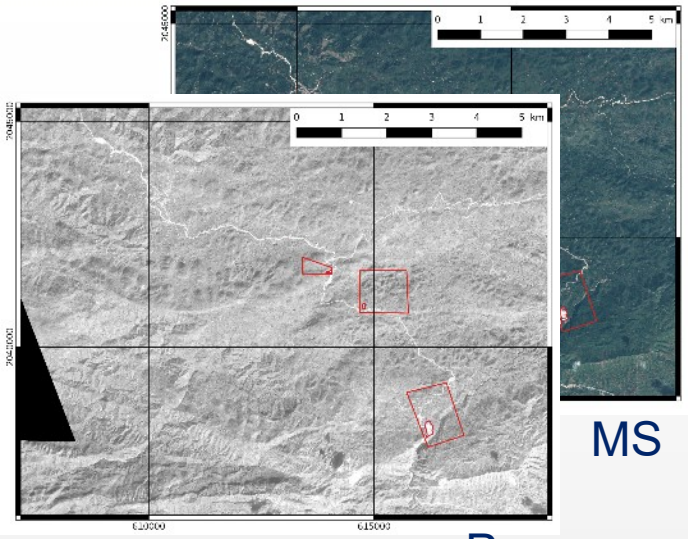


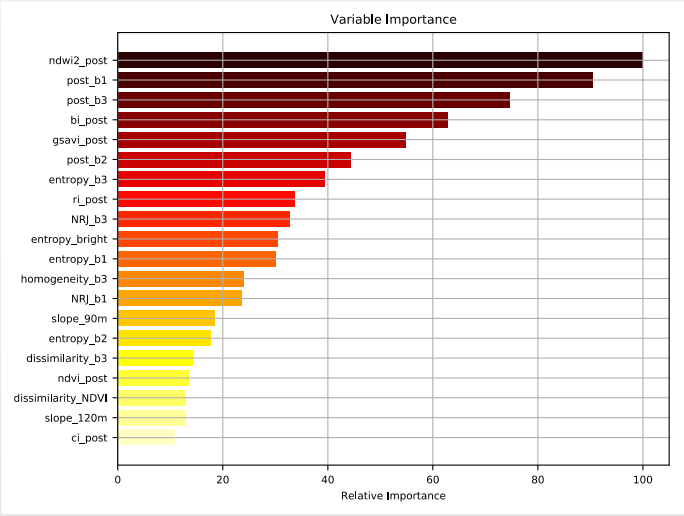


ImCLASS
Generic image classifier

Application:
Automatic quarry detection in Haïti



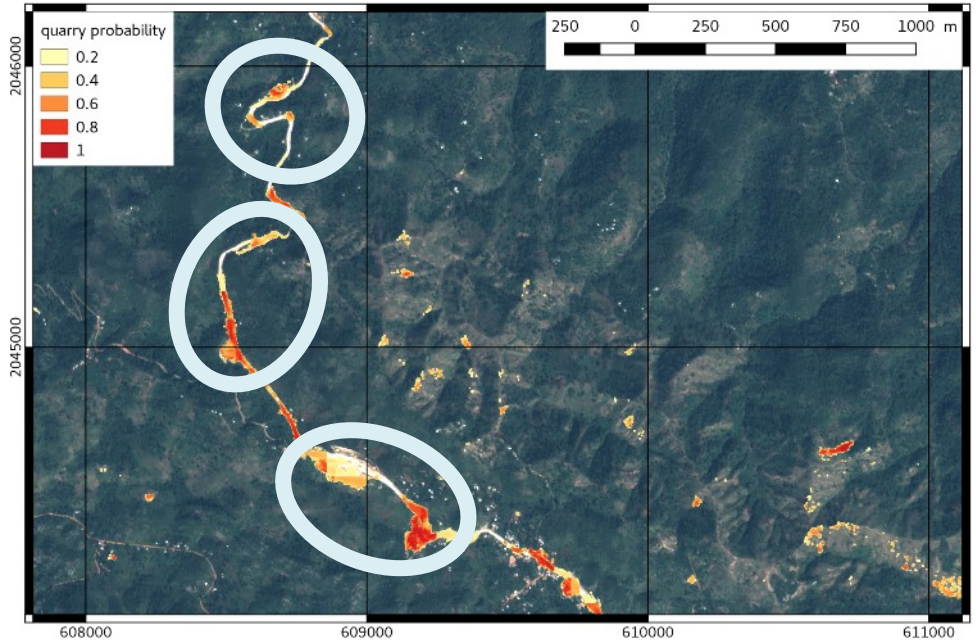




ImCLASS

Application : Automatic quarry detection in Haïti

First results:

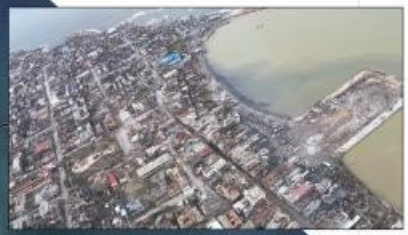


Some objects are difficult to differentiate from quarries:

- Portions of road / roads under construction
- Landslides, …

But a lot of quarries well identified

Damaged buildings in Jérémie (End Users Map)



Produit No.: 01JEREMIE_BATI_ETAT_20161007

Jérémie - HAITI
Évaluation des dommages liés à l'ouragan Matthieu
Situation le 7 octobre 2016

Information cartographique

1:10 000 — Full color A1, high resolution (300dpi)

0 0.25 0.5 0.75 1 KM

Projection locale : WGS 84 Zone 18 N (grille)
Projection géographique : WGS 84 Lat/Long (marges)

Légende

État du bâti post-Matthieu (07/10/2016) déterminé à partir d'une observation orthogonale au sol (état des toitures, débris, etc.)

- Détruit
- Endommagé
- Peu ou pas endommagé

Aire d'intérêt

- Limite d'analyse

Points d'intérêt

- Supermarché
- Station d'essence
- Traitement d'eau potable
- Cimetière

Contexte

Le 4 octobre 2016 l'ouragan Matthieu a frappé le sud-ouest d'Haïti, le premier cyclone de catégorie 4 à frapper Haïti depuis l'ouragan Cleo en 1964. Avec plus de 1 300 vies perdues dans les Caraïbes dont plus de 1000 vies perdues en Haïti, l'ouragan a été le plus mortel à frapper dans les Caraïbes depuis Jeanne en 2004. L'impact de Matthieu sera durable. Alors que les inondations ont causé des dommages considérables et des pertes en vies humaines, l'impact principal a été ressenti par le vent, qui dans certaines régions a détruit plus de 95% des bâtiments et a complètement détruit les arbres et l'agriculture. En outre, des dommages environnementaux généralisés se sont produits. Il convient de noter que la zone la plus touchée a la plus grande concentration d'aires naturelles protégées en Haïti.

Source des données

État des bâtiments :
dérivé de l'analyse de l'image satellite Pléiades-HR (50cm) acquise le 7 octobre 2016 après le passage de l'ouragan Matthieu, © SERTIT 2016

Image de fond
Ortho-photographie (25cm) acquise en 2014, © IGN (2014), distribution CNIGS.

Informations de référence : CIAT, CNIGS.

Cartes de localisation
dérivées des bases de données JRC 2013, GISCO 2010, Natural Earth 2012.

Description de la carte

Cette carte présente l'état d'endommagement du bâti sur la ville de Jérémie (Haïti) déterminé à partir d'une image satellite acquise le 7 octobre 2016, quelques jours après le passage de l'ouragan Matthieu.
L'état des bâtiments a été évalué selon 3 classes d'endommagement : peu ou pas endommagé, endommagé ou détruit.
La terminologie ci-dessus s'applique à ce que l'on peut déterminer à partir d'une vue orthogonale au sol : ce sont essentiellement les toitures et les débris alentours qui sont observés et qui fournissent une estimation des dégâts liés aux vents cycloniques.
De plus, l'interprétation visuelle des dégâts peu parfois être limitée en raison de la qualité radiométrique de l'image, et donc floutée.

	État post-Matthieu (07/10/2016)	
	Nombre de bâtiments	%
Peu ou pas endommagé	4128	34,6
Endommagé	1579	13,3
Détruit	6153	51,9

Contact

Cette carte a été produite dans le cadre du Recovery Observatory (CNES/CEOS).

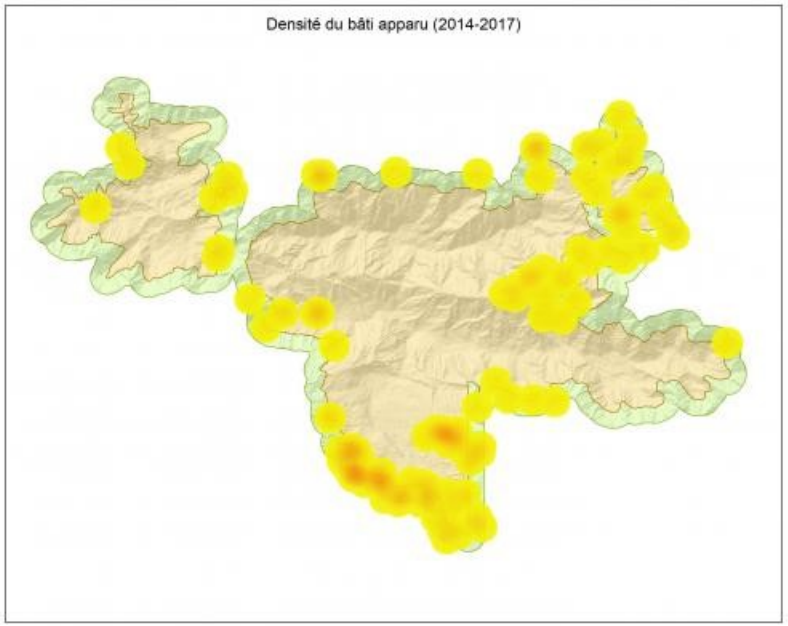
Toutes les informations géographiques ont des limitations dues à l'échelle, la résolution, la date ainsi que l'interprétation de la donnée source. La responsabilité de l'auteur de cette carte ne peut être engagée quant à son contenu et son éventuelle utilisation.

