



Committee on Earth Observation Satellites

Recovery Observatory (RO)

Haiti Hurricane Matthew RO Status and Next Steps

Presentation to WGD #12

Reykjavik September 25, 2019

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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 Haiti Status Overview



**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 #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

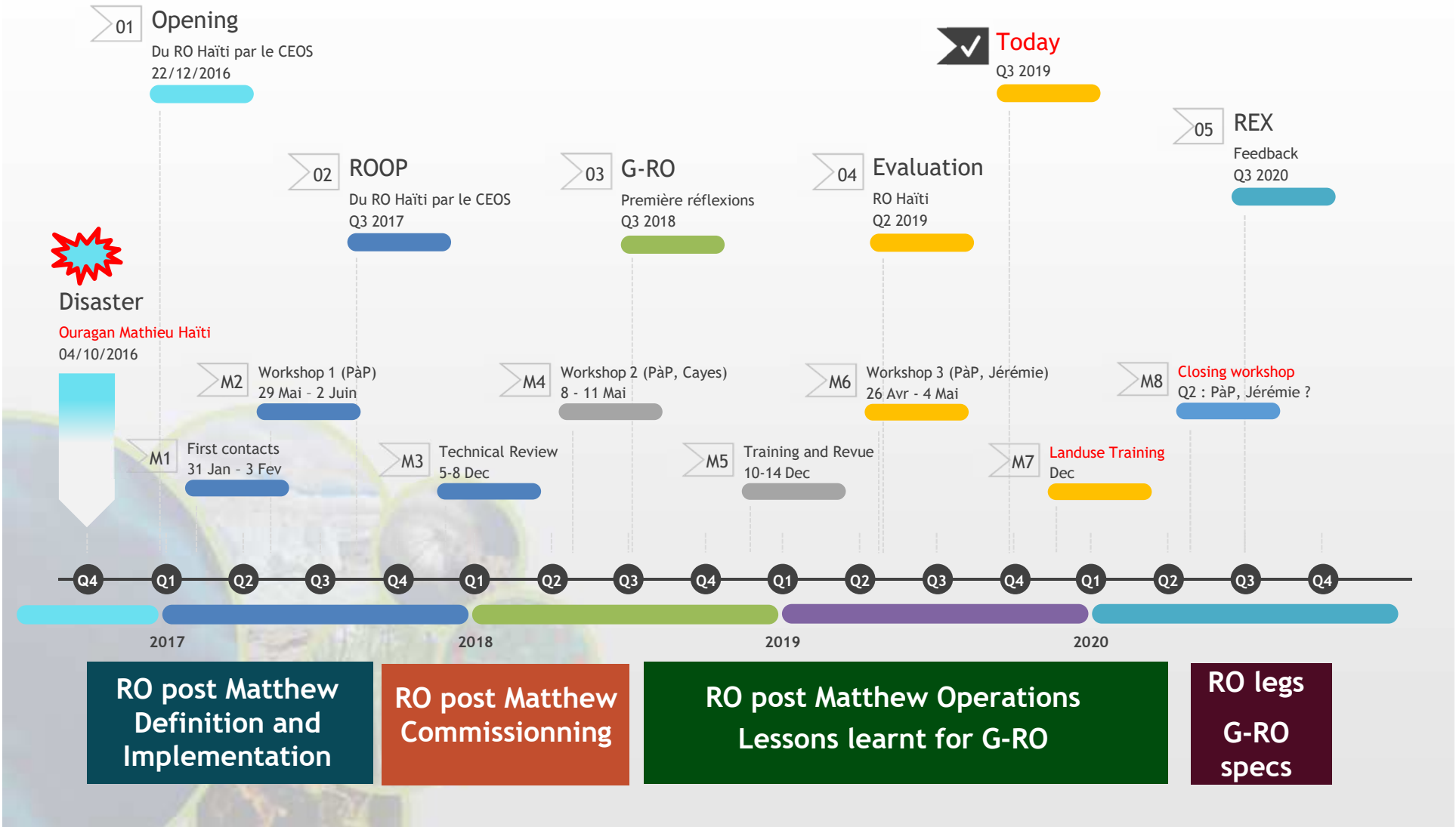


	Product	Key user	CEOS	Sat. Data
	Buildings Mapping	CIAT / Planning Ministry	CNES/SERTIT, Copernicus EMS R&R	Pléiades, WorldView-3
	Terrain Motion Change Detection	BME / URGeo	ASI, CNES/EOST	COSMO-SkyMed, Pléiades, Spot 6/7, TerraSAR-X
	Watershed / Flood	ONEV / Agriculture Ministry	ASI/CIMA Foundation	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





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 :
 - o Jérémie
 - o Camp Perrin Road <-> Jérémie
 - o 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

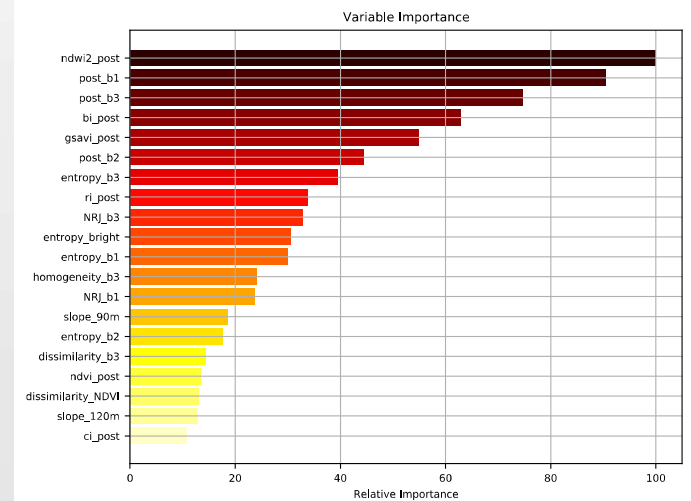
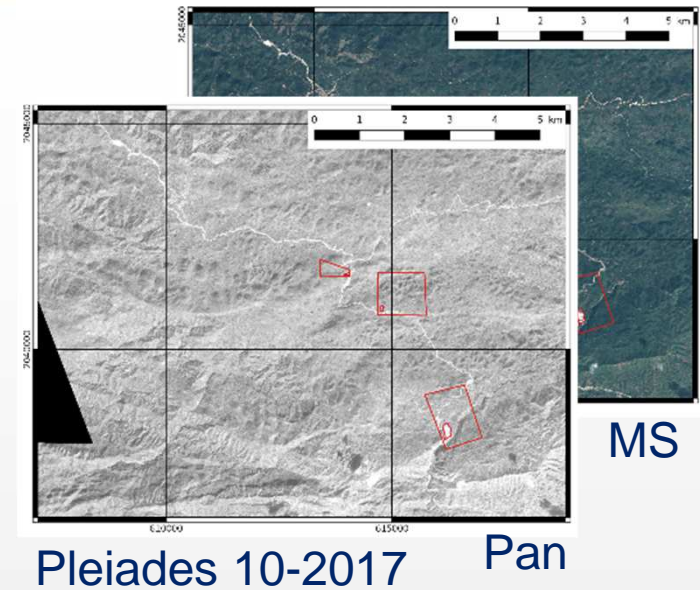
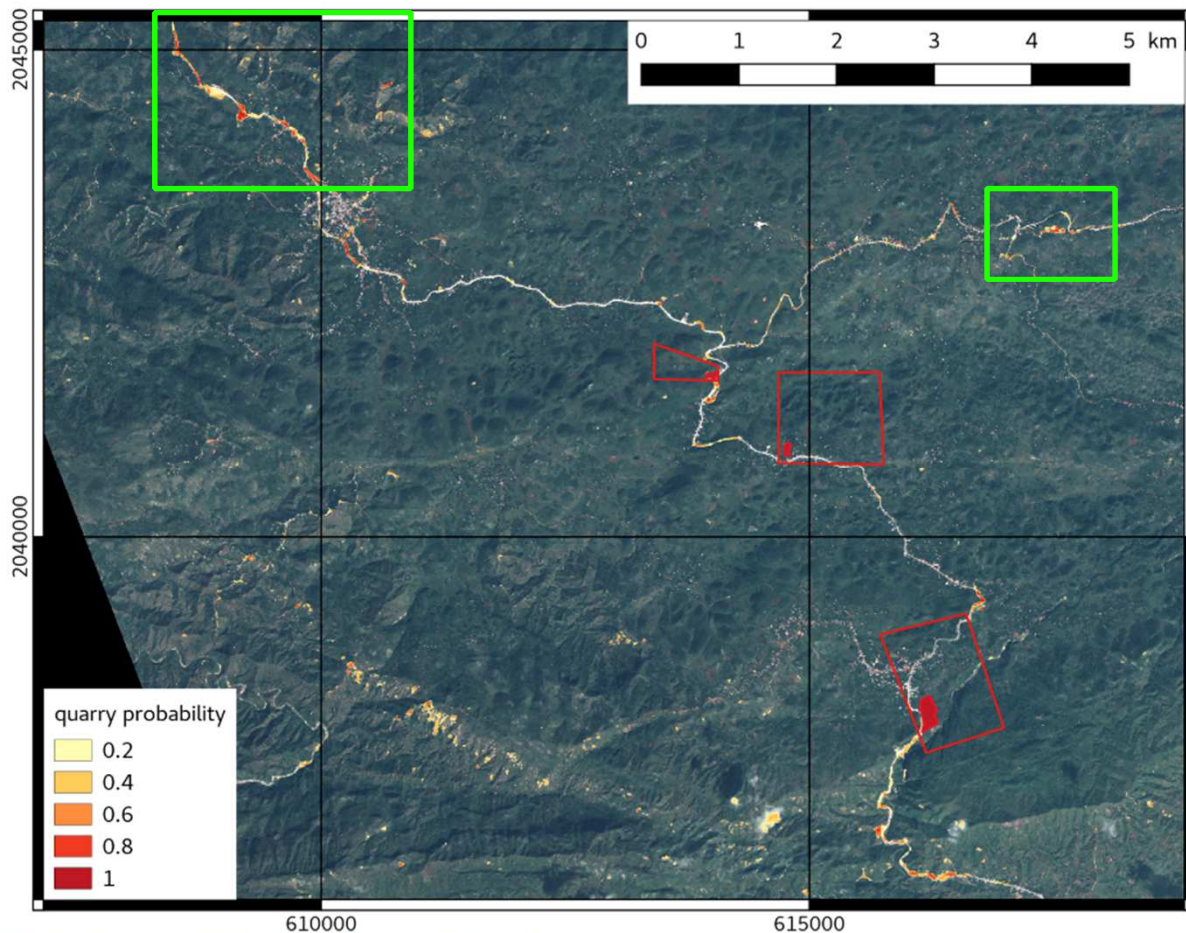


