



FLEGT Watch

Support de formation au Gabon



Serge RIAZANOFF
Directeur
serge.riazanoff@visioterra.fr
<http://www.visioterra.fr>

serge.riazanoff@u-pem.fr
<http://www-igm.univ-mlv.fr/~riazano/>



Table des matières

➤ Administration

- Organisation du projet
- Gestion des utilisateurs
 - Enregistrement des participants
- Gestion des aires à surveiller

➤ L'observation par satellites

- Plateformes, orbites et instruments
- Sentinel-2 – Optique HR
- Sentinel-1 – Radar HR

➤ Photo-interprétation

- Examiner les évènements d'une aire à surveiller
- Vérifier un événement avec:
 - les cartes de base
 - des images optiques
 - les précipitations l'ayant précédé

➤ Mission de terrain

- Préparer la mission
- Exécuter la mission
- Retourner de mission, partager les ressources



VT-P281-TRN-005-F-01-00 - Agenda de la formation
- page 1 -

Formation « FLEGT Watch »

Présentation du projet et des données satellitaires, photo-interprétation, mission de terrain



Lundi 27 janvier 2020 - Introduction

Après-midi

- Présentation des participants
- Objectifs et organisation du projet « FLEGT Watch »
- Création des comptes utilisateurs : « Observateurs indépendants »
- Création des « Aires surveillées » (forêts classées, parcs, réserves, concessions forestières...)

Mardi 28 janvier 2020 - Présentation des images Sentinel-2 et Sentinel-1

Matin

- Présentation des données optiques Sentinel-2
- Traitement, photo-interprétation et partage
- Photo de famille

Après-midi

- Présentation des données radar Sentinel-1
- Traitement, photo-interprétation et partage

Mercredi 29 janvier 2020 - Présentation de « FLEGT Watch »

Matin

- Présentation du portail (composante Web) de « FLEGT Watch »
- Découvrir et analyser les événements sur les aires à surveiller
- Choisir la cible de la mission de terrain

Après-midi

- Téléchargement de l'application « FLEGT Watch App »
- Préparation de la mission
- Simulation d'observations dans cette mission

Jeudi 30 janvier 2020 - Mission de terrain

Vendredi 31 janvier 2020 - Exploitation des observations lors de la mission de terrain

Matin

- Visualisation / écoute des observations de terrain
- Edition et évaluation des rapports de mission
- Evaluation de la formation et recommandations pour l'amélioration de « FLEGT Watch »
- Remise du certificat de formation

Matériel des participants : PC et/ou smartphone avec navigateur Web et gestionnaire d'e-mails.

Contact FLEGT Watch : flegtwatch@visioterra.fr

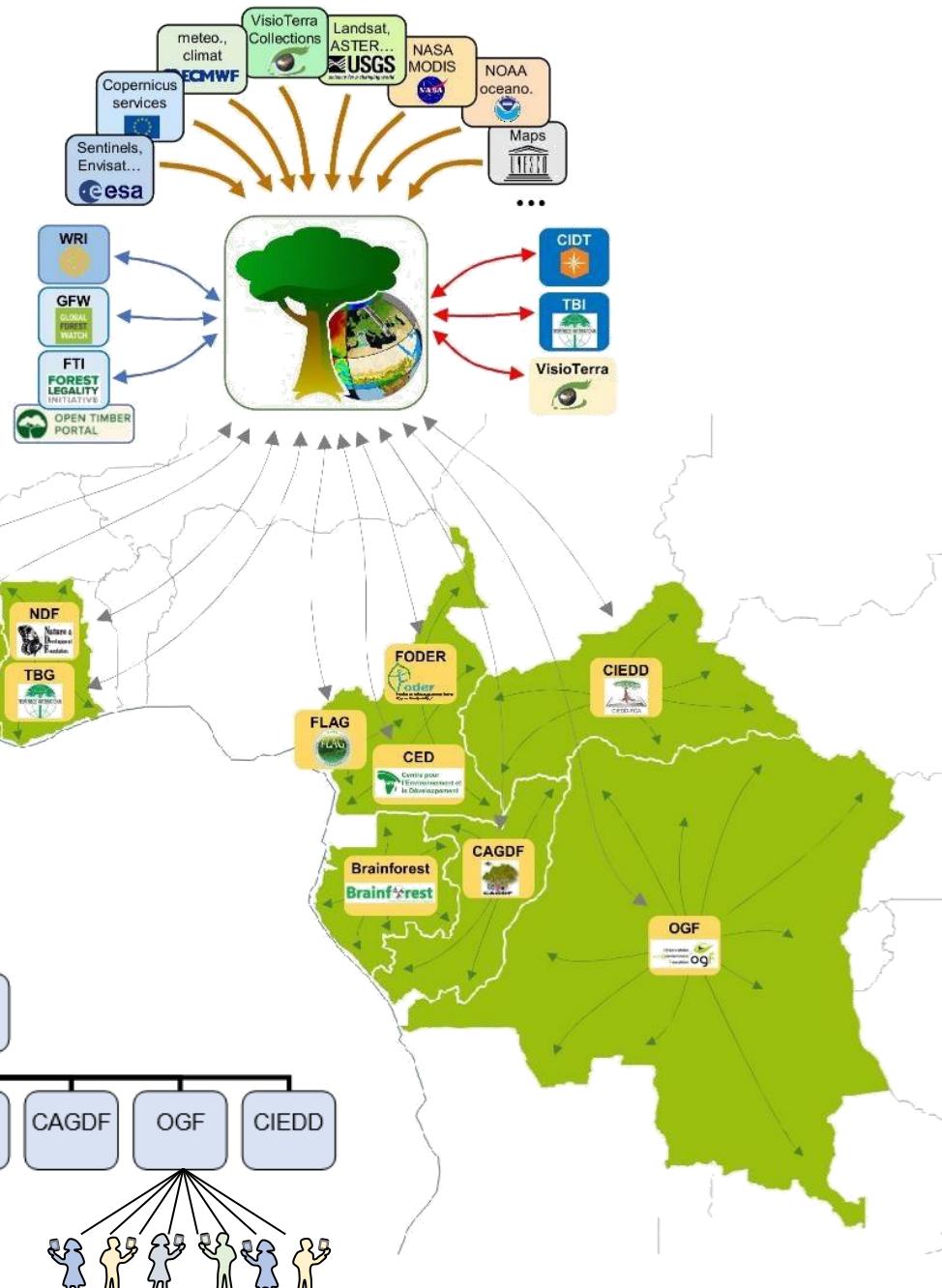




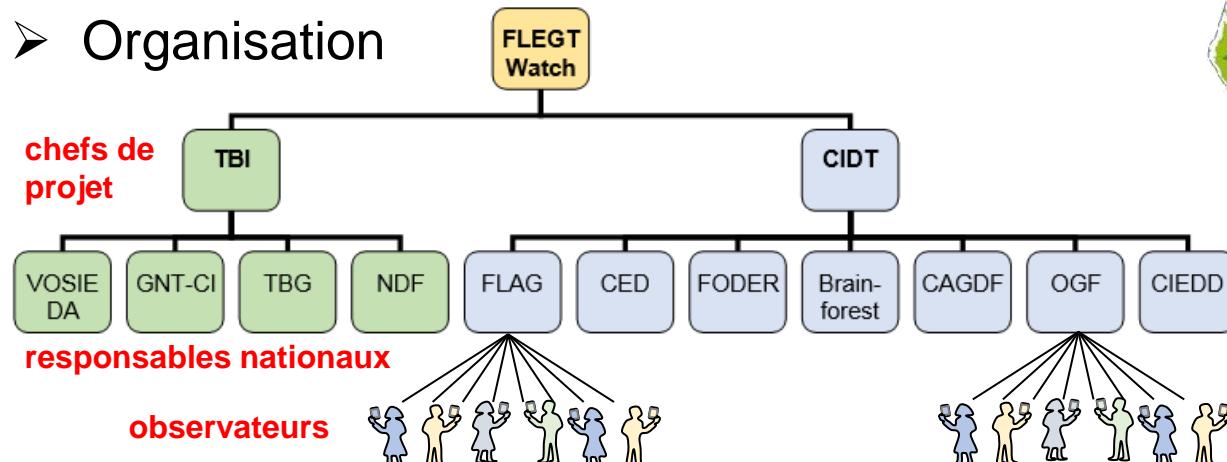
Organisation du projet

- “FLEGT Watch” offre les mêmes services aux deux sous-régions:

- Afrique de l'Ouest – Liberia, Côte d'Ivoire, Ghana
- Afrique Centrale – Cameroun, Gabon, République Centrafricaine, Congo, RDC



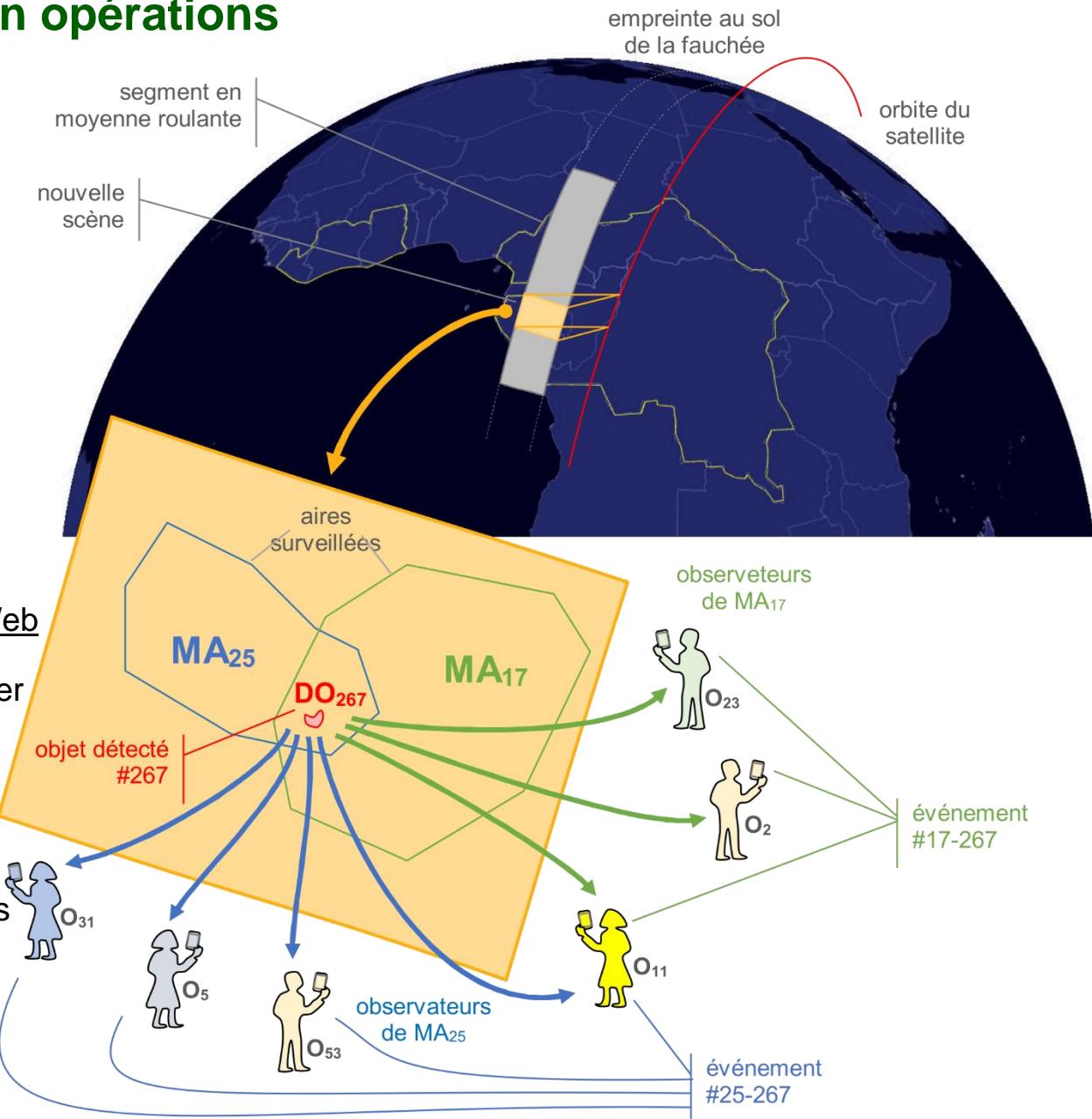
➤ Organisation





FLEGT Watch en opérations

- Observations satellite tous les 6 jours en utilisant S1A et S1B
- Détection automatique avec des algorithmes toujours optimisés
- Les objets détectés ont un indice de confiance
- Distribuer les événements dans les aires à surveiller
- Les observateurs évaluent un événement sur FLEGT Watch Web
- Les observateurs peuvent évaluer l'événement sur le terrain
- Des observations de terrain peuvent être collectées
- Ces observations sont partagées à travers la communauté
- On peut produire un rapport de mission de terrain





Observateurs au Gabon (liste collectée le 27 janvier 2020)

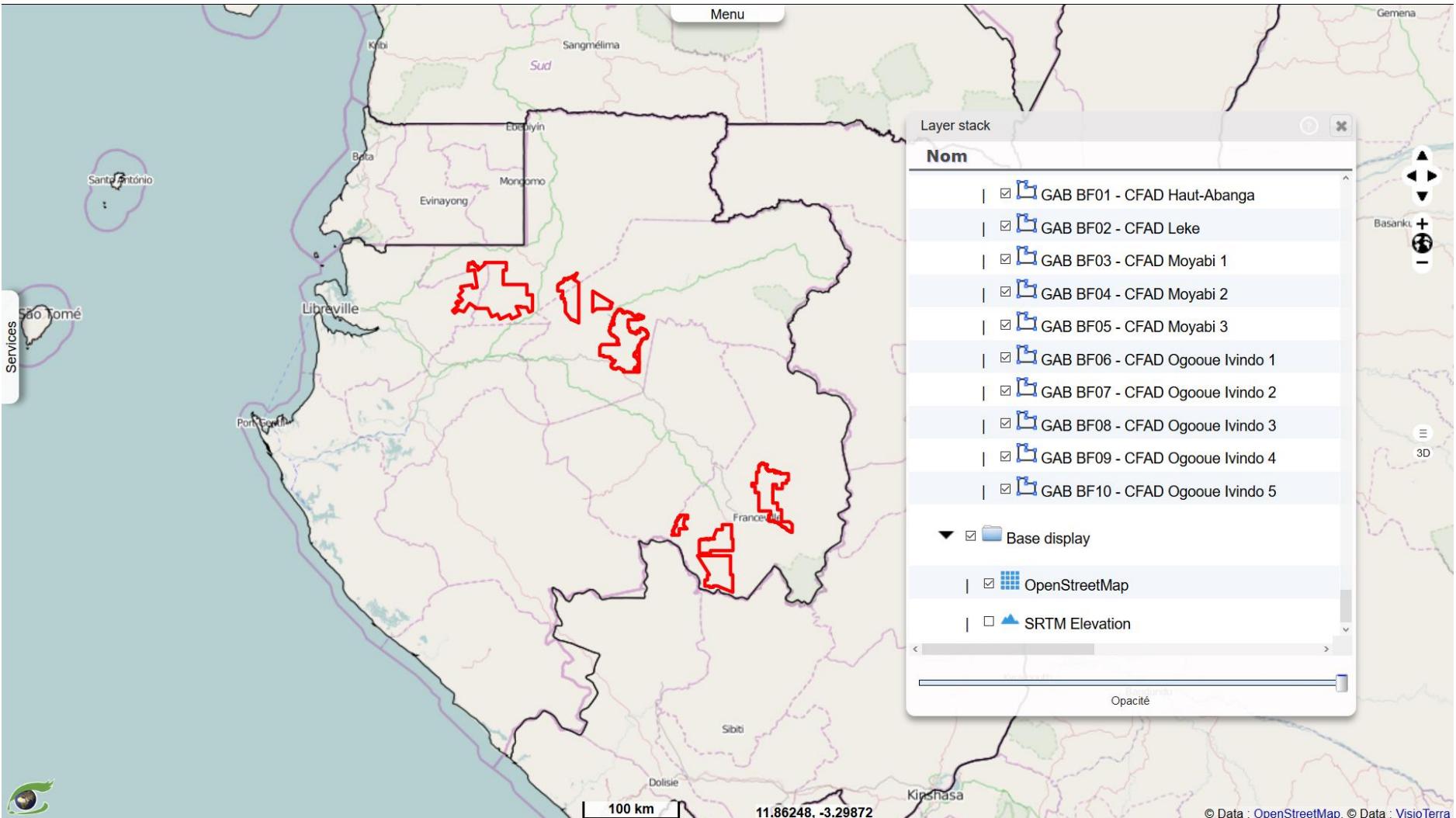
Prénom(s)	NOM	Organisation	adresse e-mail
Chef de projet			
Aurelian	MBZIBAIN	CIDT	A.Mbzibain2@wlv.ac.uk
Responsable national			
Grace	NTSAME OLLOMO	Brainforest	graceollomo@brainforest-gabon.org
Botrin	EBANG MINKO	Brainforest	botrinebang@gmail.com
Observateurs			
Jean Calvin	NDONG OBAME	Brainforest	calvinobame1993@gmail.com
Abdoul	EYEGUE	CJ	abdouleyegue@gmail.com
Géraldine	OBONE NDONG	FENSED	djidjiobone@yahoo.fr
Ophélie	OWONO MBENG	FENSED	oowono@yahoo.fr
Amédé	ENGONO MBA	Kéva	gurauud1984@yahoo.fr
Fabrice	KOMBILA	ME	kf_epiclibris@yahoo.com
Ulrich	BACHOYI NJOUMBI	MEF	bachoyi@gmail.com
Josiane	NGOUNA	MEF	ondzagha2007@gmail.com
Hugues Serge	MOUIDY	UFIGA	msergehugues@yahoo.fr