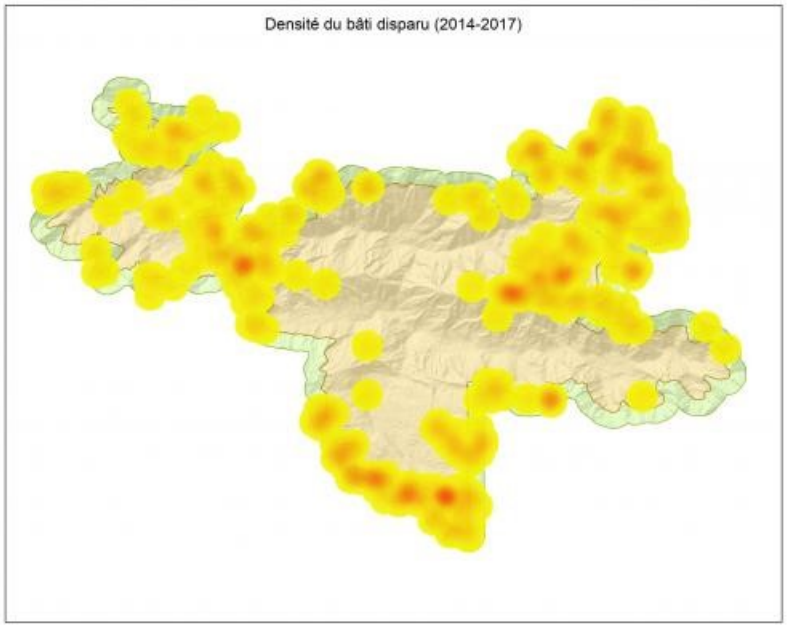
Carte réalisée par le SERTIT
sertit@unistra.fr
http://sertit.u-strasbg.fr

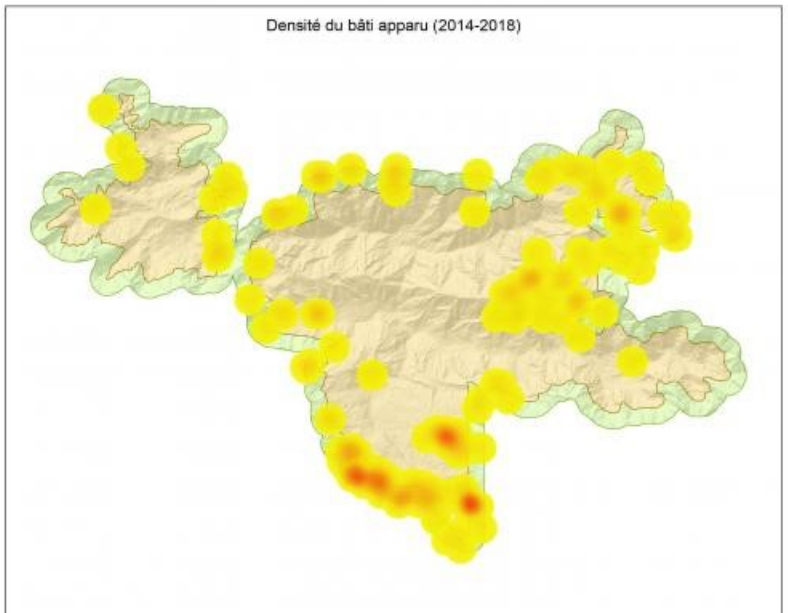
CEOS Recovery Observatory Haïti

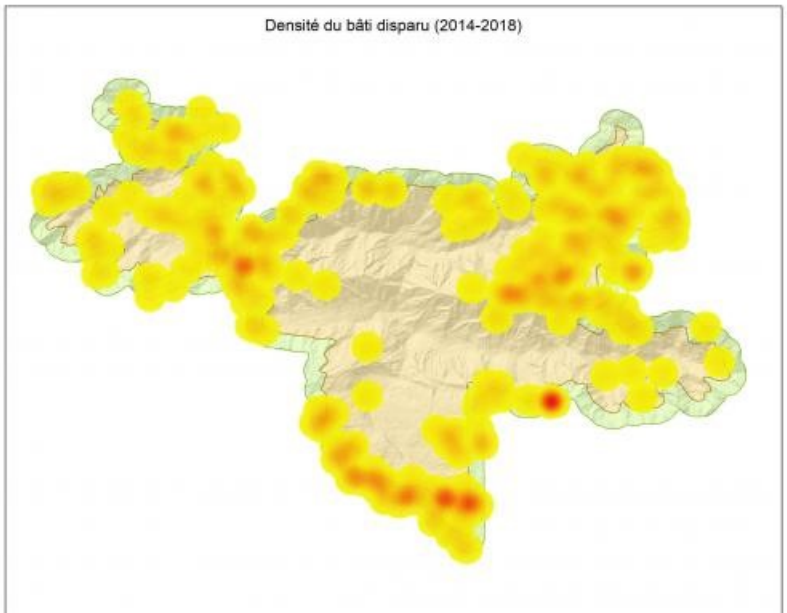
cnes Sertit ICUBE

Built up areas in Macaya Park (2014-2017-2018)









Produit No.: 05MACAYA_BATI_DENSITE_EVOLUTION

Parc Macaya - HAITI

Densité du bâti

Evolution entre 2014, 2017 et 2018

Carte de localisation

Information cartographique

1:72 000

Projection locale : WGS 84 UTM Zone 18 N (grille)
Projection géographique : WGS 84 Lat/Long (marques)

Légende

Densité du bâti (nb/km²) 20 0

Zone d'intérêt
- Limite Parc Macaya
- Zone tampon (500m)

Interprétation

Le 4 octobre 2016 l'ouragan Matthieu a frappé le sud-ouest d'Haïti, le premier ouragan de catégorie 4 à frapper Haïti depuis l'ouragan Cleo en 1964. Avec plus de 1 300 vies perdues dans les Caraïbes dont plus de 1000 vies perdues en Haïti, l'ouragan a été le plus mortel à frapper dans les Caraïbes depuis Jeanne en 2004.
L'impact de Matthieu sera durable. Alors que les inondations ont causé des dommages considérables et des pertes en vies humaines, l'impact principal a été ressenti par le vent, qui dans certaines régions a détruit plus de 90% des bâtiments et a complètement détruit les arbres et l'agriculture. En outre, des dommages environnementaux généralisés se sont produits. Il convient de noter que la zone la plus touchée a la plus grande concentration d'aires naturelles protégées en Haïti.

Sources des données

Cartographie du bâti
dérivée de l'analyse de l'ortho-photo (0.25m) acquise en 2014, avant le passage de l'ouragan Matthieu, ainsi que des images Pléiades (0.5m) acquises le 08 décembre 2017, le 15 juin 2018 et le 01 décembre 2018 © SERTIT 2019.
Image de fond
Ortho-photographie (25cm) acquise en 2014, © IGN (2014), distribution CNIGS.
Informations de référence : CNIGS, CIAT, OSM.
Cartes de localisation
dérivées des bases de données ARC 2013, UNESCO 2010, Natural Earth 2012.

Description de la carte

Cette carte présente la densité du bâti apparu et disparu sur l'emprise élargie (zone tampon de 500m) du Parc Macaya (Haïti) entre 2014, 2017 et 2018, soit une période de deux ans avant et jusqu'à deux après le passage de l'ouragan Matthieu.
La précision thématique de l'analyse par photo-interprétation est certifiée supérieure à 80%.

	Nombre de bâtiments
Apparus entre 2014 et 2017	153
Disparus entre 2014 et 2017	546
Apparus entre 2014 et 2018	232
Disparus entre 2014 et 2018	554

Contact

Cette carte a été produite dans le cadre du Recovery Observatory (CNES/CEOS).

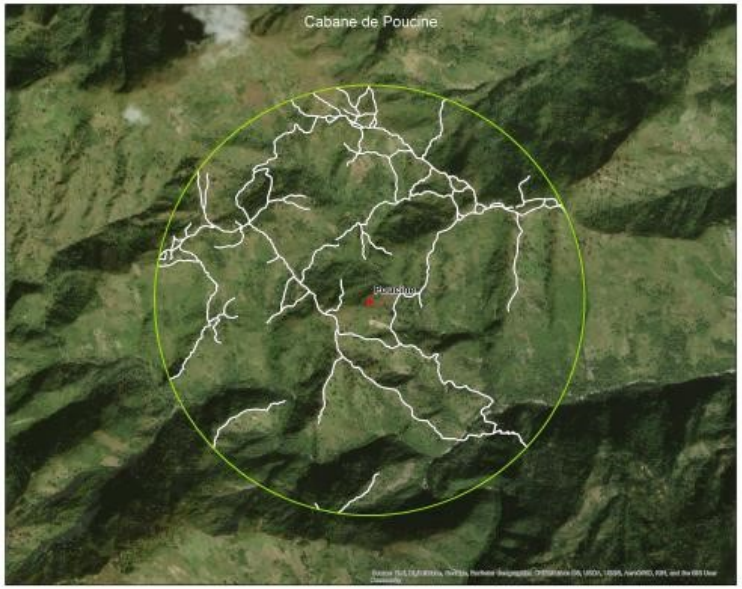
Toutes les informations géographiques ont des limitations dues à l'échelle, la résolution, la date ainsi que l'interprétation de la donnée source. La responsabilité de l'auteur de cette carte ne peut être engagée quant à son contenu et son éventuelle utilisation.

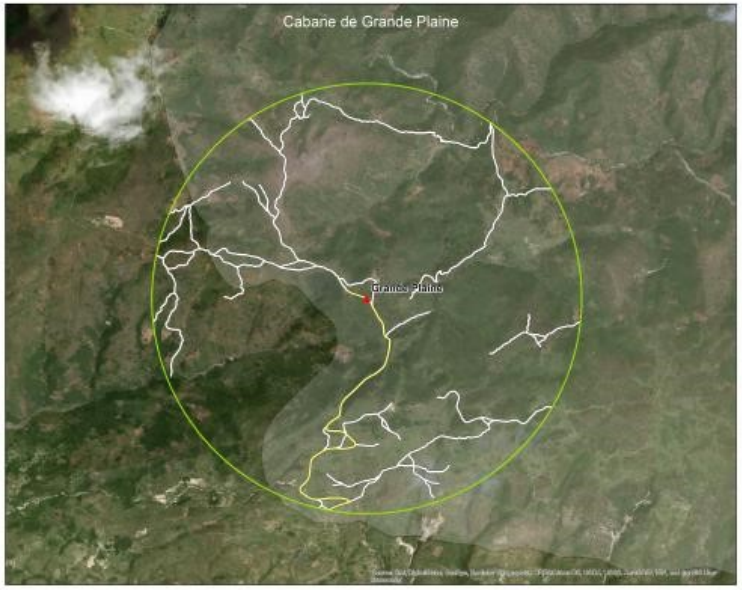
Carte réalisée par (Cube-SERTIT
sertit@sertit.u-strasbg.fr
http://sertit.u-strasbg.fr

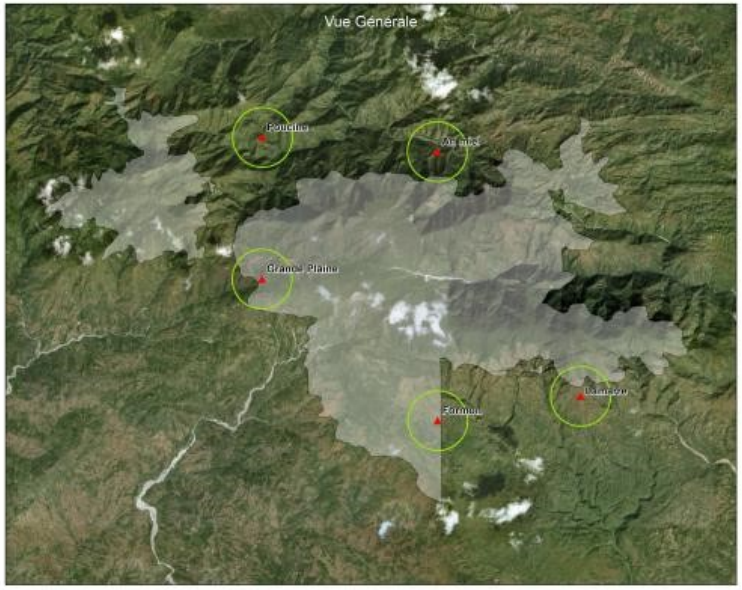
CEOS Recovery Observatory Haïti

coes Sertit

Trails around 3 forest houses in Macaya (2018)
To control settlement of inhabitants