ImCLASS

Generic image classifier



Application: Automatic quarry detection in Haiti



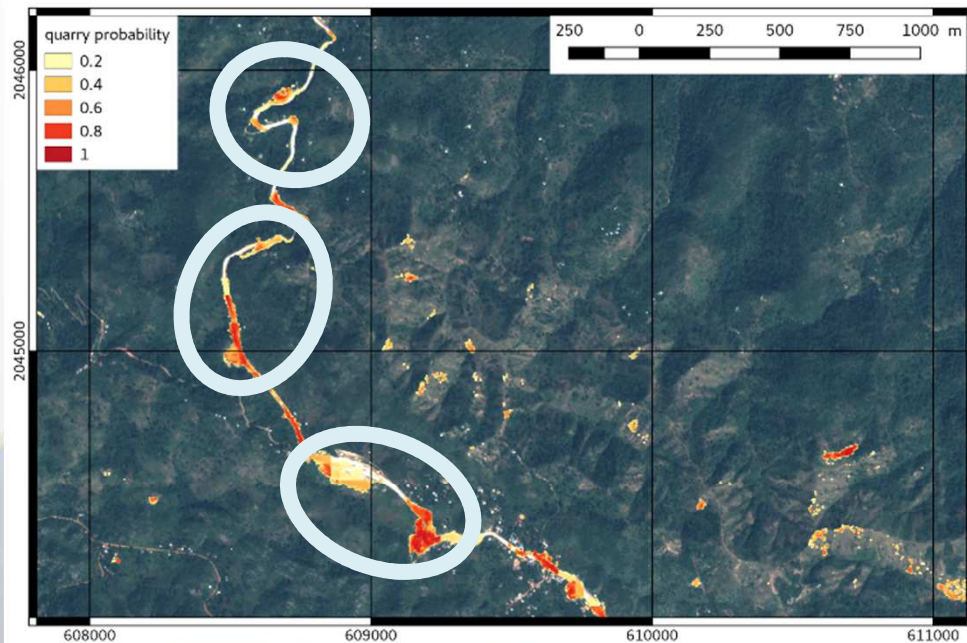


ImCLASS

Application : Automatic quarry detection in Haïti



First results:

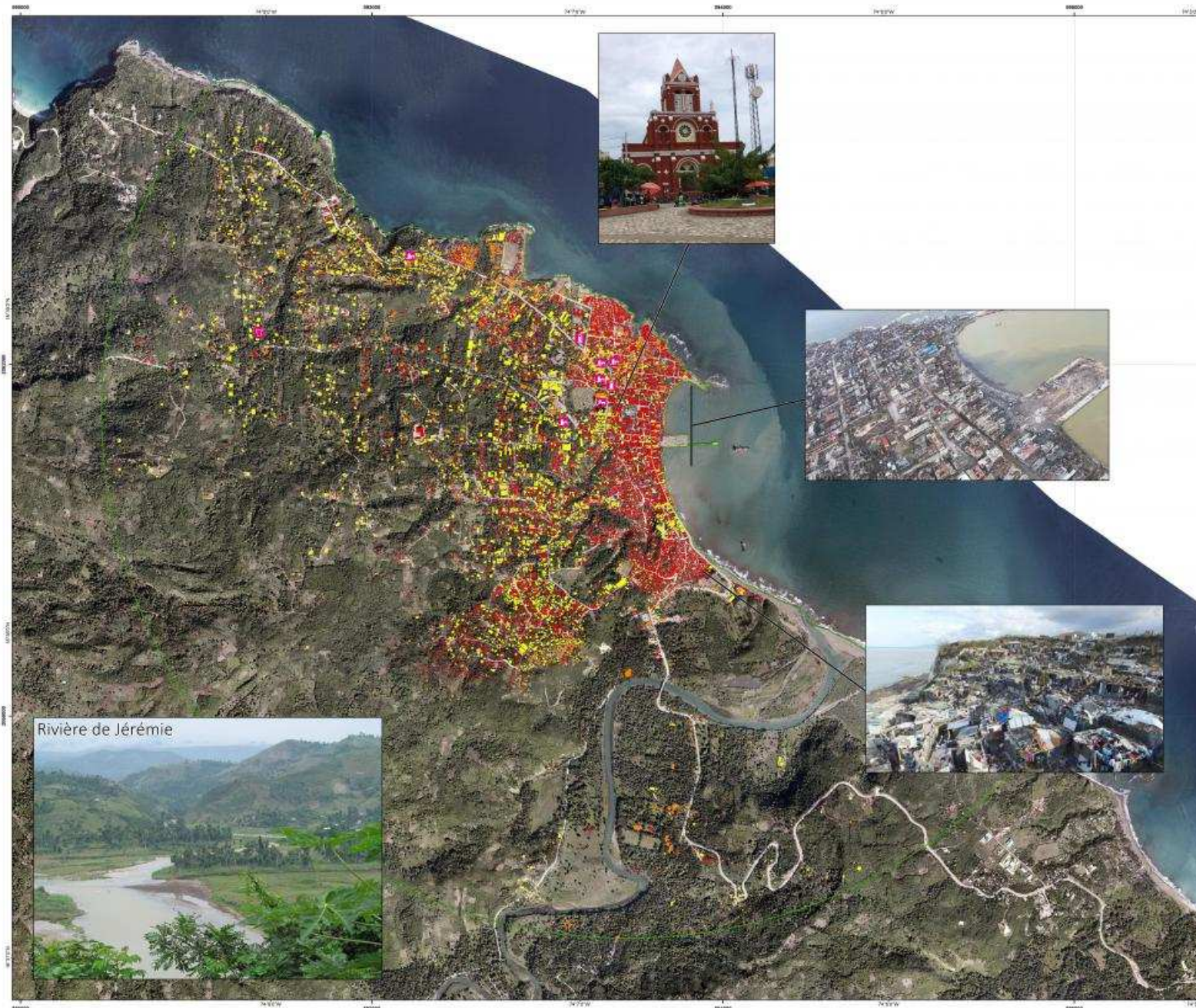


Some objects are difficult to differentiate from quarries:

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

But a lot of quarries well identified

Damaged buildings in Jérémie (End Users Map)



Rivière de Jérémie

Produit No. 01JEREMIE_BATI_ETAT_20161007

Jérémie - HAÏTI

Évaluation des dommages liés à l'ouragan Matthieu

Situation le 7 octobre 2016

Information cartographique
 1:10 000
 Feuillet A1, high resolution (300dpi)
 Projection locale: WGS 84 Zone 18 N (EPSG)
 Projection géographique: WGS 84 Lat/Long (Spheroid)

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
 ■ Limites d'analyse
 Points d'intérêt
 ■ Supermarché
 ■ Station d'essence
 ■ Traitement d'eau potable
 ■ Créche

Contexte
 Le 4 octobre 2016, l'ouragan Matthieu a frappé le sud-ouest (PAYS) le centre-ouest de Catalogne à la trajectoire parallèle à la côte en 1964. Avec plus de 1 300 mm de pluie dans les Caraïbes et plus de 1000 mm de pluie en Haïti, l'ouragan a été le plus mortel à frapper dans les Caraïbes depuis Jeanne en 2004. L'impact de Matthieu sera dévastateur. Mais que les innovations en matière de cartographie satellitaire et des drones en vue humaine, l'impact principal a été l'accès par le vent, qui dans certains secteurs a détruit plus de 95% des bâtiments et a complètement détruit les arbres et l'agriculture. En outre, des dommages environnementaux graves ont été constatés. Il convient de noter que la zone la plus touchée a la plus grande concentration d'édifices religieux protégés en Haïti.

Source des données
 État des toitures
 Bâti de l'analyse de l'image satellite Pleiades HR (20cm) acquise le 7 octobre 2016 après le passage de l'ouragan Matthieu, © SERTIT 2016
 Image de fond
 Cartographique (20cm) acquise en 2014, © IGN (2014), distribution CMG-IGP.
 Informations de référence: CIAIT, CNIG.
 Carte de localisation
 Données des données: © Jivonne JAC 2015, 69800 2010, Natural Earth 2015

Description de la carte
 Cette carte présente l'état d'endommagement du bâti sur le site 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 divisé selon 3 classes d'endommagement: peu ou pas endommagé, endommagé et détruit.
 La terminologie «bâti» s'applique à ce qui fut précédemment à partir d'une vue orthogonale au sol, ce qui exclut notamment les toitures et les autres éléments qui sont situés et qui pourraient être retirés des images lors de leurs opérations.
 De plus, l'interprétation visuelle des images peut être biaisée en raison de la qualité variable de l'image et des nuages.