Les aires à surveiller (*monitored areas*) au Gabon

Aires à surveiller (4 concessions représentant 10 polygones) proposées par M. Louis-Marie NGOUA (Rougier Gabon) lors de la formation à Douala le 03-04.10.2019 et acceptées par Brainforest.

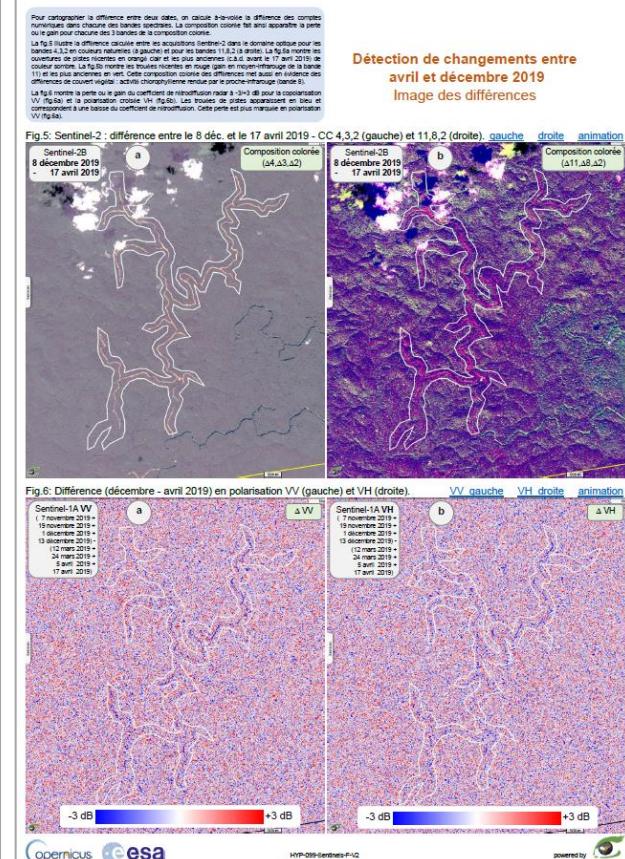
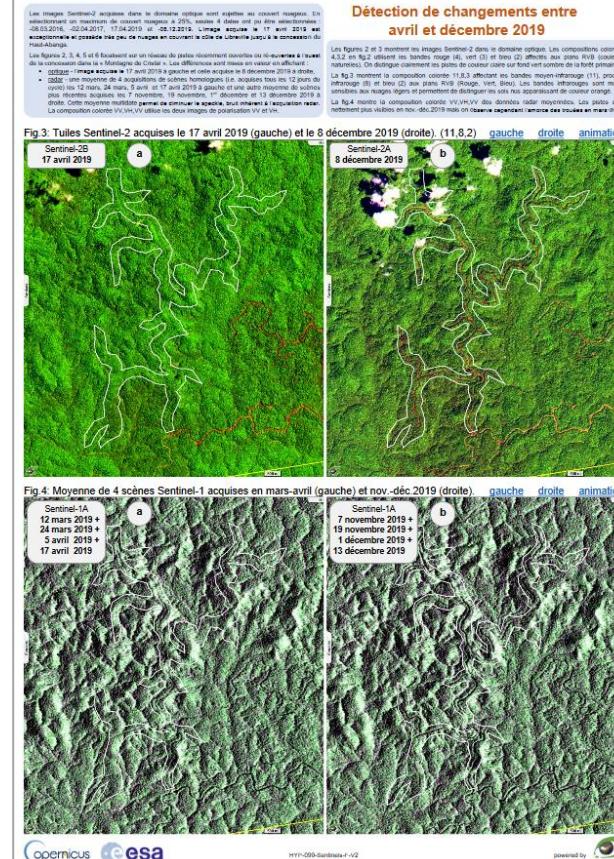
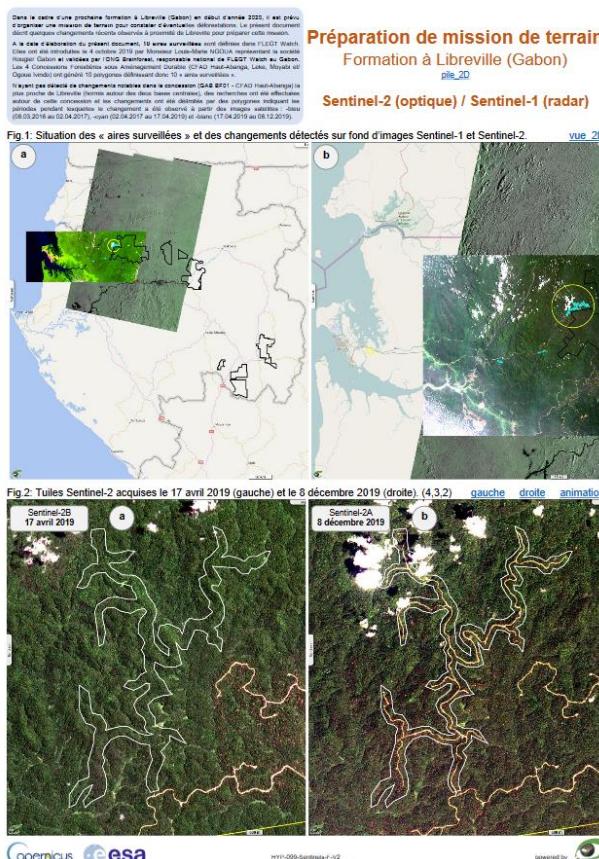
[Hyperlook](#)





Préparation de la mission de terrain (1)

- Document d'hyperlooks
 - [HYP-099-Sentinels-F](#) – Préparation de mission de terrain, Formation à Libreville (Gabon)
 - Repérage de changements de couvert forestier
 - Tentative 1 – Dans la concession GAB BF01 - CFAD Haut-Abanga – Peu de changements
 - Tentative 2 – Au nord de cette concession – Changements dans les pistes de débardage – Trop loin !





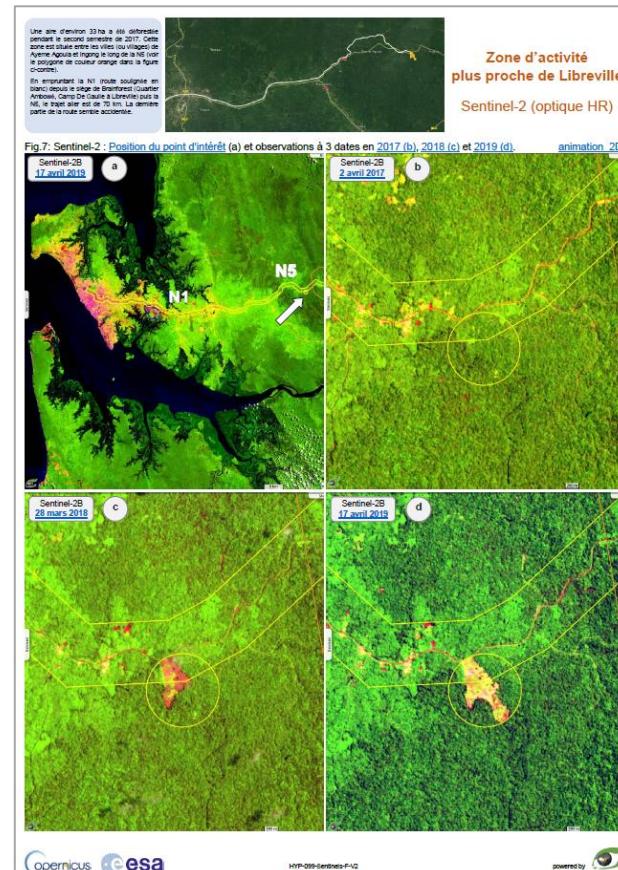
Préparation de la mission de terrain (2)

□ Tentative 3 – entre Ayeme Agoula et Ingong le long de la N5 (70 km de Brainforest)

Phase des travaux

- phase 1: du 1^{er} au 13 juillet 2018
 - phase 2: du 1^{er} au 23 décembre 2018

Superficie finale: 33 ha



Le couvert nageant ne permet pas d'avoir beaucoup de scènes séquentielles (voir fig7). A l'inverse, l'image radar peut être acquise par tous les temps, de jour comme de nuit.