Product No.: 01MACAYA_SENTIERS_2018

Parc Macaya - HAITI

Cartographie des sentiers

Situation en 2018

Carte de localisation

Information cartographique

1:10 000

Projection locale : WGS 84 UTM Zone 18 N (grille)
Projection géographique : WGS 84 Lat/Long (marges)

Légende

- Cabane (2018)
- Route
- Zone tampon (1000m)
- Sentier
- Limite Parc Macaya

Interprétation

Le 4 octobre 2016 l'ouragan Matthieu a frappé le sud-ouest d'Haïti, le premier ouragan de catégorie 4 à frapper Haïti depuis l'ouragan Cleo en 1964. Avec plus de 1 300 morts perdues dans les Caraïbes dont plus de 1000 rien perdues en Haïti, l'ouragan a été le plus mortel à frapper dans les Caraïbes depuis Jeanne en 2004.
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Sources des données

Cartographie du bâti :
dérivée de l'analyse de l'ortho-photo (0.25m) acquise en 2014, avant le passage de l'ouragan Matthieu, ainsi que des images Pléiades (0,5m) acquises le 15 juin 2016 et le 01 décembre 2016. © SERTIT 2016
Image de fond :
ESRI World Imagery © DigitalGlobe.
Informations de référence :
CNIGS, IGN, OSM
Cartes de localisation :
dérivées des bases de données JRC 2013, GISCO 2010, Natural Earth 2012.

Description de la carte

Cette carte présente les sentiers visibles dans un rayon de 1000 m autour des cabanes de surveillance de l'UGP Macaya (Haïti) en 2018.

La précision thématique de l'analyse par photo-interprétation est certifiée supérieure à 85%.

	Sentier (km)	Route (km)
An Miel	17,6	0,0
Grande Plaine	12,5	1,8
Poudine	17,5	0,0

Contact

Cette carte a été produite dans le cadre du Recovery Observatory (CNES/CEOS).

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

Carte réalisée par ICube-SERTIT
sertit@sertit.u-strasbg.fr
http://sertit.u-strasbg.fr

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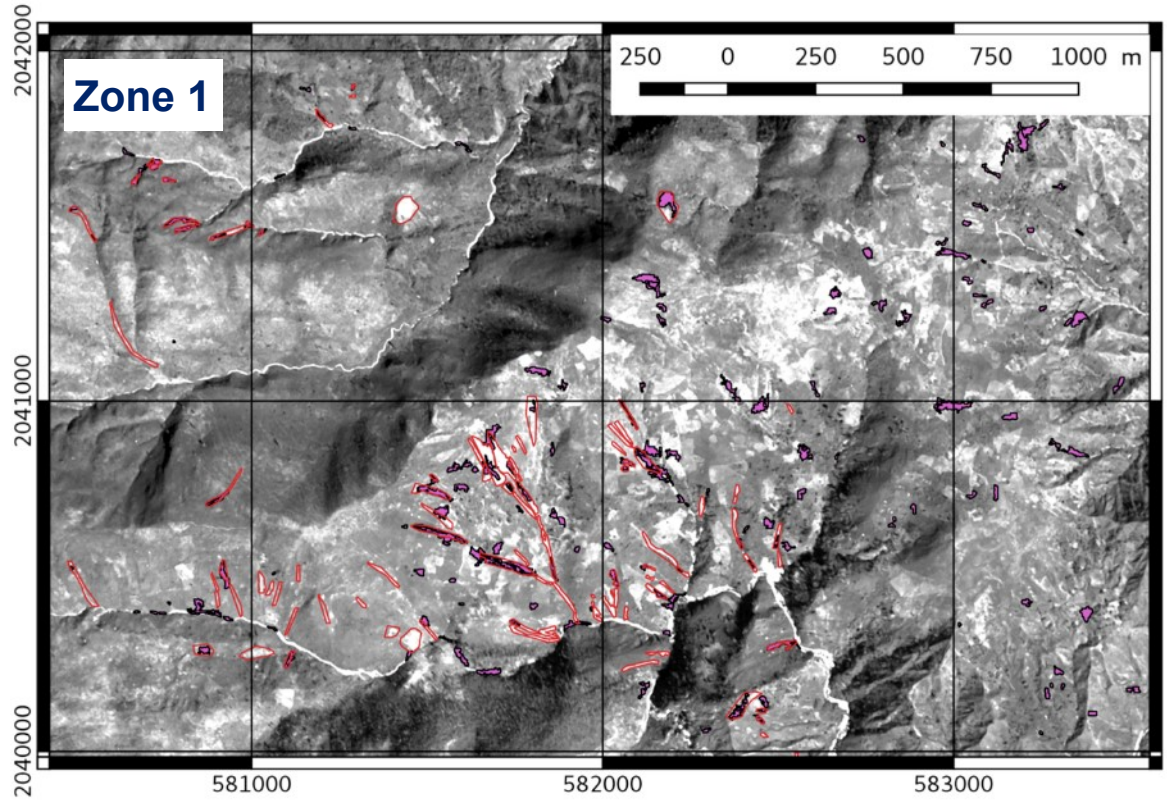
EOST RO activities on landslide mapping: JP Malet

APPLICATIONS: RAIN-TRIGGERED LANDSLIDES HURRICANE MATTHEWS - HAITI



Machine Learning with 20 attributes

Parameters:

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SEG_MIN_SIZE=3 ; SUN_AZIMUTH=90.44,31.17
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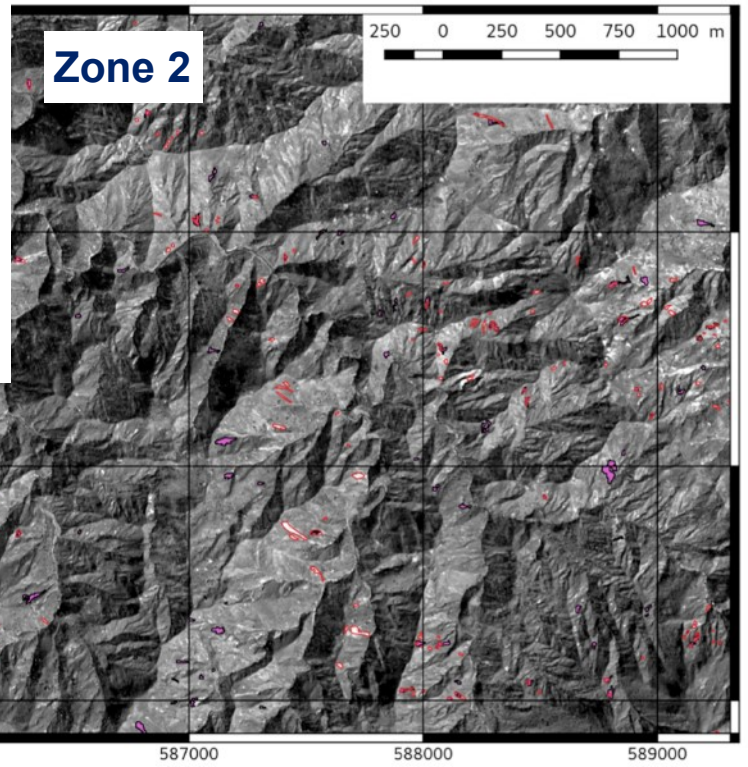
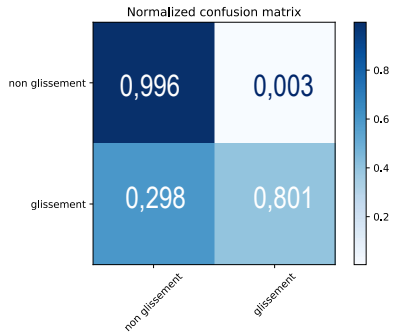
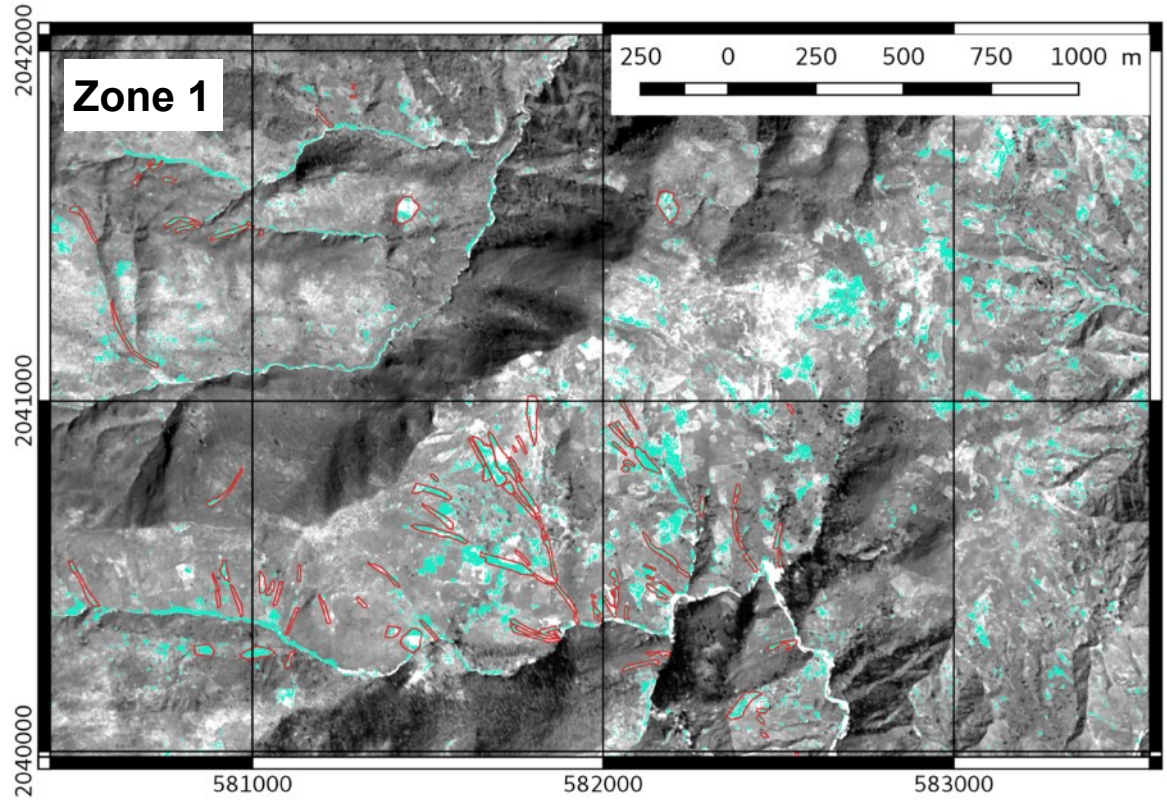