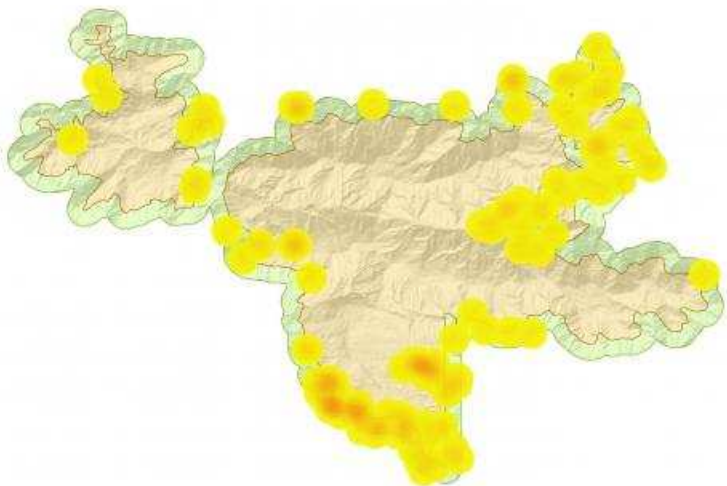
État post-Matthieu (07/10/2016)		
	Nombre de bâtiments	%
Peu ou pas endommagé	4228	34,8
Endommagé	1579	13,3
Détruit	6353	51,9

Contact
 Cette carte a été produite dans le cadre du Recovery Observatory (RECOVEROBS).
 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'usage de cette carte ne peut être engagée quant à son contenu et son éventuelle utilisation.
 Carte réalisée par le SERTIT
 serti@seriti.org.hi
 Tél: +509 34 43 46 67

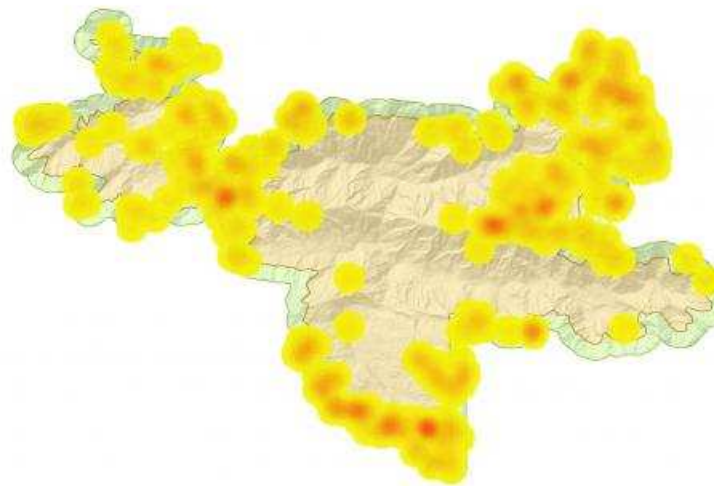
Logos: CIOS, Recovery Observatory Haiti, cnes, Sertit, ICUSE

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

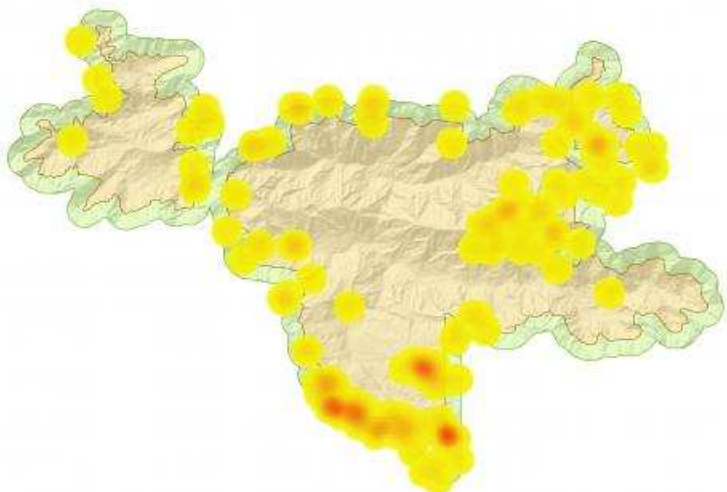
Densité du bâti apparû (2014-2017)



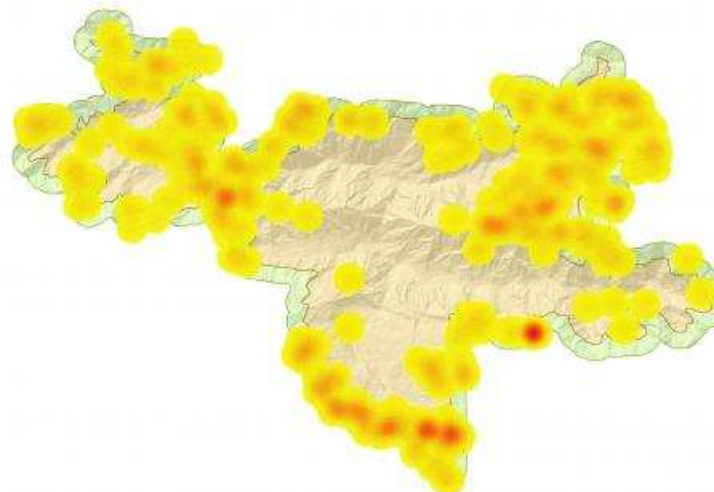
Densité du bâti disparu (2014-2017)



Densité du bâti apparû (2014-2018)



Densité du bâti disparu (2014-2018)



Titulaire: M. USMADORA, BNTI, DENSITE_EVOLUTION

Parc Macaya - HAÏTI

Densité du bâti

Evolution entre 2014, 2017 et 2018

Carte de localisation



Information cartographique

1:72 000

0 1 2 km

Projection locale: WGS 84 UTM Zone 18 N (globe)
Projection géographique: UTM 84 UTM (globe)

Légende

Densité du bâti (nb/km²)

20
0

Zone d'intérêt

Levier Parc Macaya
Zone tampon (500m)

Interprétation

Le 4 octobre 2018, l'ouragan Matthew a frappé le sud-ouest d'Haïti, le premier ouragan de catégorie 4 à frapper Haïti depuis l'ouragan Cléa en 1962. Avec plus de 1 300 personnes dans les Caraïbes dont plus de 1000 sans pertes en fait, l'ouragan a été le plus mortel à frapper dans les Caraïbes depuis Jeanne en 2004.

L'impact de Matthew varie considérablement. Alors que les habitants ont subi des dommages considérables et des pertes en vies humaines, l'impact principal a été ressenti par le vent, qui a été sensible partout à 1000 plus de 80% des résidents et a complètement détruit les arbres et les cultures. En outre, des dommages environnementaux graves ont été constatés. Il convient de noter que la zone la plus touchée a le plus grande concentration d'aires naturelles protégées en Haïti.

Sources des données

Cartographie de bâti
Bâtiment de l'Institut de Topographie de Haïti (IT) en 2014, avant le passage de l'ouragan Matthew, ainsi que des images Planète (0,5m) acquises le 04 décembre 2017, le 10 juin 2018 et le 01 décembre 2018 © BNTI 2018.

Image de fond

Carte géographique (2018) acquise en 2014, © IGN (2014), adaptation CNIG.

Informations de référence

CHIGG, CHAT, CGM.

Cartes de localisation

services des données JMC 2015, USBCO 2015, Natural Earth, 2015.

Description de la carte

Cette carte présente la densité du bâti apparû et disparu sur l'ensemble du Parc Macaya (zone tampon de 500m) de Parc Macaya (Haïti) entre 2014, 2017 et 2018, sur une période de deux ans avant et après le passage de l'ouragan Matthew.

La précision spatiale de l'analyse par photo-interprétation est estimée supérieure à 90%.

	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 (ONRECOV).

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 du contenu de cette carte ne peut être engagée quant à son contenu et son exactitude à l'échelle.

Carte réalisée par l'Cube-GEOTIT

we@we.it-geo.it

http://we.it-geo.it

we@we.it-geo.it

http://we.it-geo.it

we@we.it-geo.it

http://we.it-geo.it

we@we.it-geo.it

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http://we.it-geo.it

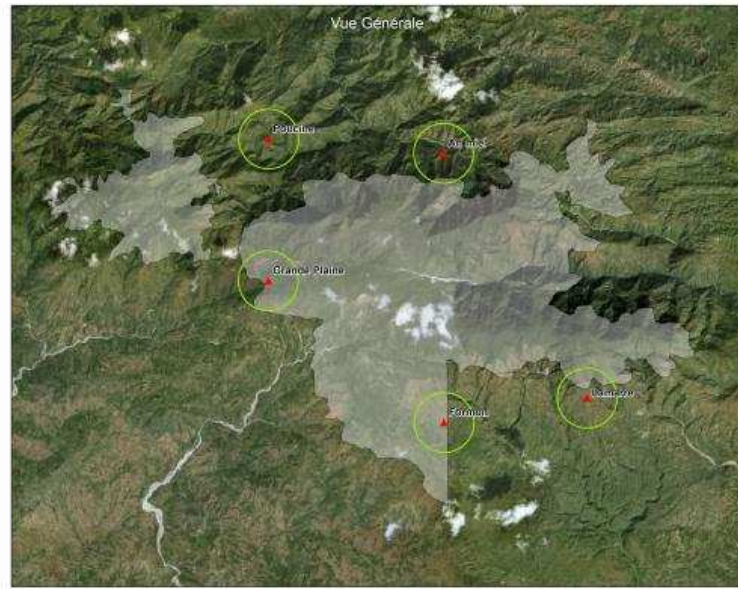
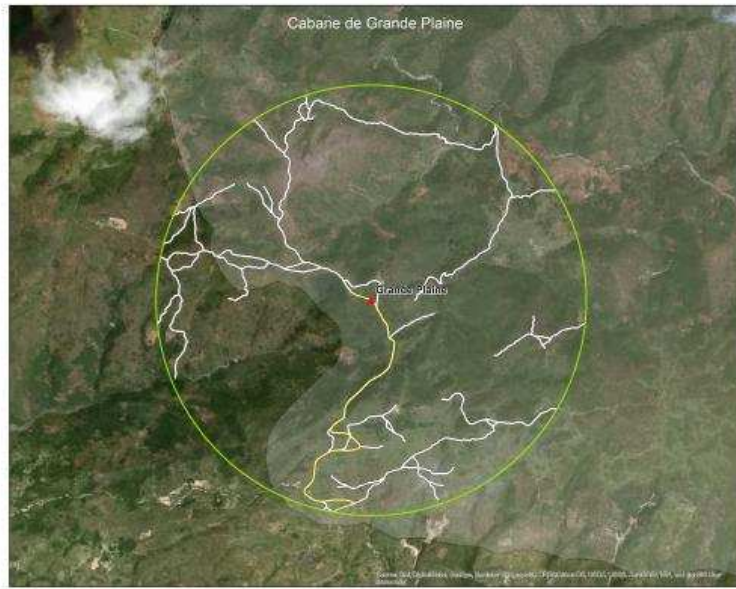
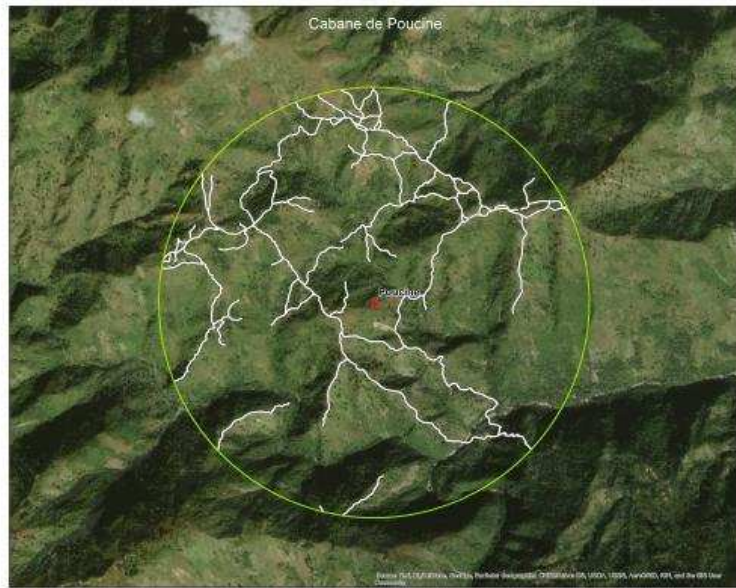
we@we.it-geo.it