La zone de déforestation est actuellement observée par Sentinel-1 tous les 10 à 15 jours fournissant des images cohérentes. Ces images peuvent être combinées pour donner une image moyenne qui nous permet de mieux suivre l'évolution des travaux qui ont débuté entre le 1^{er} et le 15 juillet 2018 et se sont poursuivis jusqu'en juillet 2019. L'observation a été réalisée en deux phases : l'une en juillet 2018 et la seconde fin décembre 2019.

L'image radar est cependant compromise par le changement (spécie en argile) du lit de la rivière, des débâcles et des débordements de la rivière. Cela entraîne des erreurs dans l'interprétation de l'image et entraîne une moyenne temporelle d'acquisitions successives. La figure est une moyenne temporelle de quatre (4) acquisitions effectuées en décembre 2018 et janvier 2020.

Zone d'activité plus proche de Libreville

Sentinel-1 (radar HR)

Fig 8: Sentinel-1 : Moyenne de 4 dates fin 2019 (a) et observations les 1^r (b) et 13 juillet (c) et 23 déc. 2018 (d). animation_2D



Documentation de FLEGT Watch

➤ Brochures

- [VT-P281-BKL-001-E-01-06](#) – Introduction to FLEGT Watch
- [VT-P281-BKL-001-F-01-06](#) – Introduction à FLEGT Watch (français)
- [VT-P281-BKL-002-E-01-00](#) – FLEGT Watch in operation
- [VT-P281-BKL-002-F-01-00](#) – FLEGT Watch en operation (français)

➤ Manuels utilisateur

- [VT-P281-SUM-005-E-01-03](#) – FLEGT Watch user's manual
- [VT-P281-SUM-005-F-01-03](#) – Manuel utilisateur de FLEGT Watch (français)

➤ Vidéos

- [VT-A003-VID-010-E-01-01](#) – Application for field observations
- [VT-A003-VID-010-F-01-01](#) – Application d'observations de terrain (français)

➤ FLEGT Watch App

- [visioterra.fr/flegtwatch/app.apk](#)

➤ Support

- [flegtwatch@visioterra.fr](#)



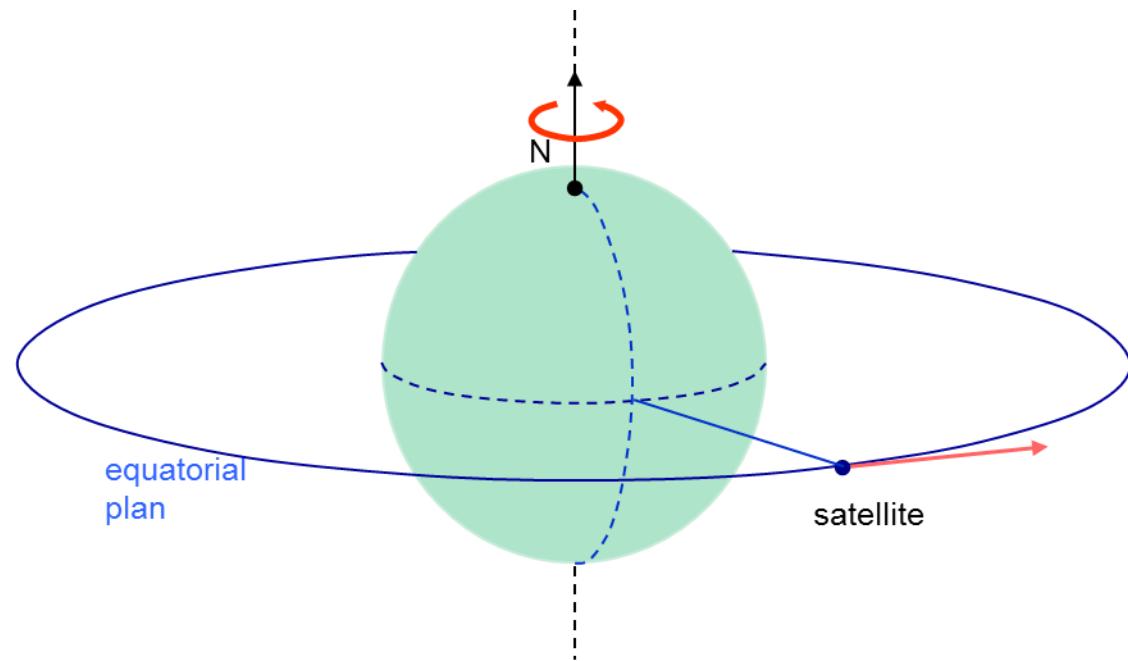
Les satellites

Plateformes, orbites et instruments

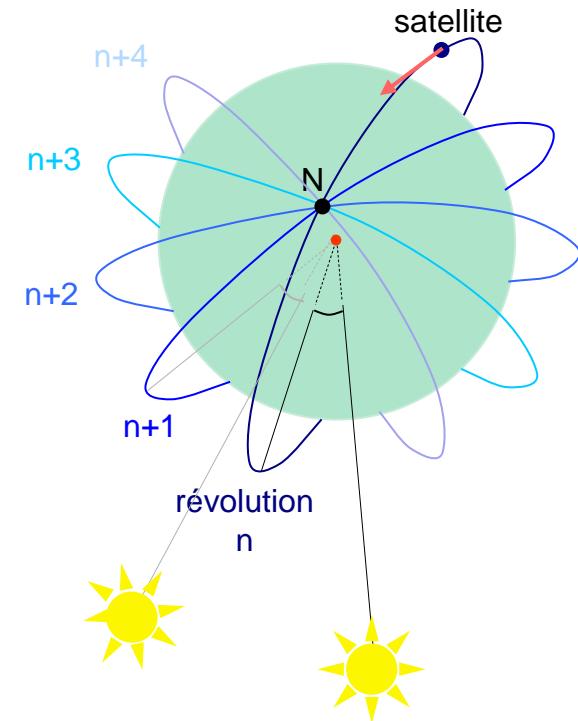


Types d'orbites, révolutions et temps de cycle

satellite géostationnaire



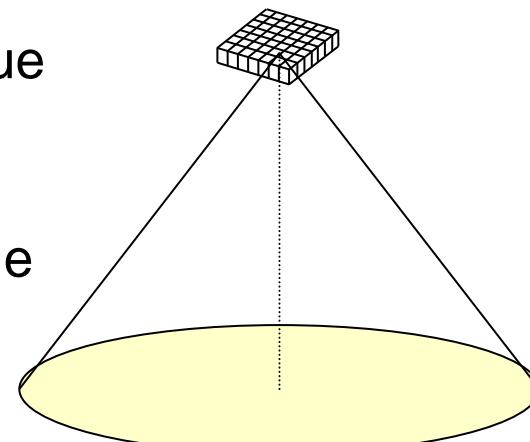
satellite héliosyncrone



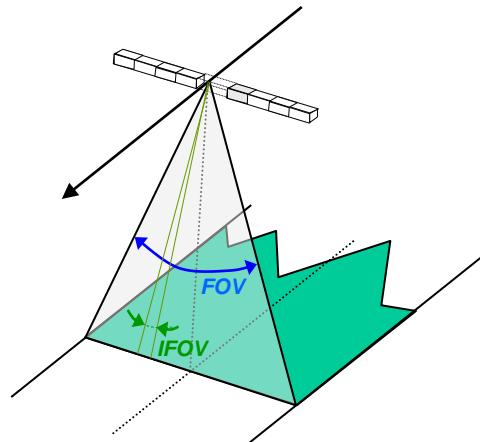


➤ Satellites et instruments – Géométrie de prise de vue

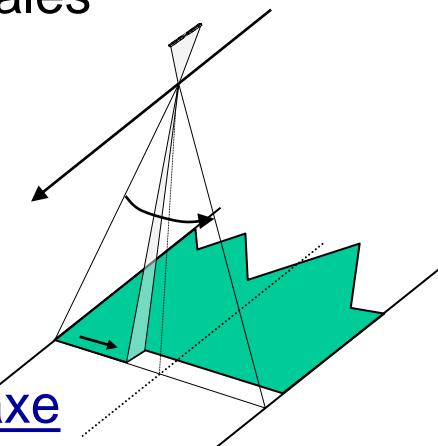
- Capteur matriciel
Géométrie conique
(*frame camera*)