Accuracy:
Confusion matrix

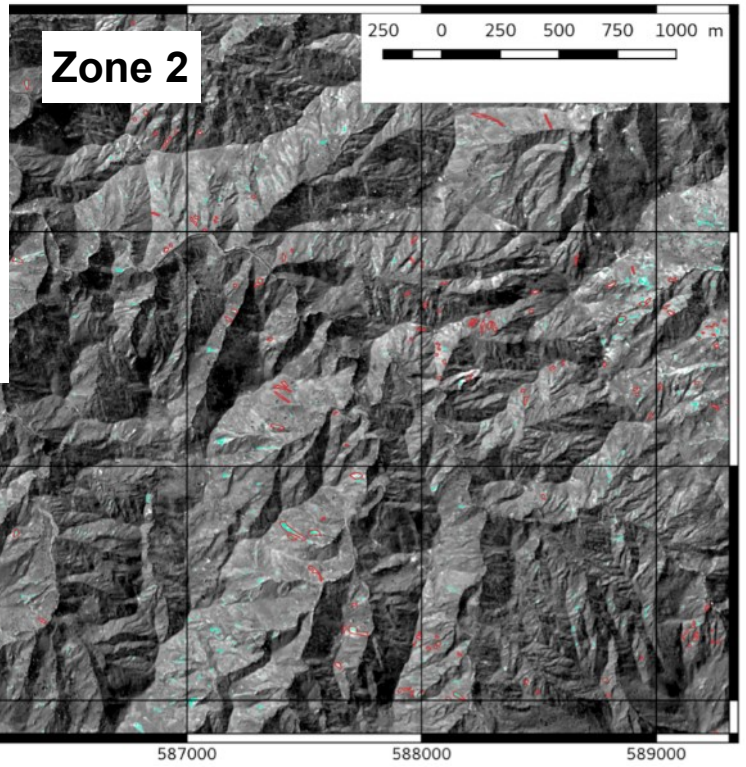


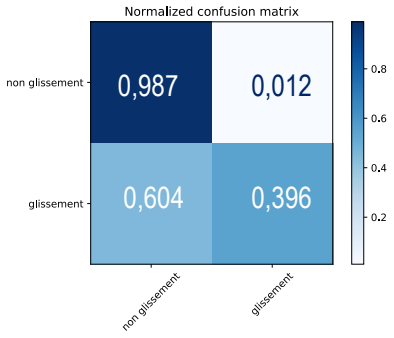
ImCLASS FOR HAITI
MODEL 1: 22 ATTRIBUTES (similar to ALADIM)
SPOT DATA



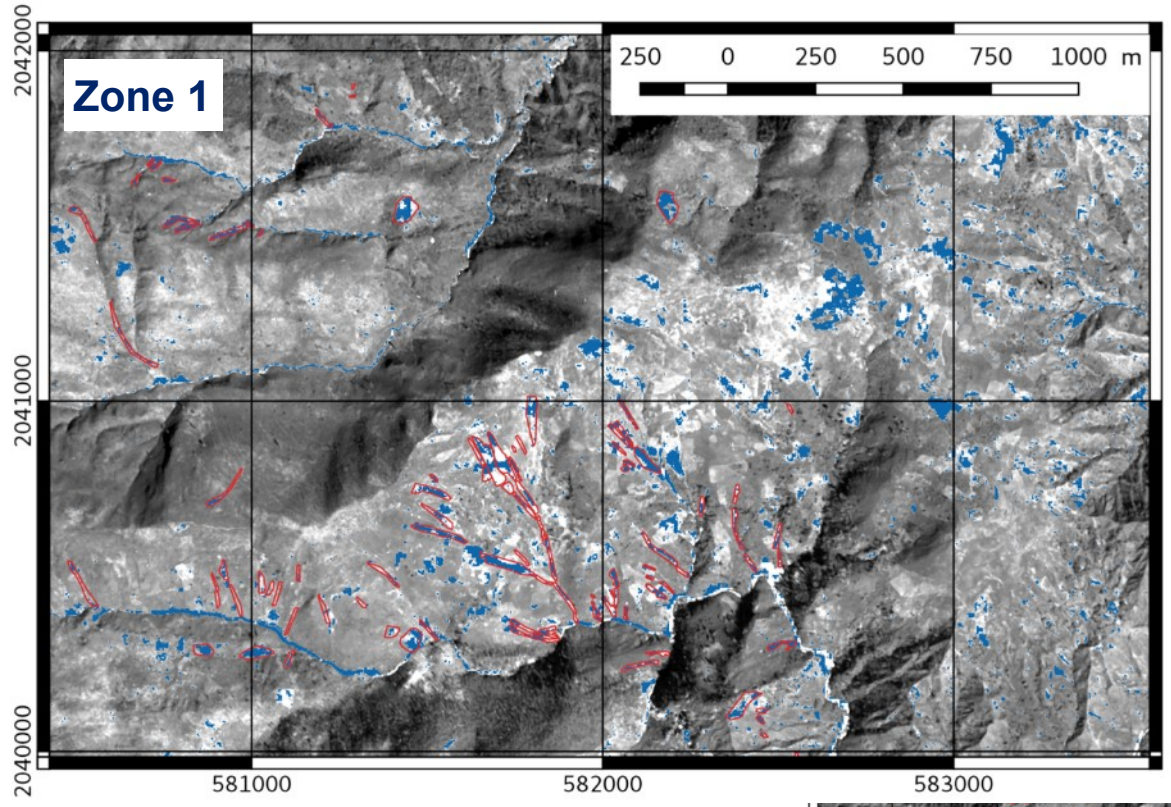
Model with 22 attributes -> same as ALADIM

- 15 radiometry
  (reflectance MS/P + NDVI -pre, post, diff-)
- 7 topography



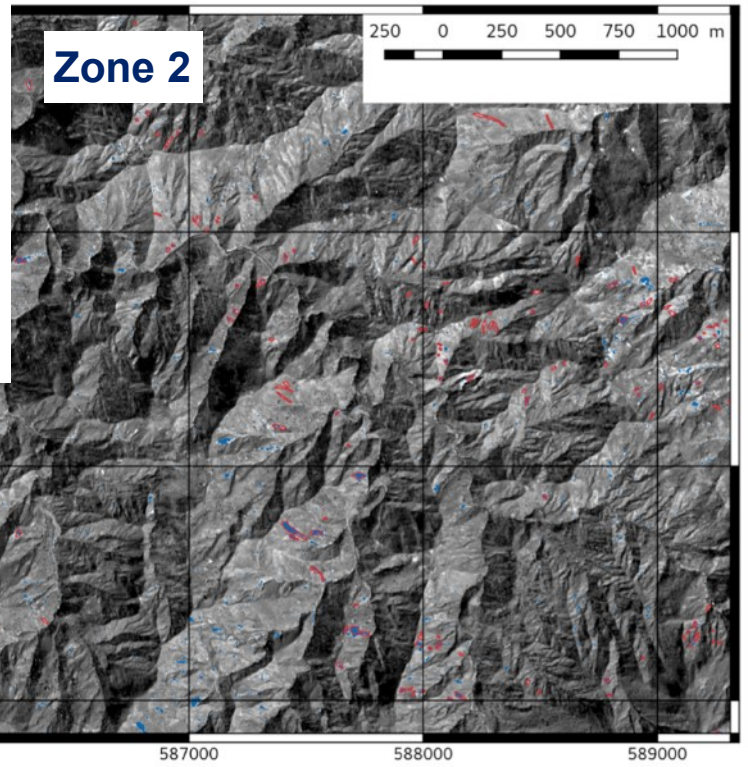


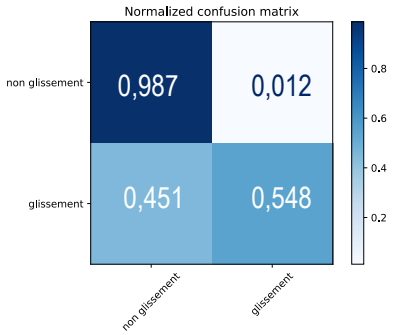
ImCLASS FOR HAITI
MODEL 2: 56 ATTRIBUTES, NO TOPO
SPOT DATA



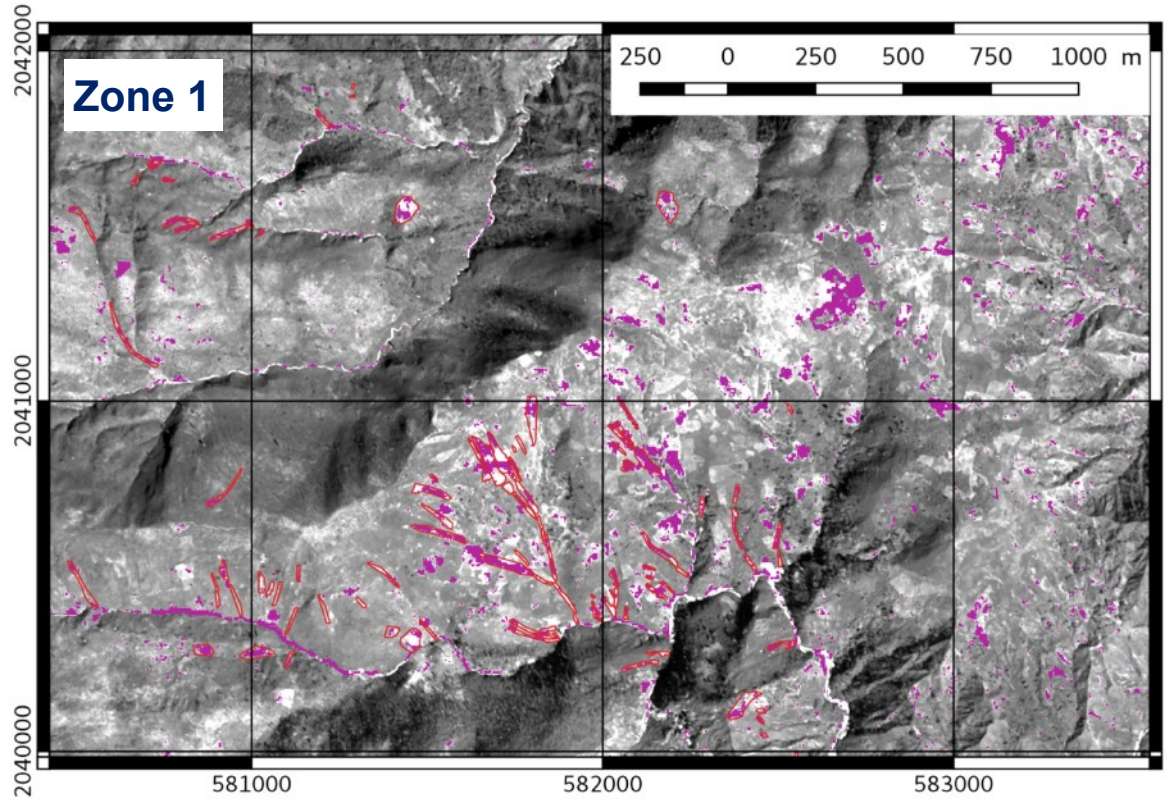
Model with 56 attributes

- 56 radiometry
  (brightness + spectral index -pre, post, diff-)
- Shape of the training sample (pad: 25 pix)