http://we.it-geo.it

we@we.it-geo.it

http://we.it-geo.it

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



Produit No. DIMAURH_SEPT2018_2018

Parc Macaya - HAÏTI

Cartographie des sentiers

Situation en 2018

Carte de localisation



Information cartographique

1:10 000



Projection locale: WGS 84 UTM Zone 18N (m)

Projection géographique: WGS 84 UTM Long (mètres)

Légende

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

Interprétation

Le 4 octobre 2018, l'organisateur Matheu a frappé le subseau d'Etat, le premier coup de catégorie 4 à Haïti depuis l'ouverture de la loi de 1982. Avec plus de 1 200 ans perdus dans les Caraïbes et plus de 1 000 ans perdus en Haïti, l'organisateur a été le plus riche à l'appel des les Caraïbes depuis James en 2004. L'impact de Matheu sans doute. Alors que les montagnes ont causé des dommages considérables et des pertes en vies humaines, l'impact estival se fait ressentir par le vent, qui dans certaines régions a défilé plus de 80% des toitures et a complètement défilé les arbres et l'agriculture. En outre, des dommages environnementaux globaux 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 de base

donnée de l'analyse de l'ortho-photo (0,25m) acquise en 2014, avant le passage de l'ancien Matheu, ainsi que des images Planes (0,5m) acquises le 15 juin 2018 et le 01 novembre 2018. © SERTIT 2018

Image de fond

ESR World Imagery © DigitalGlobe

Informations de référence

CEOS, CAT, OSH

Cartes de localisation

basées sur des données JRC 2013, GISCO 2010, Natural Earth 2012

Description de la carte

Cette carte présente les sentiers visités dans un rayon de 1000 m autour des cabanes de référence de l'UNP Macaya (2018) en 2018.

La précision horizontale des relevés par photogrammétrie est certifiée supérieure à 5cm.

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

Contact

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

Toutes les informations géographiques ont des limitations dans la précision, la date ainsi que l'interprétation de la donnée source. La responsabilité de l'usage de cette carte ne peut être engagée par le site internet et son éventuelle utilisation.

Cette carte est par © SERTIT

ser@ser.it | La Vie en Vert

14/07/2018 | 10h30



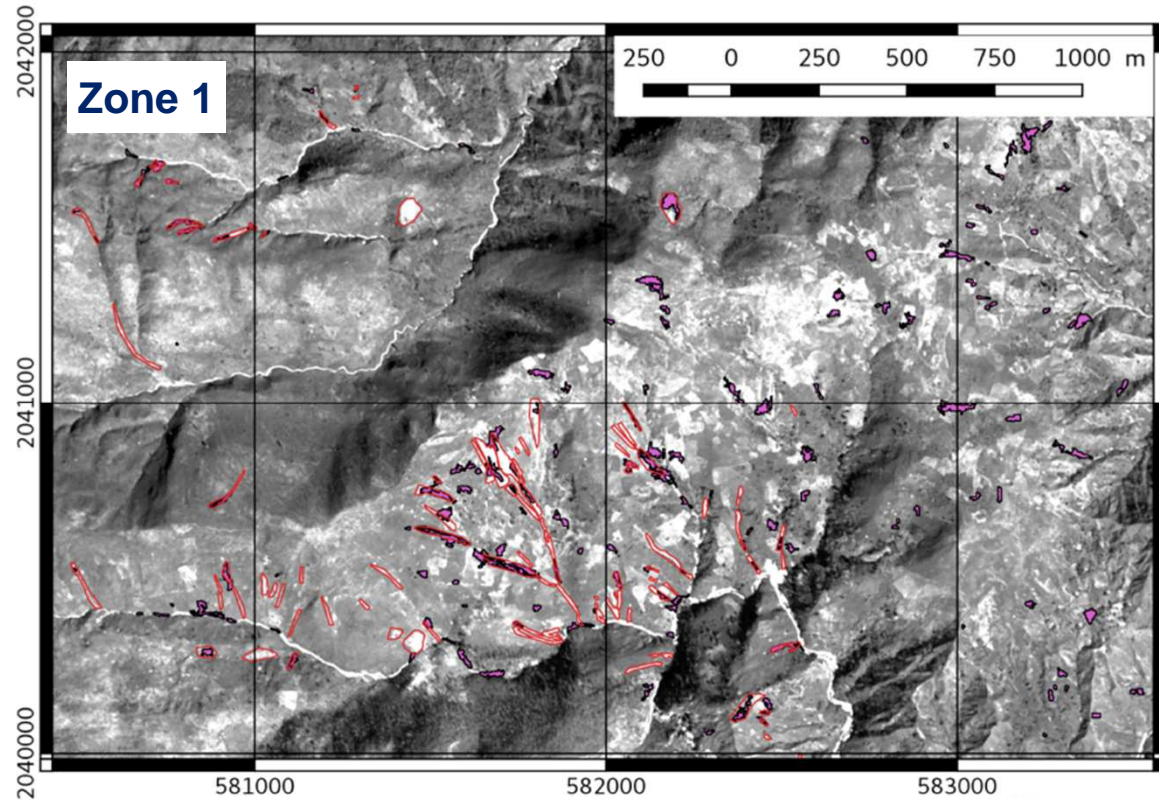


EOST RO activities on landslide mapping: JP Malet





APPLICATIONS: RAIN-TRIGGERED LANDSLIDES HURRICANE MATTHEWS - HAITI



Machine Learning with 20 attributes

Parameters:

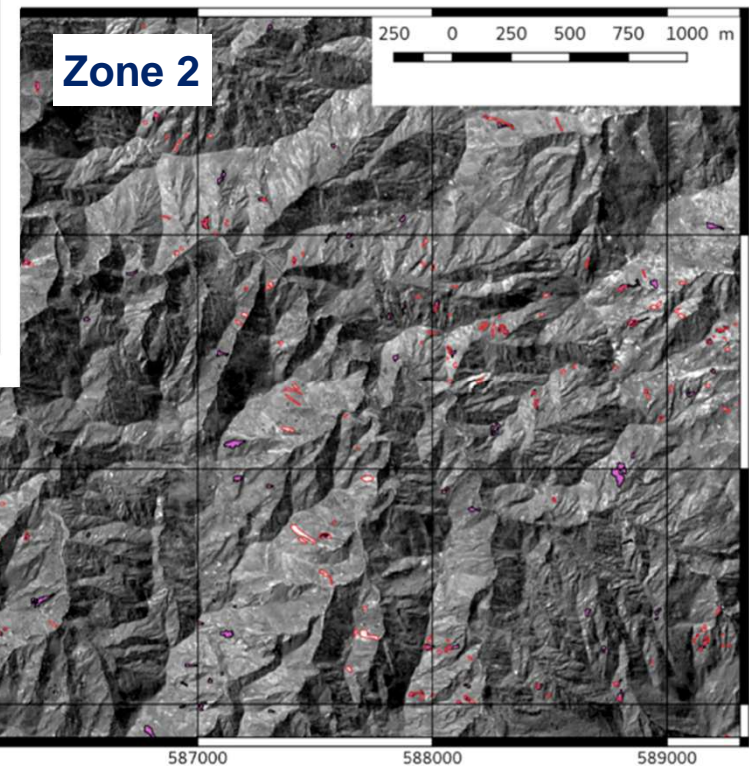
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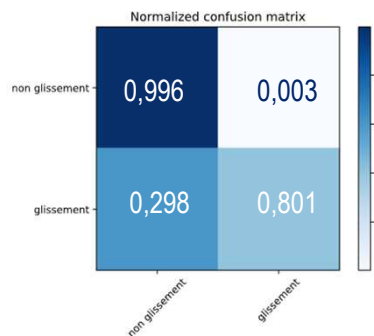
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Accuracy:
Confusion matrix