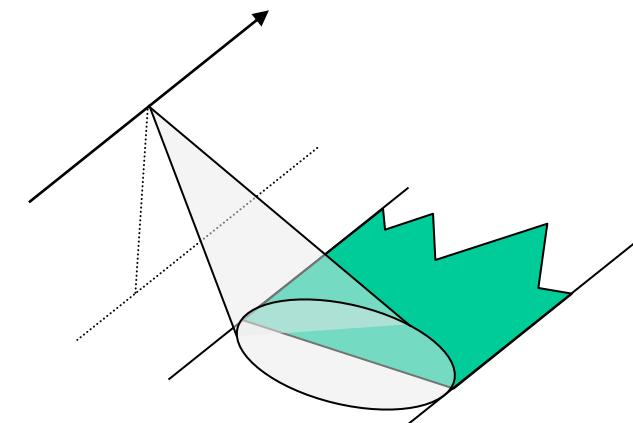
- Capteur en peigne
(*pushbroom*)



- Fauchées latérales
(*whiskbroom*)



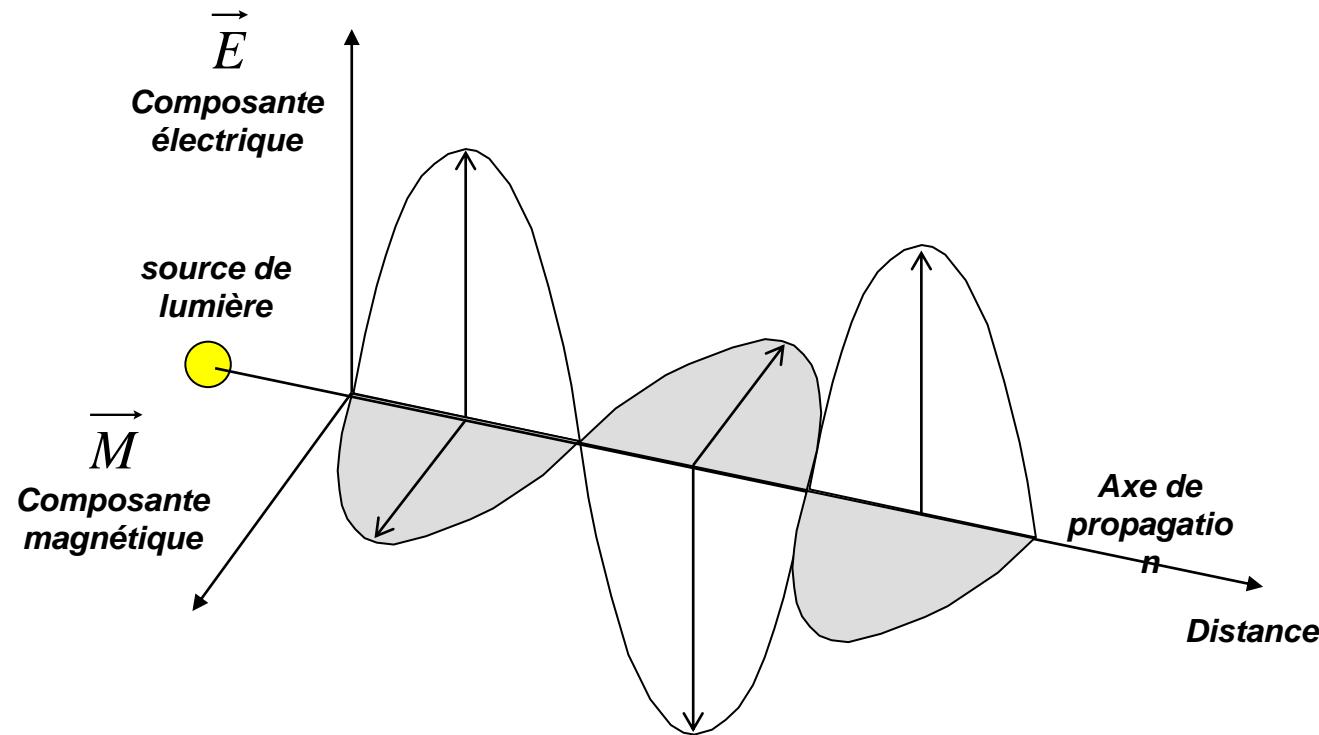
- Radar



Erreurs de parallaxe

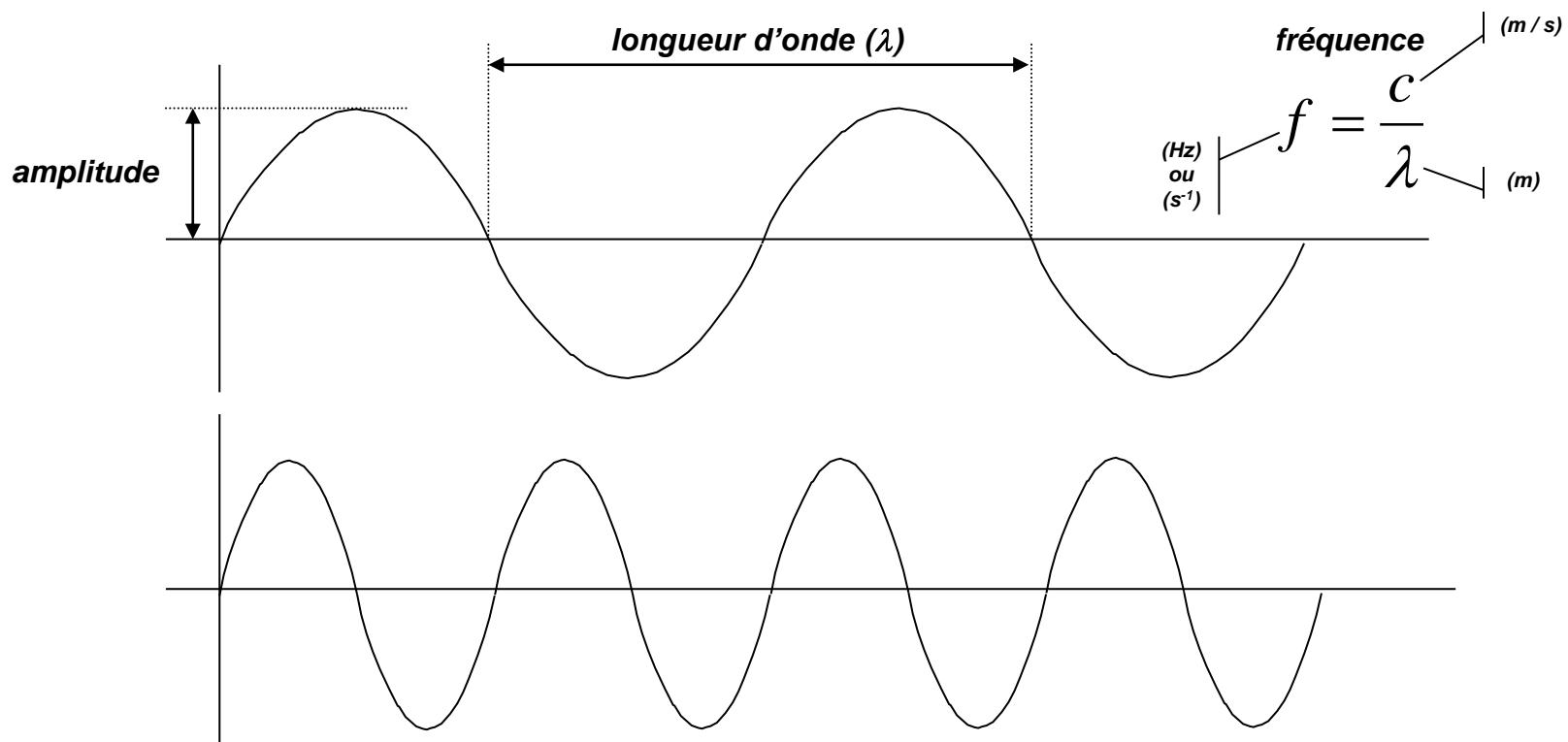