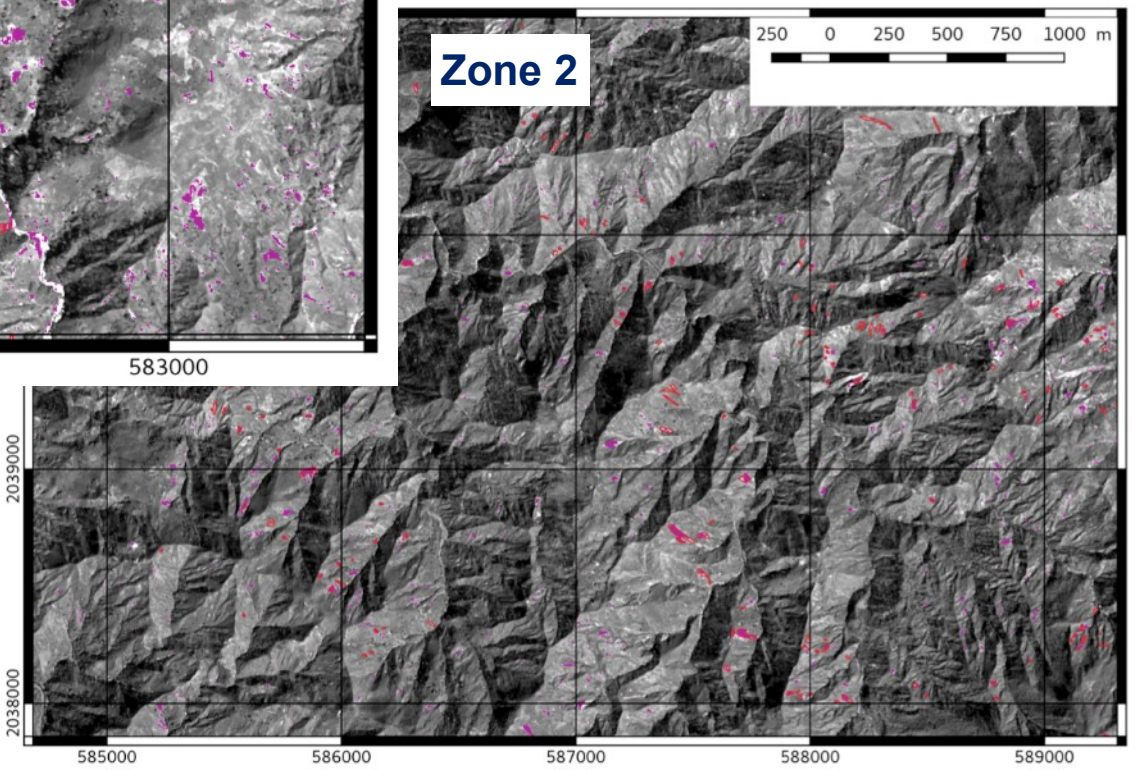


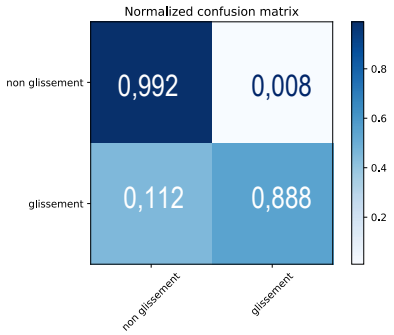


ImCLASS FOR HAITI
MODEL 3: 70 ATTRIBUTES
SPOT DATA



Model with 70 attributes
- 56 radiometry
  (brightness + spectral index -pre, post, diff-)
- 14 topography (mult-scale)
- Shape of the training sample (pad: 9 pix)

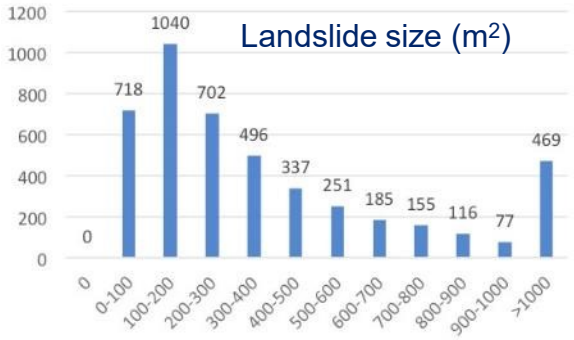


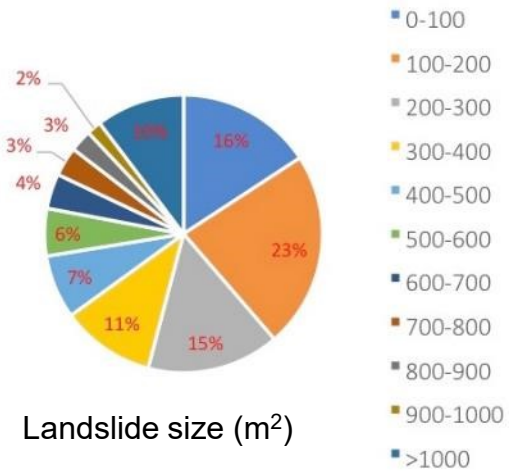


USE OF SPACE LANDSLIDE INVENTORY: STATISTICS AND TRIGGERS FOR FORECAST

Aggregated indicators

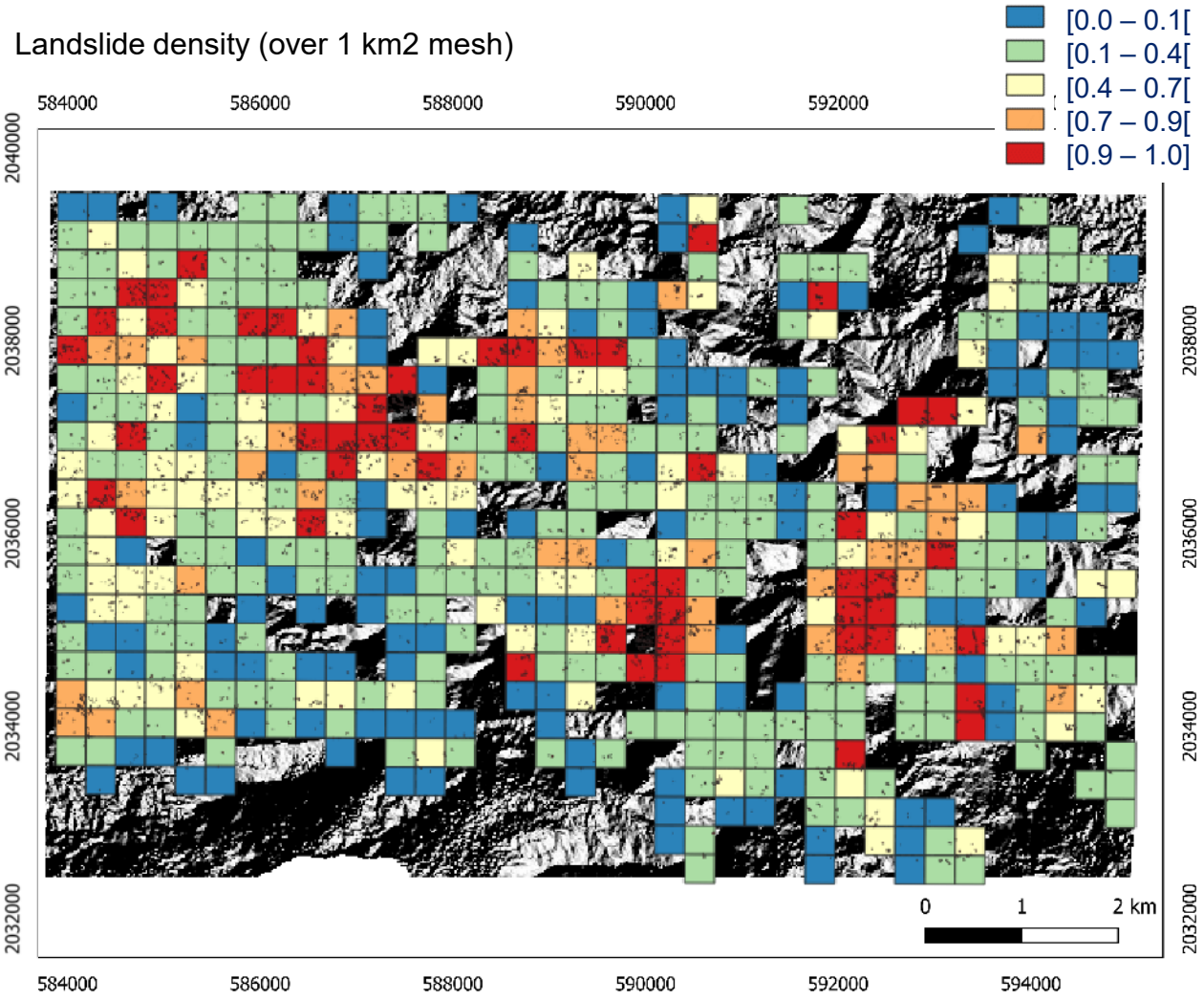
Number of landslides: > 7000
Landslide surface: 4km^2



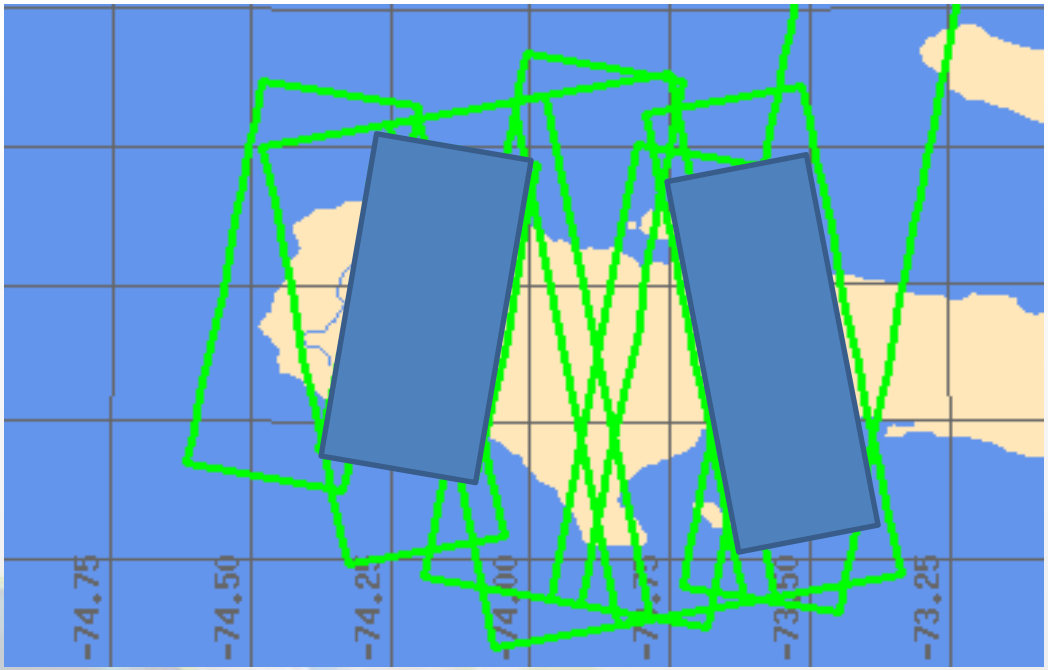


Landslide size (m^2)

Landslide density (over 1 km2 mesh)



DLR



There are 11 TerraSAR-X coverages of the whole area :

- Ascending + Descending orbit
- 3 full coverages in 2019

- The **12th coverage** have start in late August, but noted that there were some failed acquisitions (maybe connected to the demand for imagery of the Bahamas and Florida, recently, and also to an extraordinary manoeuvre of the satellite that needed to be made).
- There are **144 scenes available** in TSX-supersites of DLR.