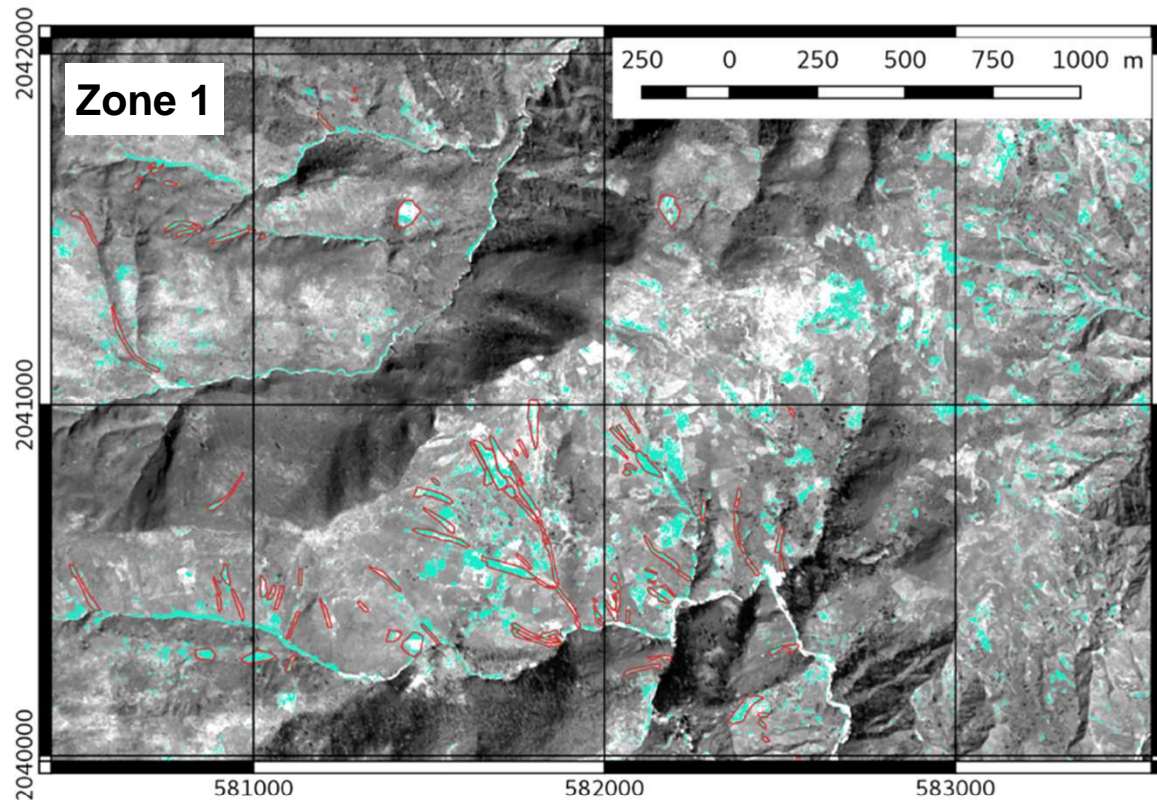




ImCLASS FOR HAITI

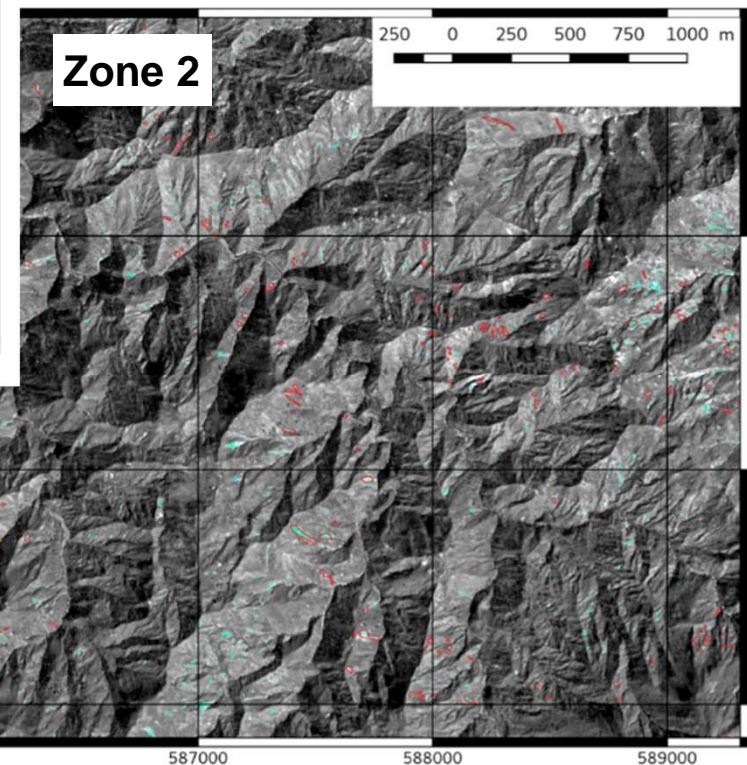
MODEL 1: 22 ATTRIBUTES (similar to ALADIM)