La radiation électromagnétique



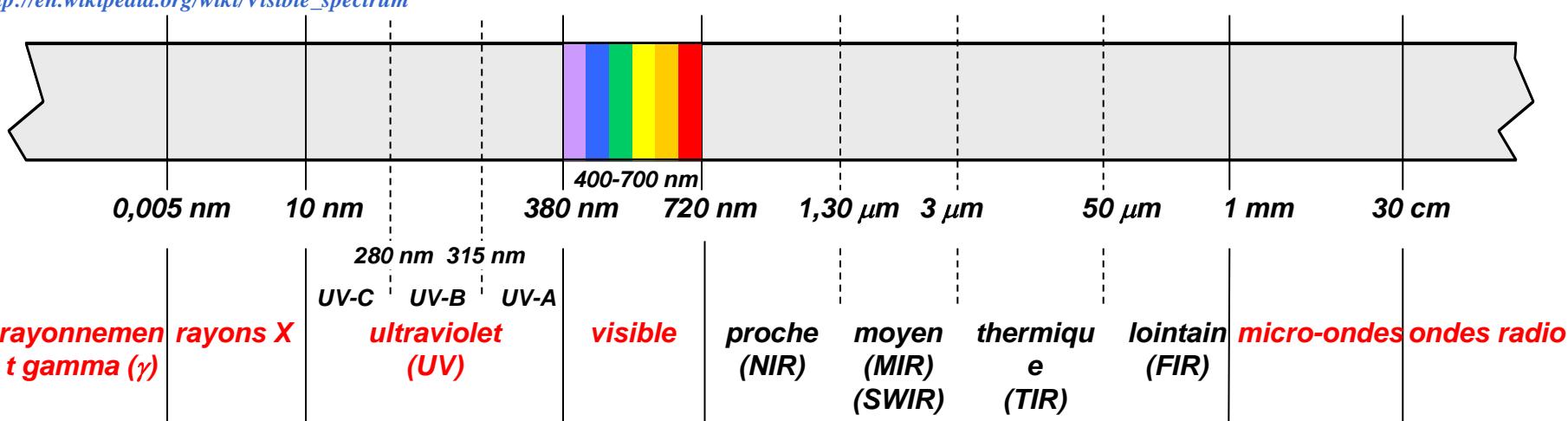
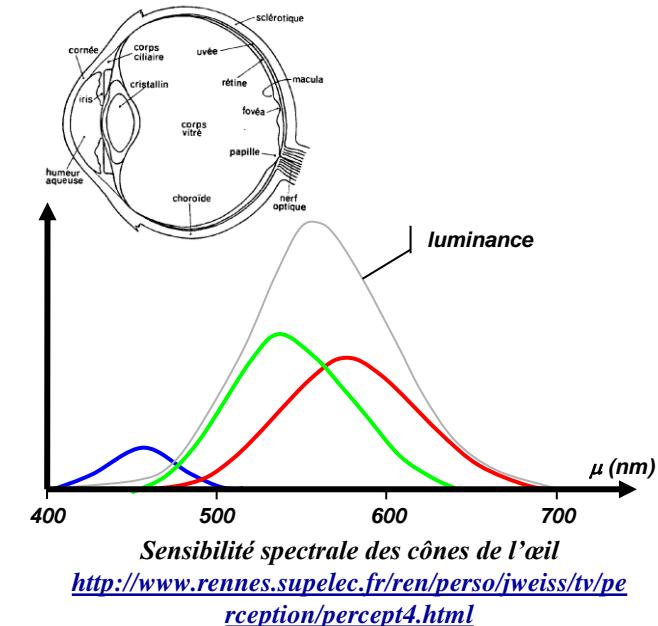
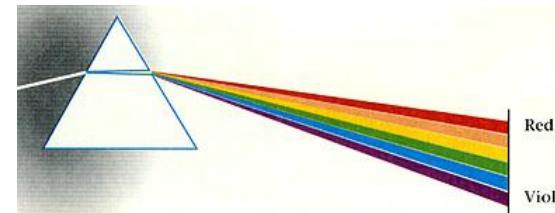
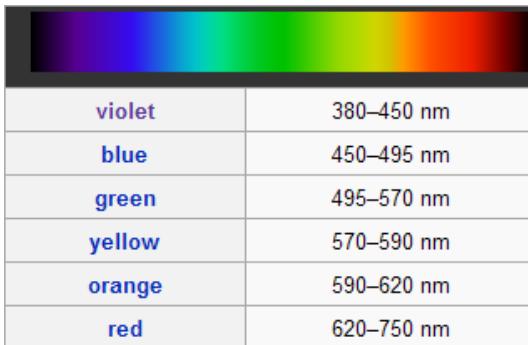