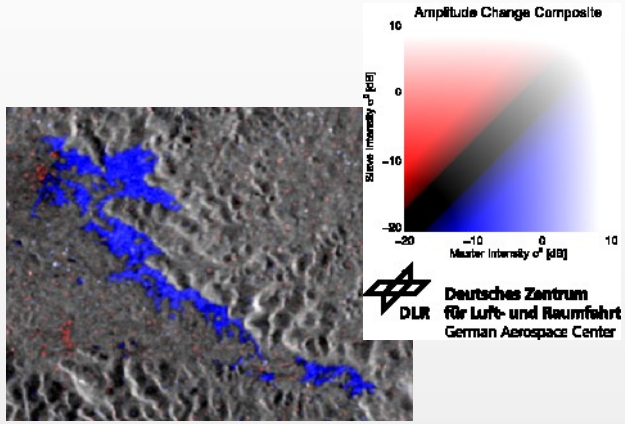
ASI – Terrain motion products

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)

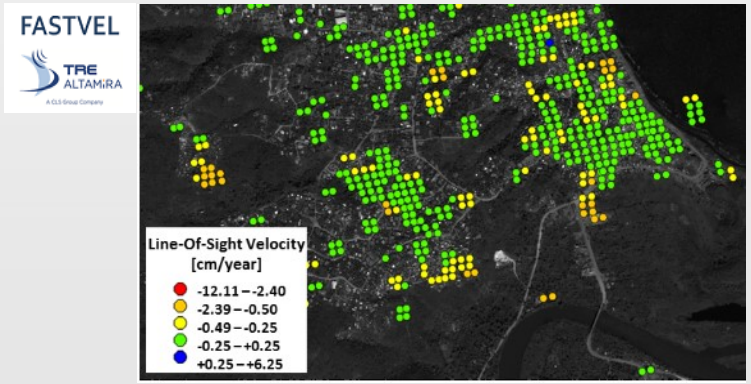
✓ Consolidated activities

- 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 [*for Haiti only since Feb 2017*]
- Qualified Haiti as target area for DLR's Sentinel-1 High Resolution InSAR service – **systematically producing high resolution interferograms, coherence and change maps**



✓ News

- First trials with TRE-ALTAMIRA's advanced InSAR service for Sentinel-1 TOPS IW time series to **identify persistent scatterers (PS)**



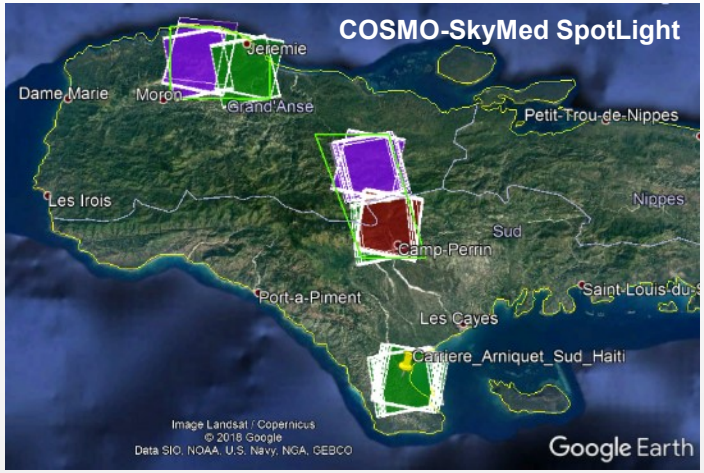
✓ Next steps

- SNAP+StaMPS combined service; integration in GEP is ongoing (*release date TBC*)

ASI – Terrain motion products

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 340 scenes acquired, i.e. > 34 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 developed SNAP COSMO-SkyMed StripMap service – *to be released soon* (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 – *can this be included in the Geohazards Lab agenda?*

ASI – Terrain motion products

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

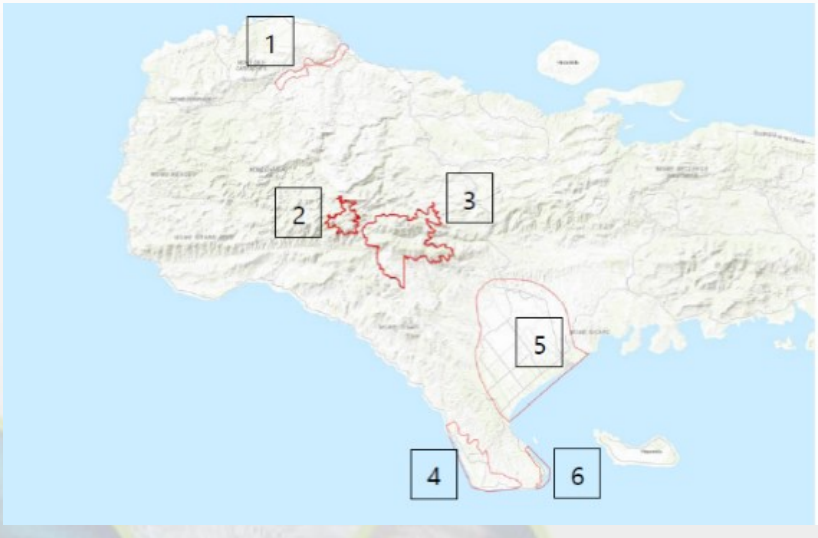
- **Offline analysis** of COSMO-SkyMed and TerraSAR-X data is ongoing (i.e. analysis outside GEP, due to current unavailability of InSAR services for X band data; *see previous slide*)
- **Technical field mission** in Haïti carried out in Apr-May 2019 (field checks, data validation, and discussion with stakeholders)

✓ Dissemination and capacity building

- Presentation at ESA Living Planet Symposium (May 2019), in collaboration with Geohazards Lab
- Scientific seminars on the use of SAR held at LNBTP-Haïti during field mission in April-May 2019
- Future training of Haitian partners to use GEP with Sentinel-1 data (early 2020)

Copernicus EMS RRM

- **EMSN 051 " Environment" end in spring**
- Area : Macaya Park, Port Salut, Les Cayes, Jérémie, Pointe Abacou and Costal line.



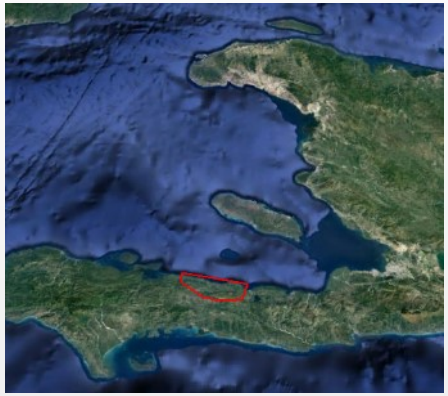
- Agricultural activities
- Coastal Line evolution
- Macaya Park classification and monitoring forest damage
- Mangrove monitoring

- CNIGS/CIAT/ONEV have asked for **two other RRM activations at mid 2019** on two products , through EU delegation by the end of 2019:
  - **Agricultural monitoring**
  - **Macaya Park land use map** and **wooden areas monitoring**

Links with a new WB Haiti agroforestry study on Nippes

- 3 Watershed to be analysed : Baconnois, Bondeau and Rivière Froide.

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

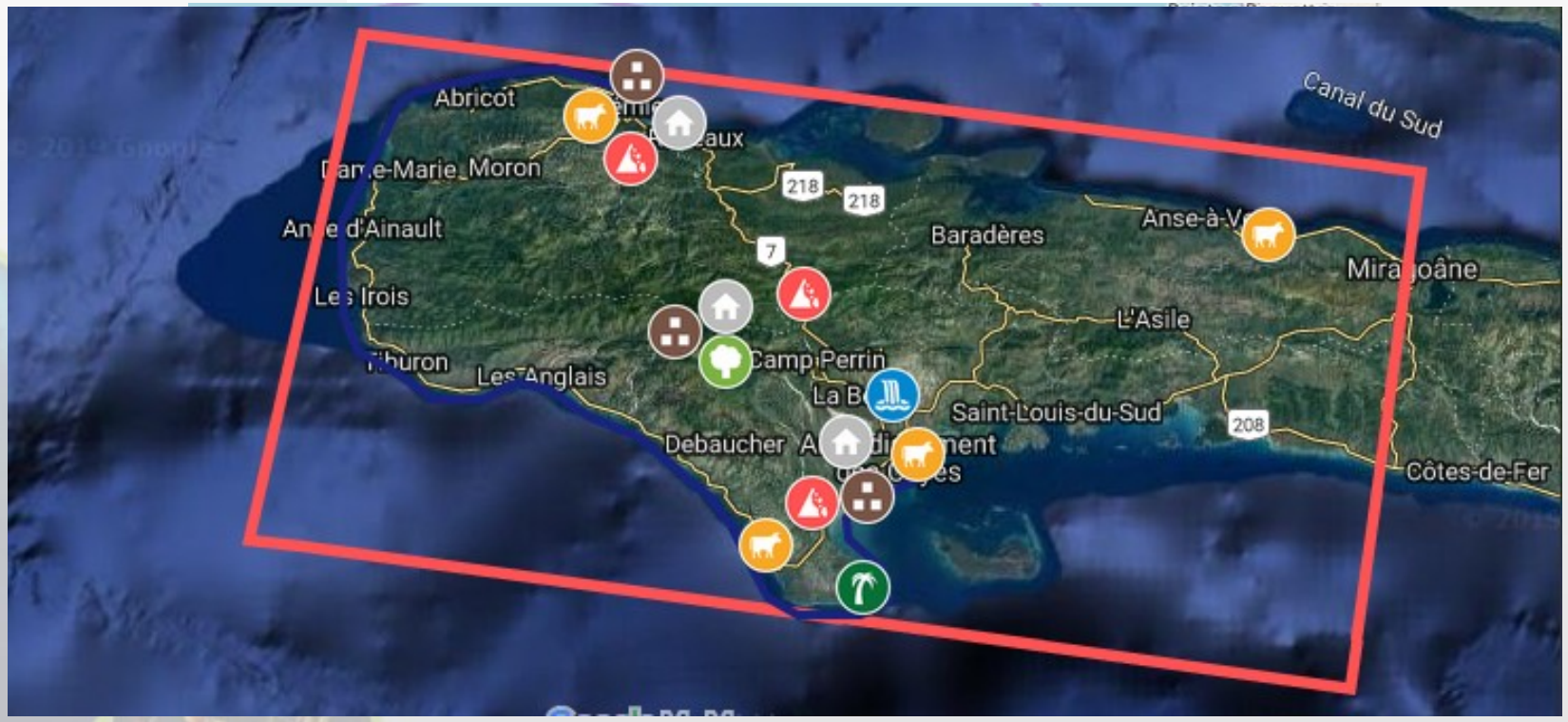


Joint activity WB–RO in 2019: Training on LULC(Land Use Land Cover) by WB (CIRAD + SERTIT in october), building on RO previous trainings; Access to RO imagery