SPOT DATA



Model with 22 attributes -> same as ALADIM

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



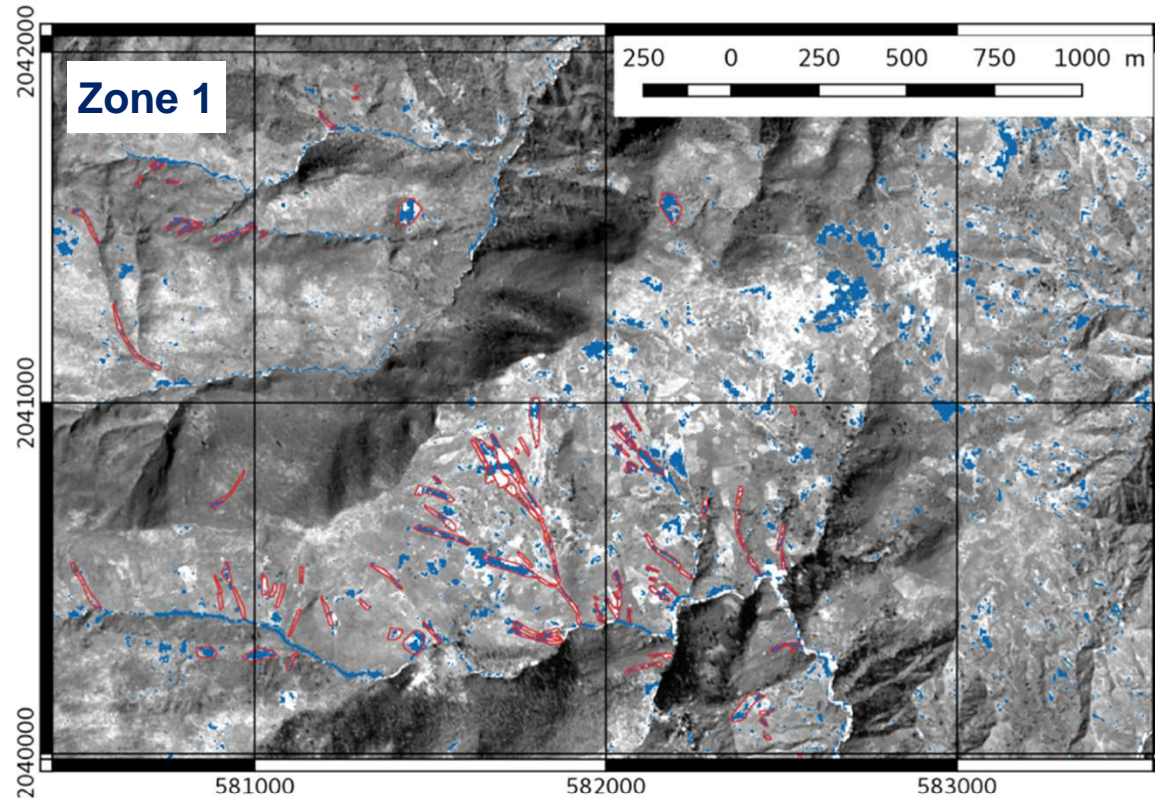
Normalized confusion matrix

non glissement	0,987	0,012
glissement	0,604	0,396
	non glissement	glissement

0.8
0.6
0.4
0.2

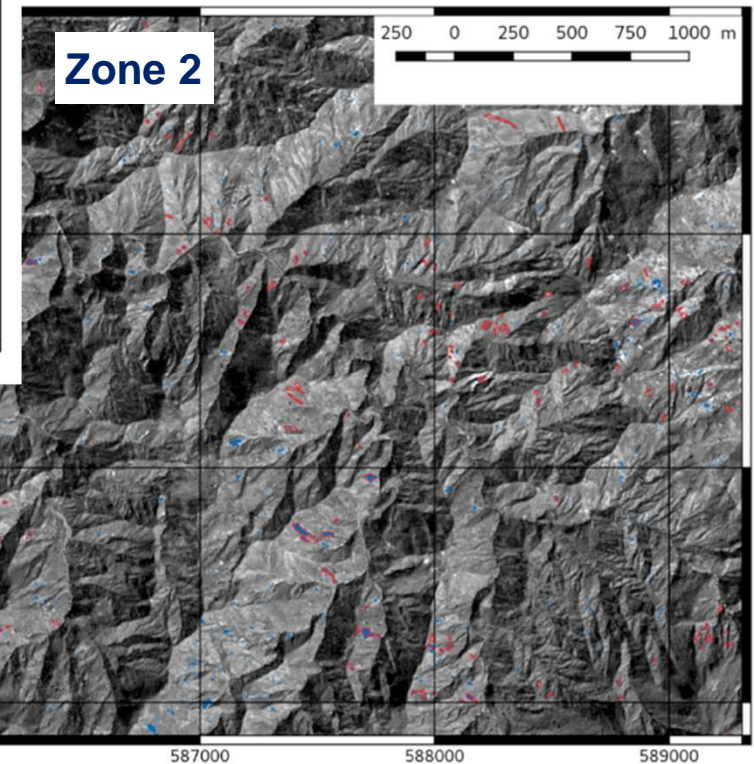


ImCLASS FOR HAITI MODEL 2: 56 ATTRIBUTES, NO TOPO SPOT DATA



Model with 56 attributes

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

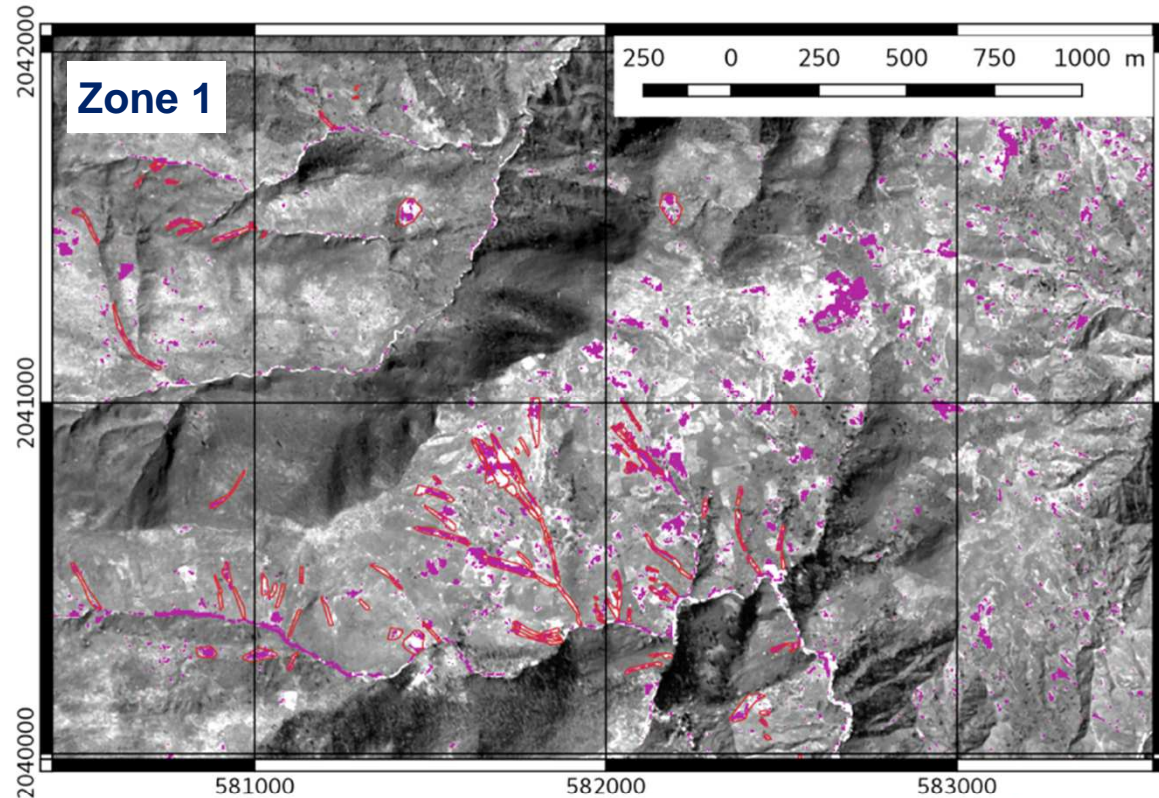


Normalized confusion matrix

non glissement	0,987	0,012
glissement	0,451	0,548
	non glissement	glissement

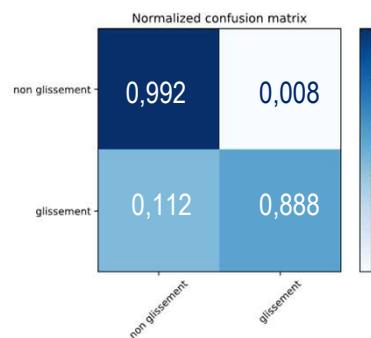
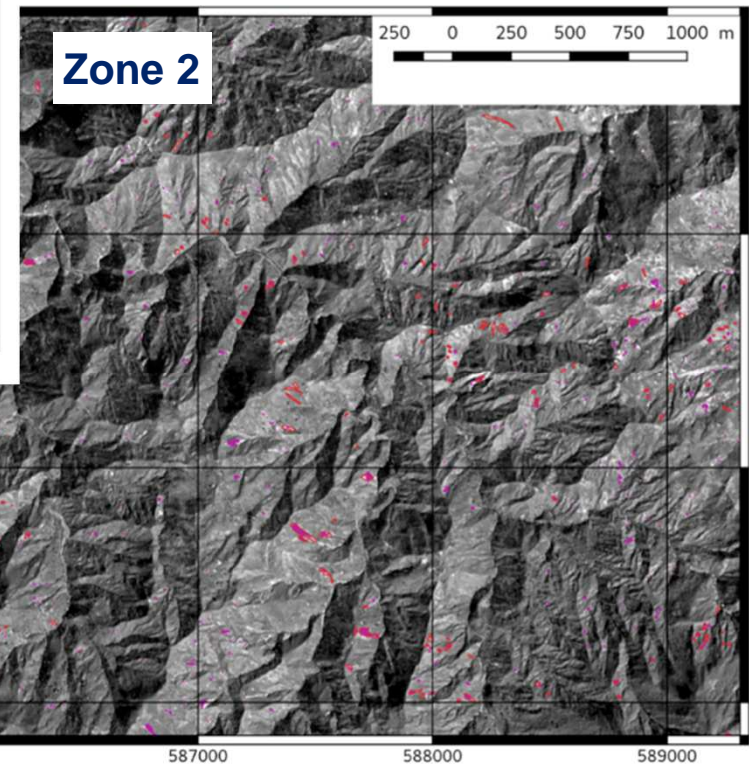


ImCLASS FOR HAITI MODEL 3: 70 ATTRIBUTES SPOT DATA



Model with 70 attributes

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



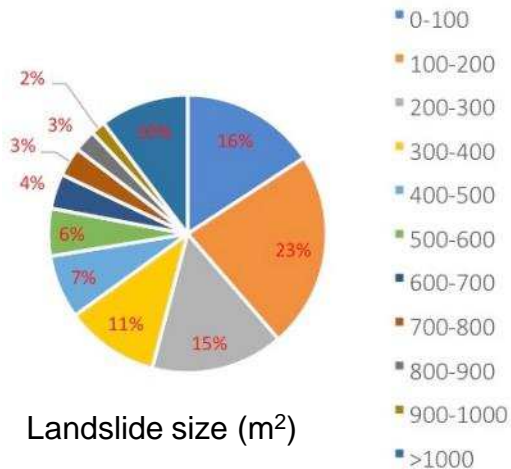
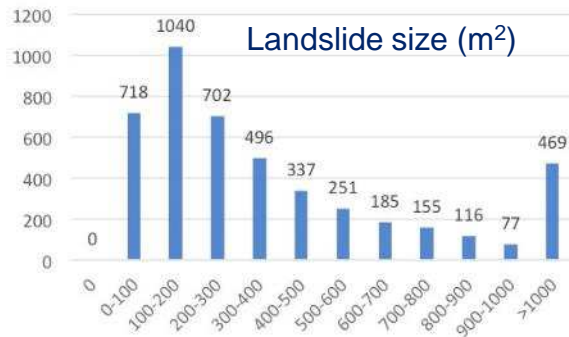