➤ L'onde électromagnétique





➤ Le spectre électromagnétique



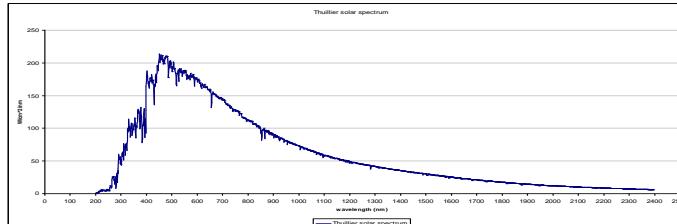
Energie du photon: $E = h \times \nu$

Constante de Planck: $h = 6,626\,068\,96 \times 10^{-34}$

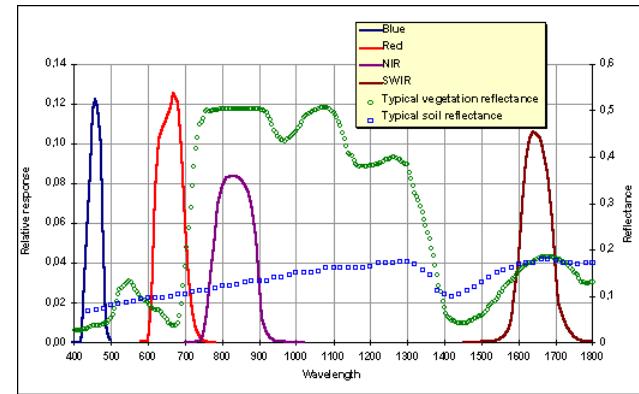
J.S



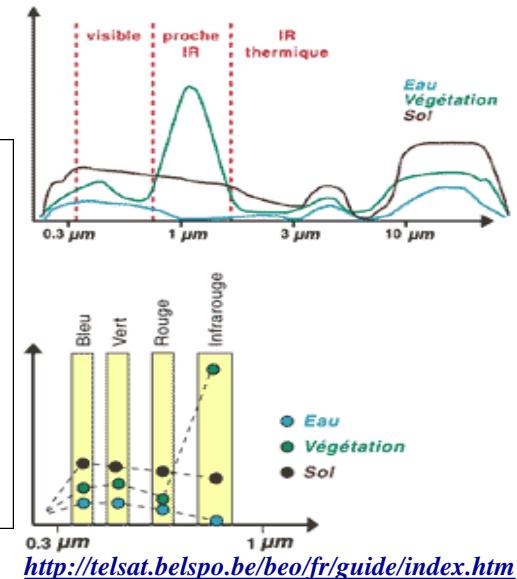
➤ Instrument passif



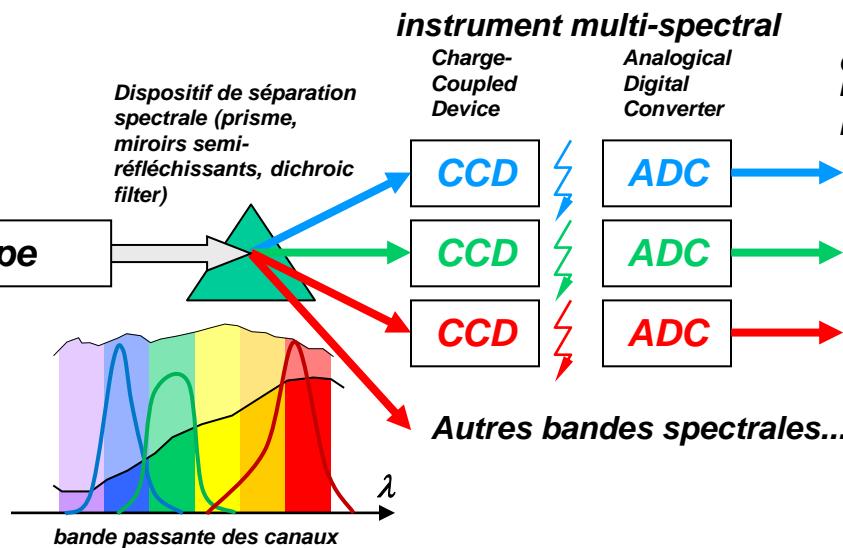
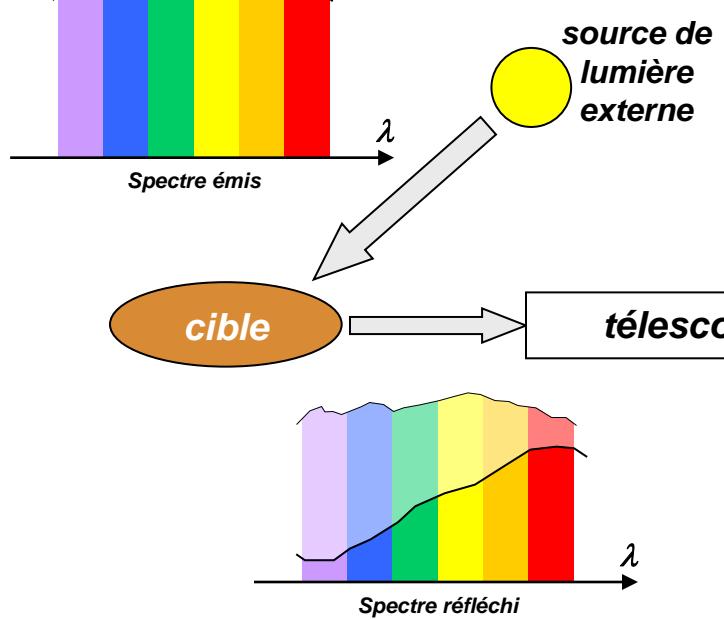
Thuillier (2003) solar spectrum - wavelength range 200 - 2397nm
 Thuillier, G., M. Hersé, P. C. Simon, D. Labs, H. Mandel, D. Gillotay, and T. Foujols, 2003,
 "The solar spectral irradiance from 200 to 2400 nm as measured by the SOLSPEC
 spectrometer from the ATLAS 1-2-3 and EURECA missions, Solar Physics, 214(1): 1-22
http://oceancolor.gsfc.nasa.gov/DOCS/RSR_tables.html



<http://vegetation.cnes.fr/system/userguide.zip>



<http://telsat.belspo.be/beo/fr/guide/index.htm>





Sentinel-2

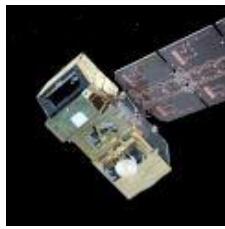
optique Haute résolution (HR)



Sentinel-2 – HR optical

<https://sentinel.esa.int/web/sentinel/missions/sentinel-2>

Sentinel-2



10 days cycle
launch 1st data

S2A 23.06.2015 27.06.2015

S2B 07.03.2017 24.04.2017
+5 days phase

Bay of Kachchativu (North) on
18.09.2017 04:56:51 GMT
One tile (100km x 100km).

2D-view-left

East coast of Sri-Lanka on
27.07.2017 05:06:01 GMT
5x3 tiles (tile D1 highlighted).

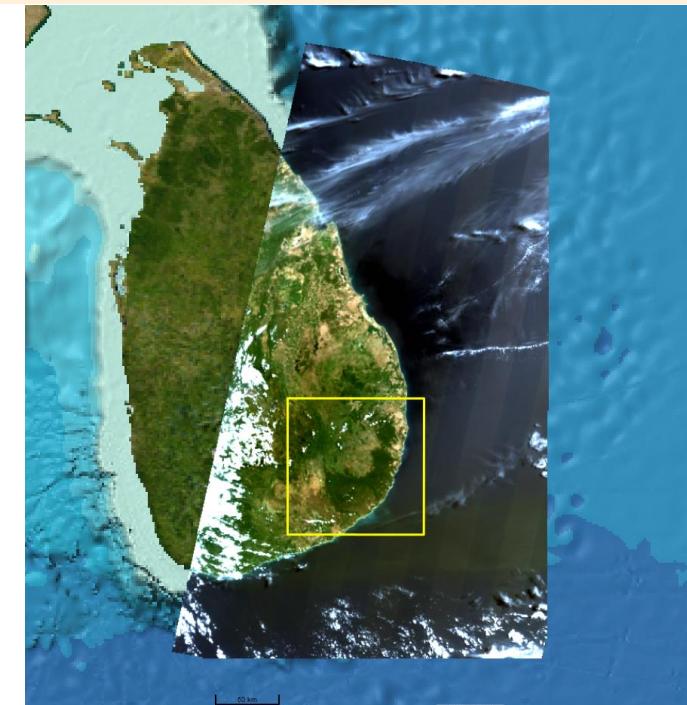
2D-view-right

Instrument

- MSI (Multi-Spectral Instrument) – optical – 290km swath

13 Bands

- VIS (visible): 2,3,4 (10m)
- Red edge: 5,6,7 (20m)
- NIR (Near Infrared): 8 (10m) 8A (20m)
- SWIR (Shortwave infrared): 11,12 (20m)
- Absorption (used for atmospheric corrections): 1,9,10 (60m)



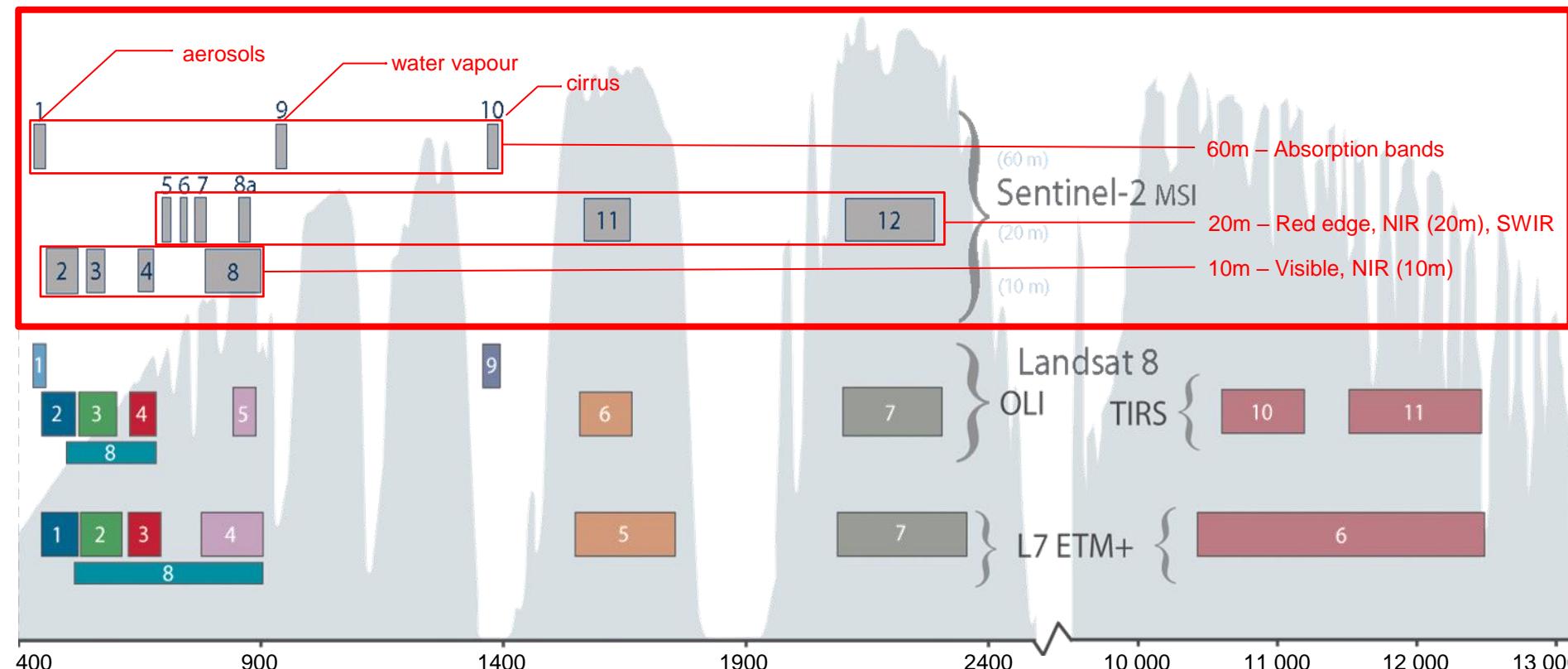


Sentinel-2 MSI – Spectral bands

MSI radiometry values: <https://earth.esa.int/web/sentinel/technical-guides/sentinel-2-msi/msi-instrument>