This is typically an example of increased use of space data thanks to RO Project

Project tasks

- Development plan for thematic products regularly updated with Haitians
- 39 New Optical images since January : Spot 6/7 whole coverage and Pléiades (being integrated on GEP)
- Integration into the Web server of new products and experience feedback from Value Adders



Committee on Earth Observation Satellites

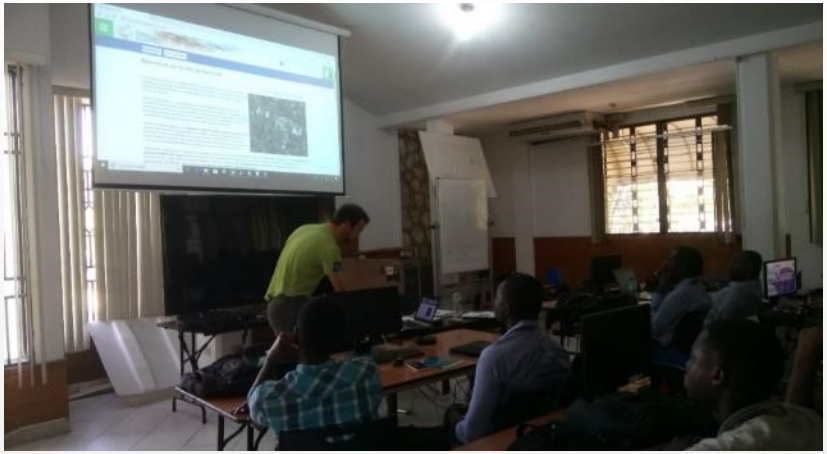
Haiti Recovery Observatory (RO)
Capacity Building Activities

Presentation to WGD#12
Reykjavik, 25 September 2019

Agwilh Collet, CNES
Boby Piard, CNIGS
Helene de Boissezon, CNES
Andrew Eddy, Athena Global

Overview

❑ Capacity Building activities



- Objectives
- Targets
- Activities in 2017/18
- Activities in 2019/2020
- Perspectives

RO Capacity Building Plan

Capacity Building needs, expressed by users (CNIGS, CIAT, ONEV, BME). Lead = CNIGS.

Final version validated during 5th Steering Committee.

This plan targets two distinct communities:

- **Remote sensing and GIS professionals**, capable of producing products derived from satellite earth observation images
- **Professionals carrying out thematic monitoring** of the territory, using EO derived products in their organizations, with the basic knowledge to understand how they were achieved and their limits of representativeness.

Specific actions carried out towards academic community

Targeted Communities

- Multiple organizations are involved at both the national and local levels.
- The CNIGS is the main producer, with fourfold reinforcement:
  - the development of new methodologies for processing optical imaging data (Land Use/Cover; Landslide detection from optical correlation on GEP),
  - the implementation of a radar satellite data processing chain on GEP,
  - training in the use of risk analysis tools (RASOR), and
  - a Charter "PM Charter" training & Rapid Mapping elementary training
- At user level, it is worth mentioning:
  - provincial communities (“awareness caravan” and basic GIS training; both by CNIGS);
  - major national users (e.g. CIAT, MDE/ONEV, MARNDR, ANAP, DPC).

2018/19 Activities

- Technical seminar on thematic products (Dec 2018) :

Advanced training of the CNIGS at IOTA-2 classification tool by the CNES for Sentinel-2 optical data products

- Academic training (UEH/URGEO, UNIQ, ENS) :
  - Introduction to space technologies
  - Introduction to Earth Observation imagery
  - Introduction to the realization of EO-derived maps
  - Earth observation for risk management
  - Optical imaging base and comparison with imaging
  - Land use classification with open source software IOAT2/OTB
  - Radar imaging initiation (SAR)
  - Examples of applications with SAR imaging
  - Training on RASOR modeling tool fitted for Haiti

Planned Activities in 2019/2020

- Basic GIS training planned by the CNIGS in municipalities & “Awareness Caravan"
- IOTA-2 training suite by CNES for Sentinel-2 optical data products (objective : Annual Land Use Maps)
- Basic training in SAR data processing by ASI and CIMA - two CNIGS experts in Italy for 3-4 months
- Training to use EOST landslide detection module on GEP
- RASOR training by CIMA at CNIGS and DPC (when WB funding available)
- Political and strategic awareness day in Port-au-Prince

In relation with Charter Universal Access :

- *Civil Protection (DPC) training : “Charter Authorized User” by CNES*
- *CNIGS training: “Charter PM “ and “Rapid Mapping” (first basic training) by CNES/SERTIT and other Charter partners*

Perspectives

- Enlargement of GIS training by the CNIGS in the local municipalities (with WB or other donor's funds)
- Operational Sentinel-2 derived Annual Land Use Maps produced by CNIGs, with only a hotline by CNES
- Semi-operational use of EOST landslide detection module on GEP
- Semi-operational use of SAR data processing (S1, Cosmo-Skymed, TerraSAR-X)

In relation with Charter Universal Access :

- *Operational use of Charter data, Copernicus products, RASOR modelisation, by the "Hydro Meteo Unit" in construction, supporting the Haitian Civil Protection*

Committee on Earth Observation Satellites

Haiti RO – Early Evaluation and Legacy Planning

Presentation to WGD #12
Reykjavik, Iceland, September 24th, 2019

Catherine Proy, CNES
Hélène de Boissezon, CNES
Agwilh Collet, CNES
Andrew Eddy, Haiti RO Secretary

Early Evaluation Objectives and Context

Objectives:

- Ensure **transparency** of project for funding organisations and beneficiaries, taking into account the diverse experiences and perspectives of the project partners (no exchange of funds project), as well as the beneficiaries.
- **Justify the effort** made by the partners and **explain results**.
- **Highlight successes** and why they are successes; share best practices and lessons learned.

Context:

- CEOS action to report on early evaluation to SIT (DIS-12)
- CNES retained AG Europe SAS to perform the evaluation, in three parts:
  - **Critical review of results by RO objective**
  - **Critical overall review by RO Steering Committee members**
  - **Survey of users and partners**
  - **Conclusions and recommendations**

Haiti RO Objectives at Outset

- **Demonstrate** in a high-profile context the **value** of using satellite Earth Observations (**EO**) to support **Recovery** from a major disaster.
- **Work with the Recovery community** to define a **sustainable vision** for increased use of satellite Earth observations in support of Recovery.
- **Establish institutional relationships** between CEOS satellite data providers and stakeholders from the international Recovery community.
- **Foster innovation** around high-technology applications to support Recovery.
- **Support capacity development in Haiti:**
  - Governmental and non-governmental players have access to detailed knowledge about EO ability to contribute to recovery;
  - Target groups have increased their capacity to implement EO-based recovery solutions and reduce risk
  - Technical capacity of those tasked with managing and producing geo-spatial data is reinforced

Methodology for critical analysis by objective (1)

Relevance: the extent to which the activity is suited to objectives, priorities, and policies.

Effectiveness: a measure of the extent to which an aid activity attains its objectives.

Efficiency: a measure of outputs in relation to inputs. Does the project as implemented use few resources to achieve the desired results?

Impact: positive and negative changes produced by the project, directly or indirectly, intended or unintended.

Sustainability : are the benefits of the activity are likely to continue after the project?

Methodology for critical analysis by objective (2)

Success measure	Color code
Completely successful (100% of objective)	Green
More than partly successful (51%-99%)	Blue
Partly successful (50% of objective)	Yellow
Less than partly successful (1-49%)	Beige
Not successful (0%)	Red

Haiti RO Objectives at Outset

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  - Target groups have increased their capacity to implement EO-based recovery solutions and reduce risk;
  - Technical capacity of those tasked with managing and producing geo-spatial data is reinforced.

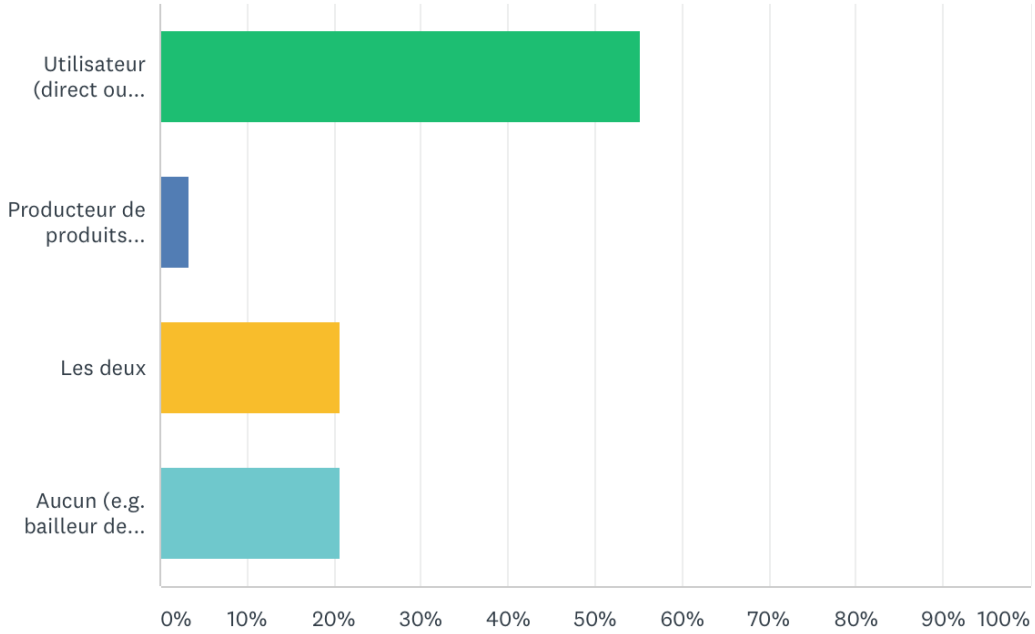
Survey

- **29 responses**, mostly from end users, to the Monkey Survey questionnaire
- Participants felt **RO products were useful in the Haitian context and provided a useful contribution to Post-Matthew recovery.**
- **85%** of participants felt the quality of RO products was **excellent** or **good**.
- Three **most useful** products: **damage to built structures, land cover, and environmental impact**.
- **80%** of participants fully agreed or agreed that the **RO fully met their organization's expectations** for the project.
- A very large majority felt that the **most important element to pursue** and reinforce was **short-term training** (one to two weeks) on **EO techniques and processing**.