USE OF SPACE LANDSLIDE INVENTORY: STATISTICS AND TRIGGERS FOR FORECAST

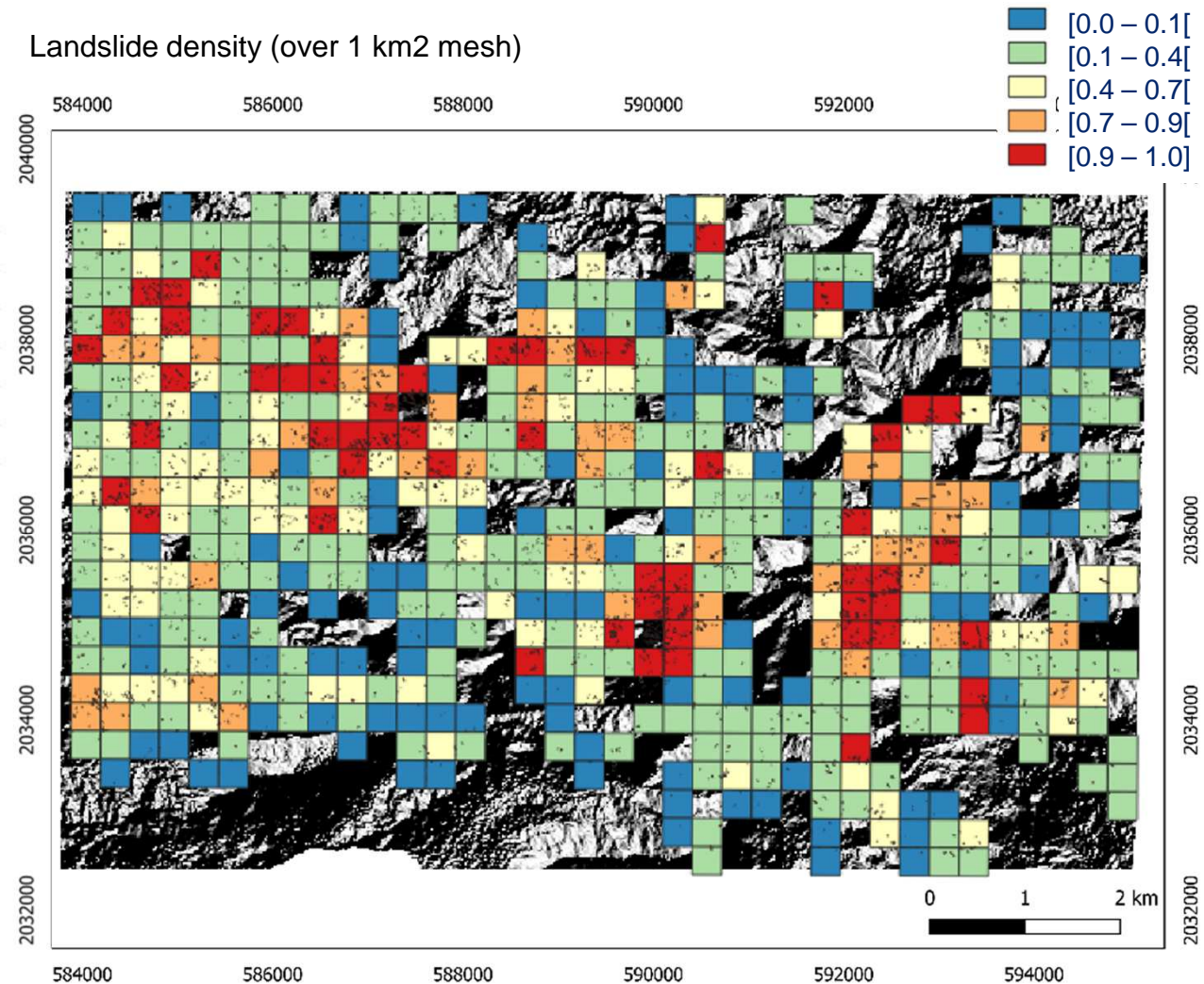


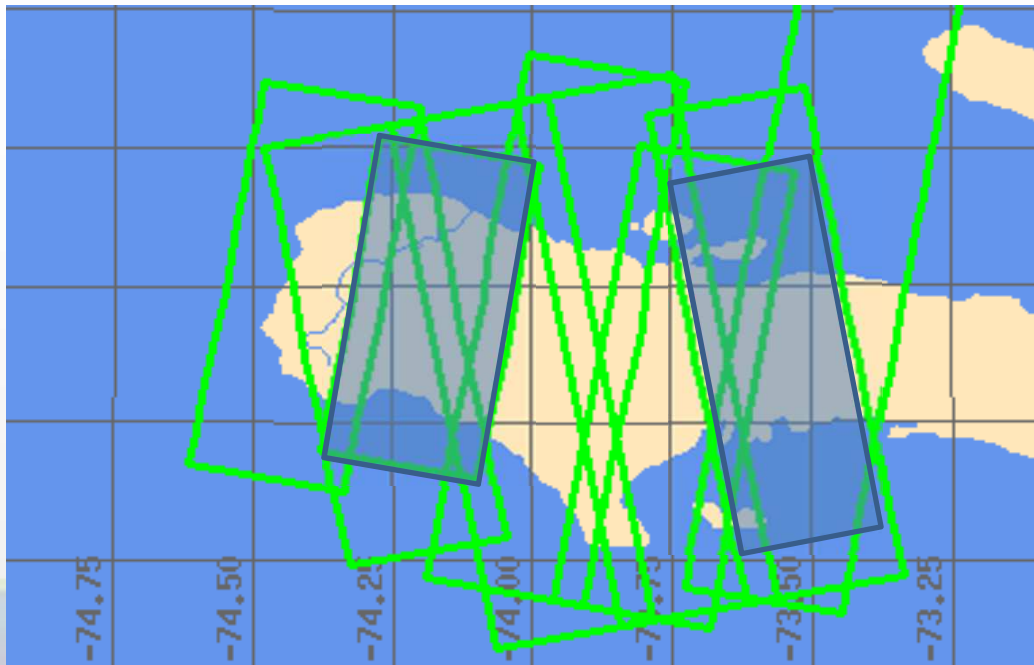
Aggregated indicators

Number of landslides: > 7000
Landslide surface: 4km²



Landslide density (over 1 km² mesh)





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

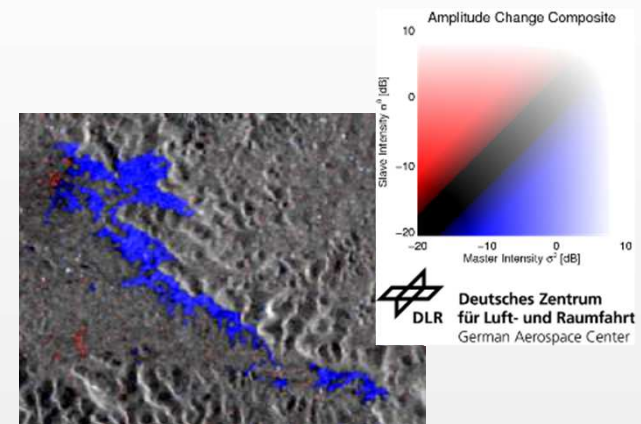


ASI's scientific goal → To develop experimental scientific products tailored to obtain useful information on ground stability and motions for target areas of the RO

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

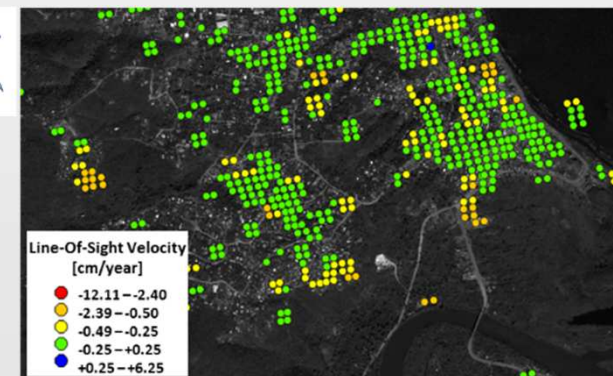
✓ Consolidated activities

- 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

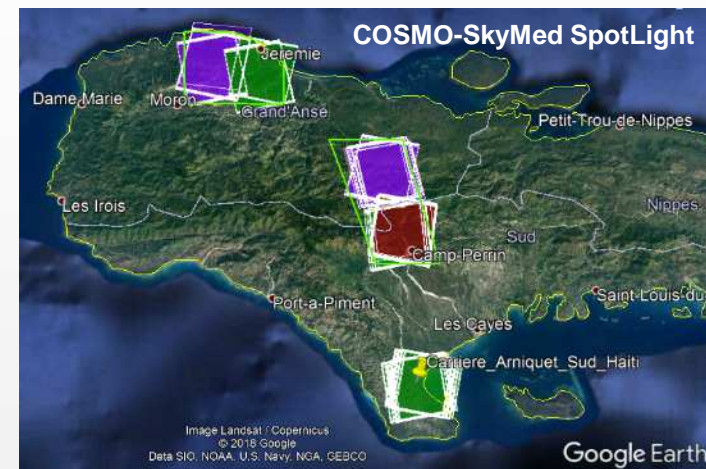


ASI's scientific goal → To develop experimental scientific products tailored to obtain useful information on ground stability and motions for target areas of the RO

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)

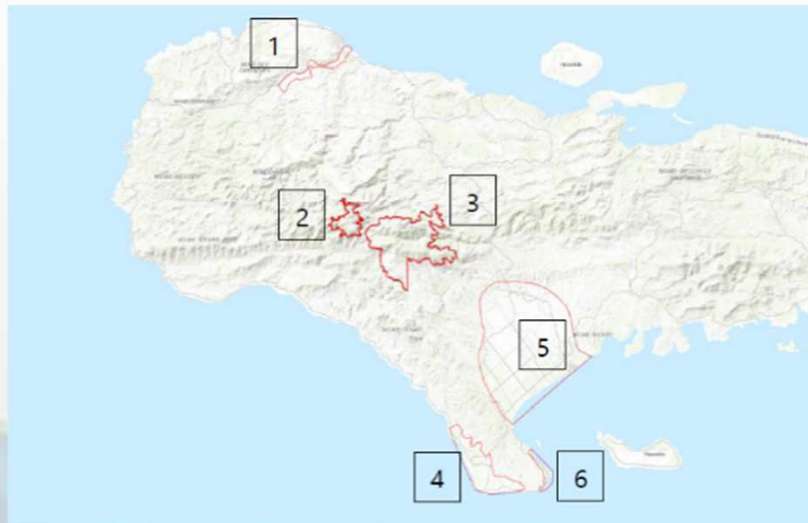




Copernicus EMS RRM



- **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**

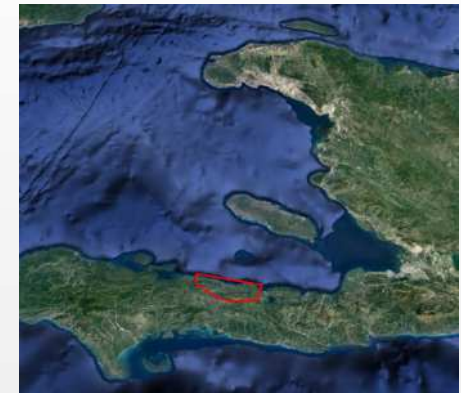


Links with a new WB Haiti agroforestry study on Nippes



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

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

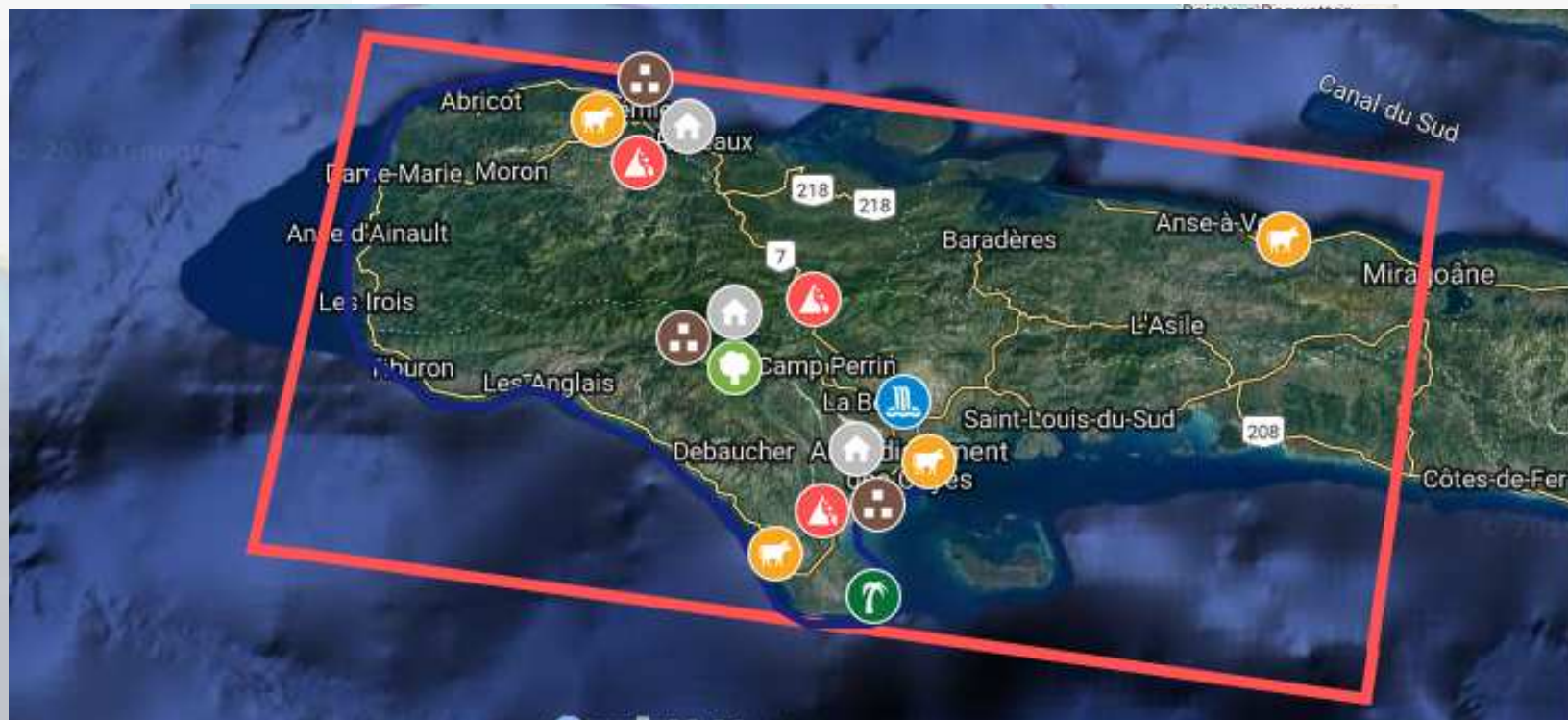


Joint activity WB–RO in 2019: Training on LULC(Land Use Land Cover) by WB (CIRAD + SERTIT in october), building on RO previous trainings; Access to RO imagery