RO Survey Results – who are respondents?

Je me considère

Answered: 29 Skipped: 1

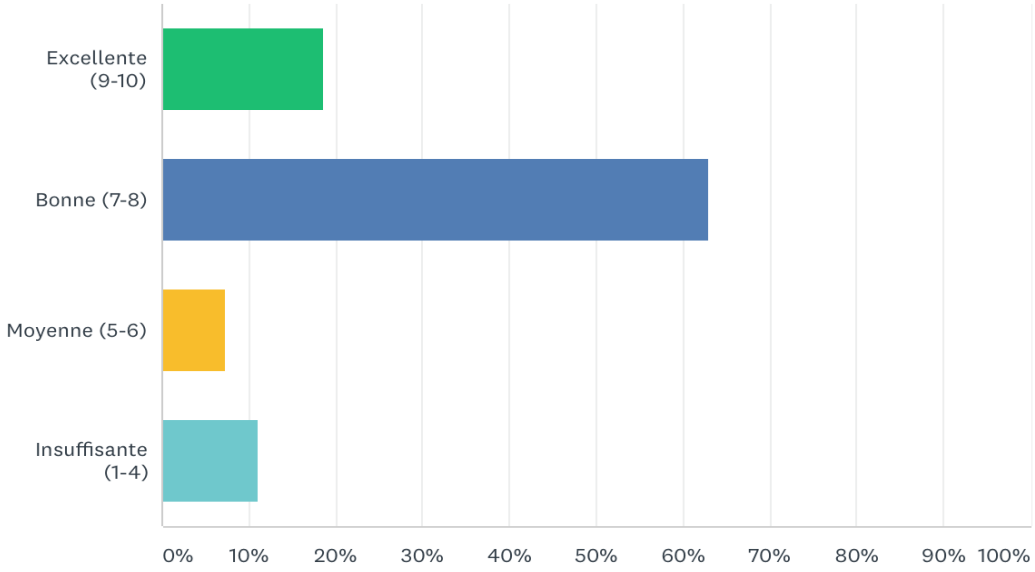


CHOIX DE RÉPONSES	RÉPONSES	
Utilisateur (direct ou indirect) de données satellitaires et de produits dérivés	55,17%	16
Producteur de produits dérivés	3,45%	1
Les deux	20,69%	6
Aucun (e.g. bailleur de fonds)	20,69%	6
TOTAL		29

RO Survey Results – quality of RO products

Je considère que globalement la qualité des produits RO est (1-10, 10 excellent)

Answered: 27 Skipped: 2

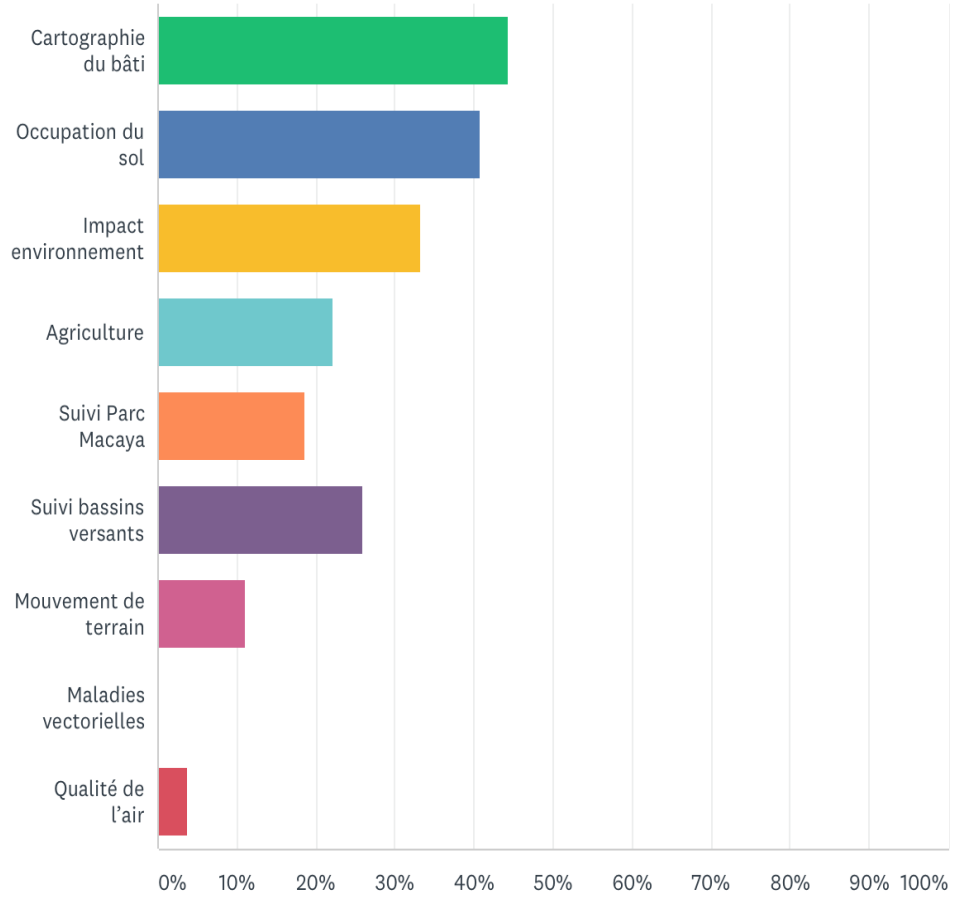


CHOIX DE RÉPONSES	RÉPONSES	
Excellente (9-10)	18,52%	5
Bonne (7-8)	62,96%	17
Moyenne (5-6)	7,41%	2
Insuffisante (1-4)	11,11%	3
TOTAL		27

RO Survey Results – most useful RO products

A mon avis, la catégorie de produits la plus utile dans les produits RO c'est (choisir deux)

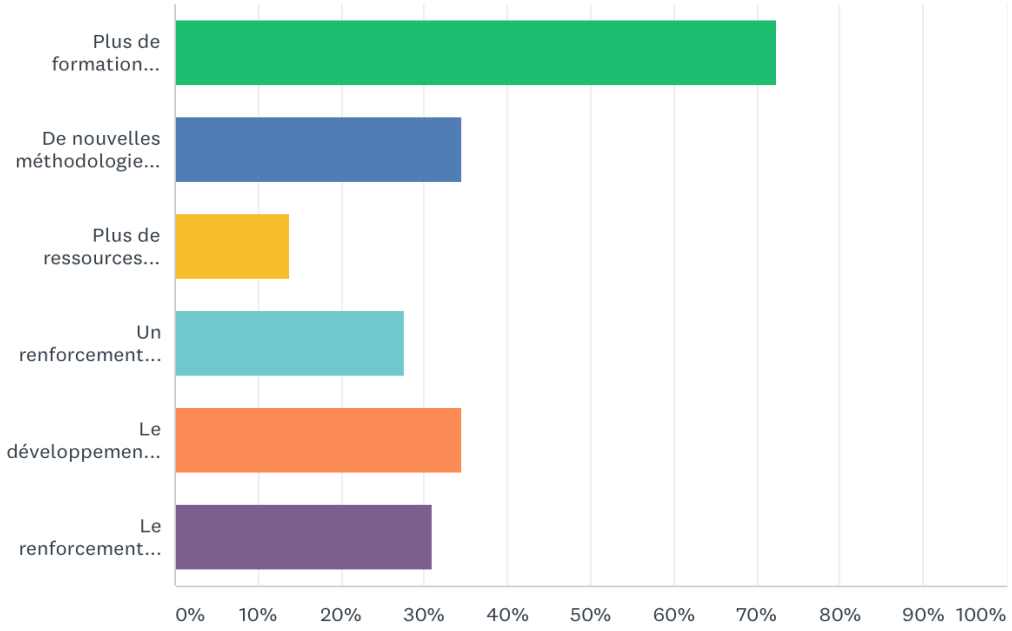
Answered: 27 Skipped: 2



RO Survey Results – most useful RO products

Afin de continuer à renforcer la capacité en Haïti, nous avons besoins en priorité de (choisir deux réponses)...

Answered: 29 Skipped: 0



CHOIX DE RÉPONSES	RÉPONSES	
Plus de formation courte durée (une semaine ou deux) sur les techniques d'Observation de la terre et du traitement des données	72,41%	21
De nouvelles méthodologies adaptées au contexte haïtien	34,48%	10
Plus de ressources financières pour acheter des équipements	13,79%	4
Un renforcement des programmes universitaires	27,59%	8
Le développement de capacités au sein des ministères	34,48%	10
Le renforcement des capacités existantes afin de consolider et empêcher la fuite des cerveaux	31,03%	9
Nombre total de participants : 29		

Conclusions

- RO Steering Committee feedback **very positive;** RO successfully built **strong relationships with end users**; **RO products of high-quality**; RO team reactive to feedback – see report
- RO **success needs to be better communicated** – website, workshops and conferences, CEOS and CEOS agencies
- Technical workshops have been a success but **more 'political' workshops and outreach** are also strongly required
- RO **well-viewed within** international **recovery stakeholder community** - profile within CEOS and **geo-spatial community could be raised**

Recommendations

Reinforce communication of project success:

- Technical summaries of future CNIGS products.
- Outreach event for Haitian public on what has been learned.
- Present status on website, by theme: T1) before Matthew; T2) immediately after; T3) 1 year later; T4) today.

Reinforce linkages to project relays for legacy

- Identification of key projects and partner institutions.

Develop capacity building programmes in close association with legacy projects, even if beyond RO scope

Target immediate post crisis and recovery planning in G-RO

- Shorter projects, with faster turn around.
- Heightened role for international stakeholders in definition of needs and linkages to end users.

Legacy Considerations

- RO will end in 2020 – presentation to CEOS plenary Q4 2020
- RO legacy in Haiti is **EO data and products database** (RO + Kal-Haiti) and **capacity building** with Haitian organizations:
  - Discussion on-going with CNIGS to determine whether RO platform remains or data is transferred to HaitiData.org
- Significant work remains to ensure success is consolidated – dedicated effort underway to identify specific projects which could fund follow-on efforts that build on RO success:
  - National Environmental Information System Indicators with UNEP
  - Agriculture projects with WB in Nippes and Les Cayes plain
  - Forestry and Environment projects with IADB
- RO legacy outside Haiti is **lessons learned for scalable and replicable RO on global scale.**


Thank you
Merci
Mesi