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



- 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

- 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**



- **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



- **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.**



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.**

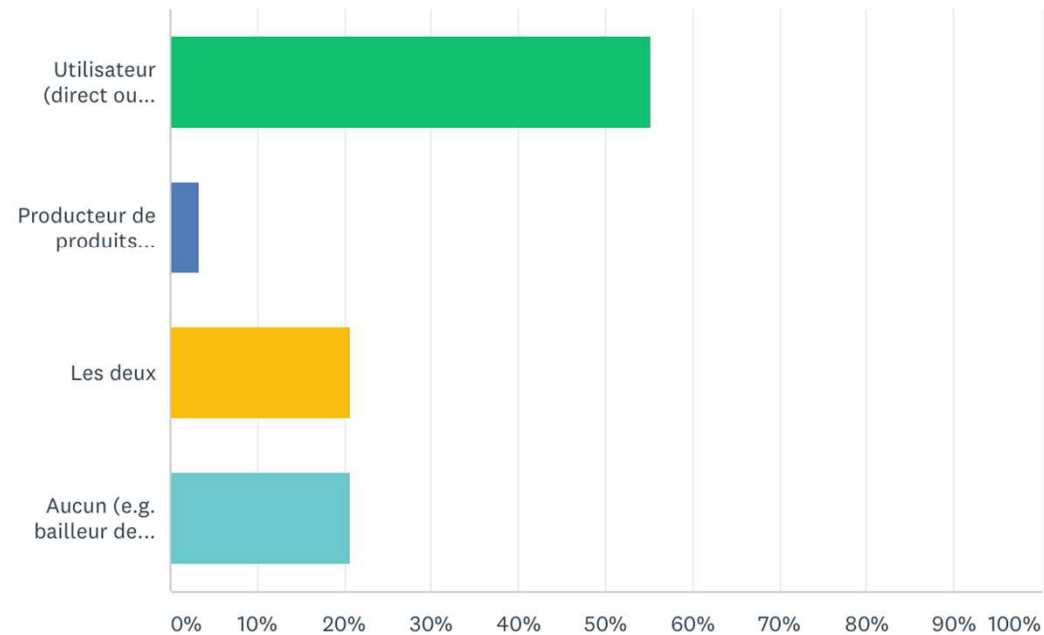


RO Survey Results – who are respondents?



Je me considère

Answered: 29 Skipped: 1



CHOIX DE RÉPONSES	RÉPONSES (%)	RÉPONSES (Nombre)
▼ 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

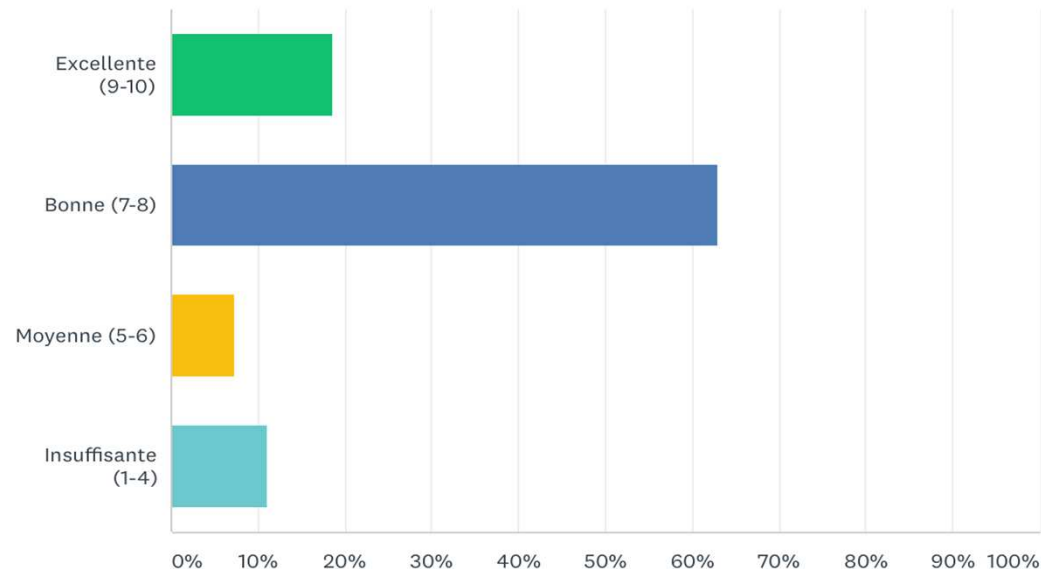


RO Survey Results – quality of RO products



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

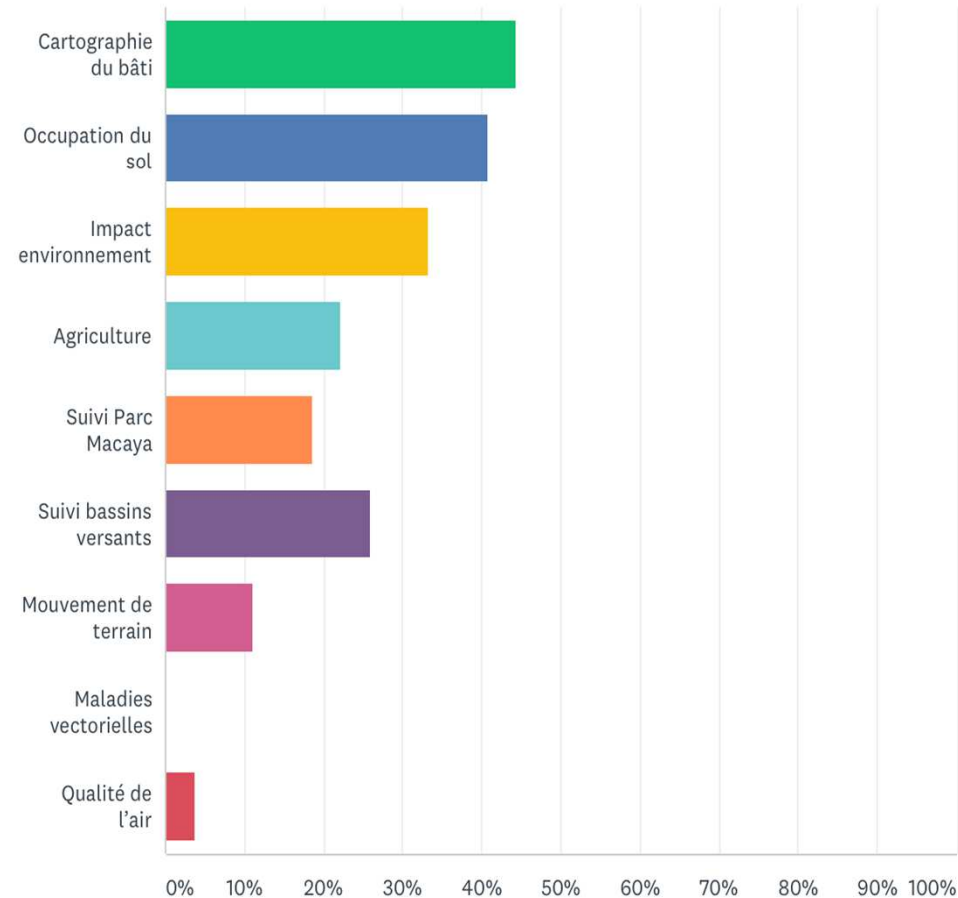


RO Survey Results – most useful RO products



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

Answered: 27 Skipped: 2



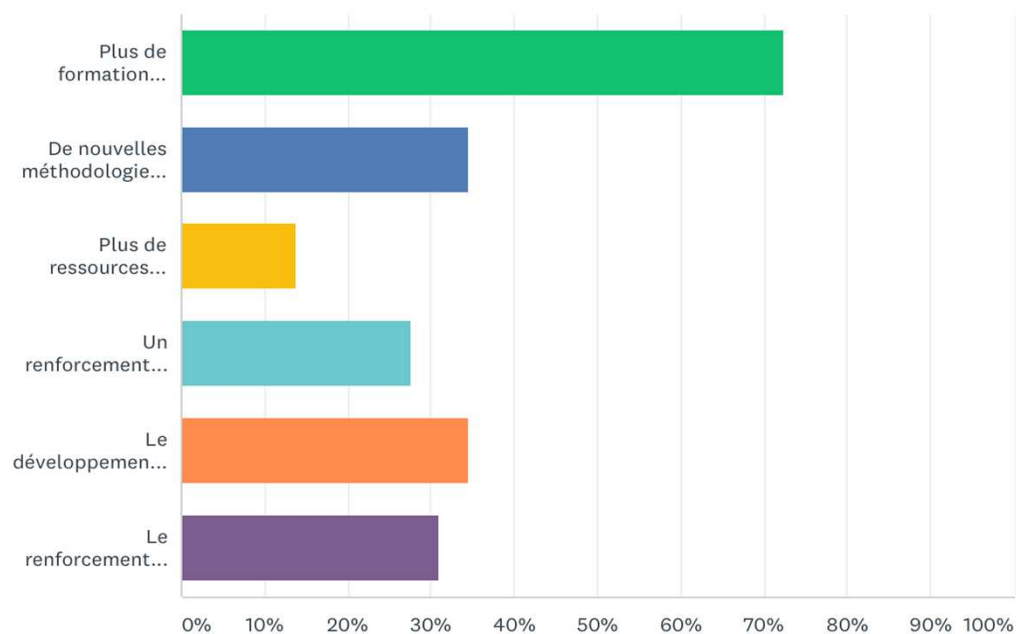


RO Survey Results – most useful RO products



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