MSI 10m, 20m, 60m groups: <https://earth.esa.int/web/sentinel/user-guides/sentinel-2-msi/resolutions/spatial>

Landsat heritage: <https://landsat.gsfc.nasa.gov/wp-content/uploads/2015/06/Landsat.v.Sentinel-2.png>



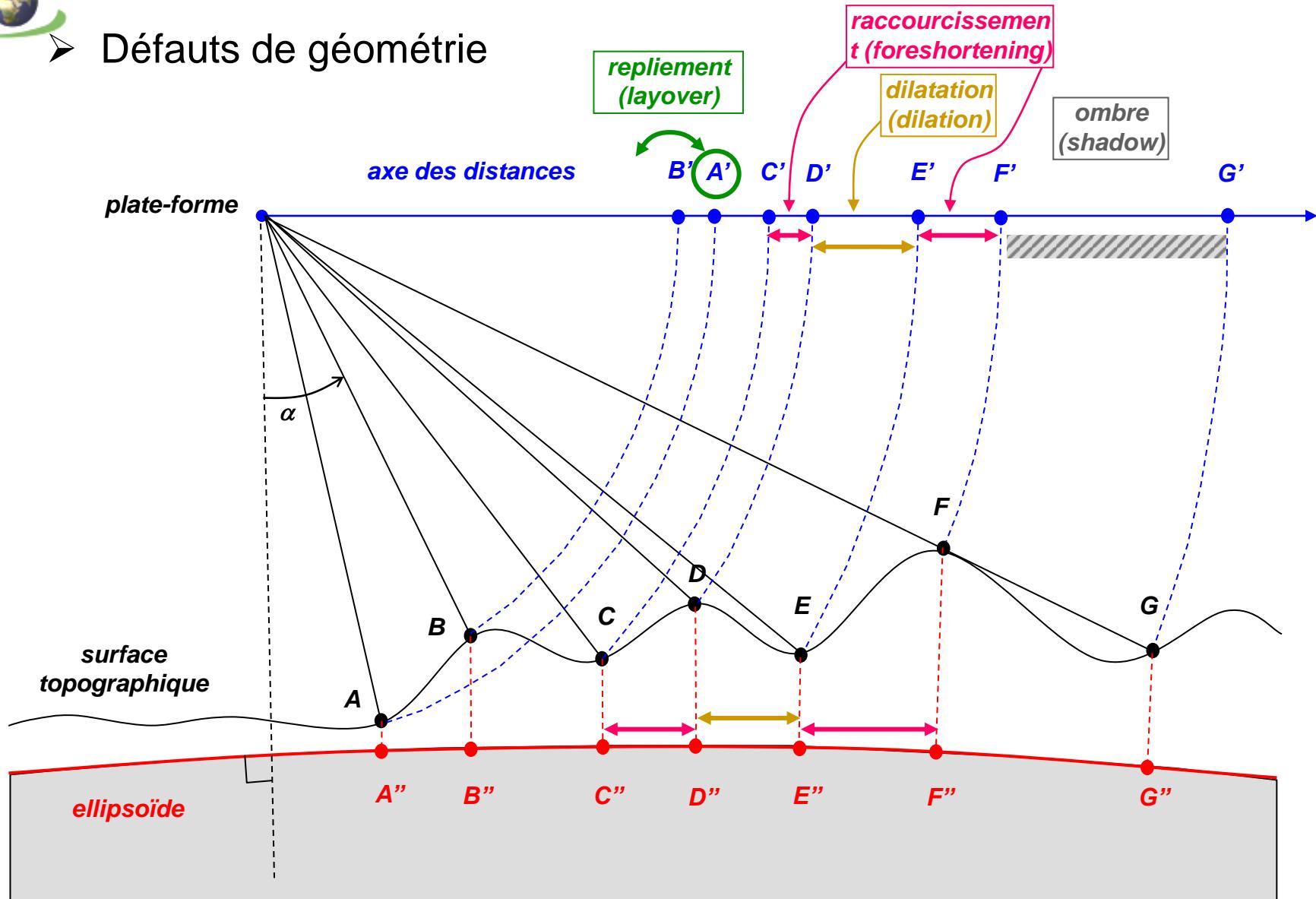


Sentinel-1

radar Haute résolution (HR)



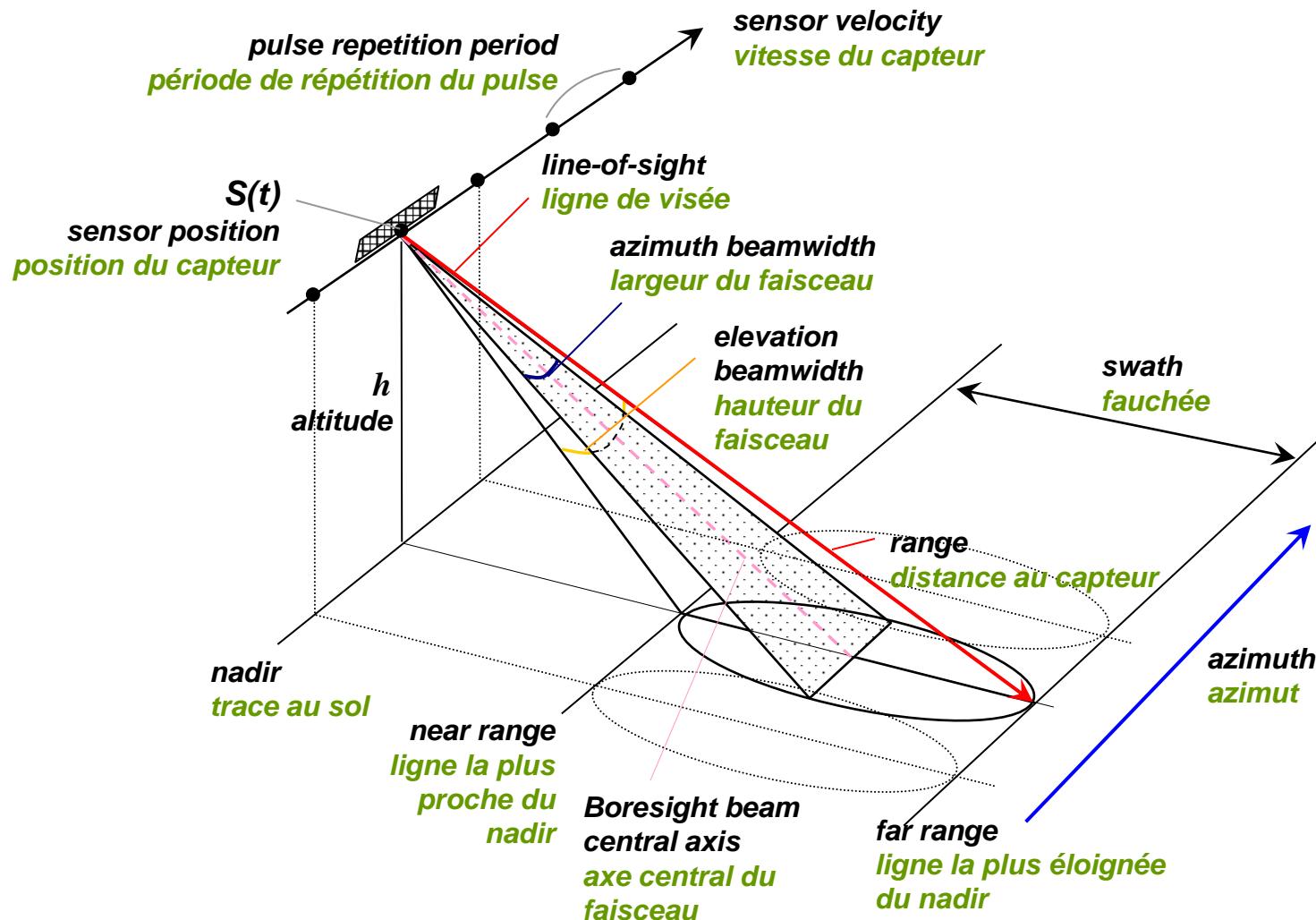
➤ Défauts de géométrie





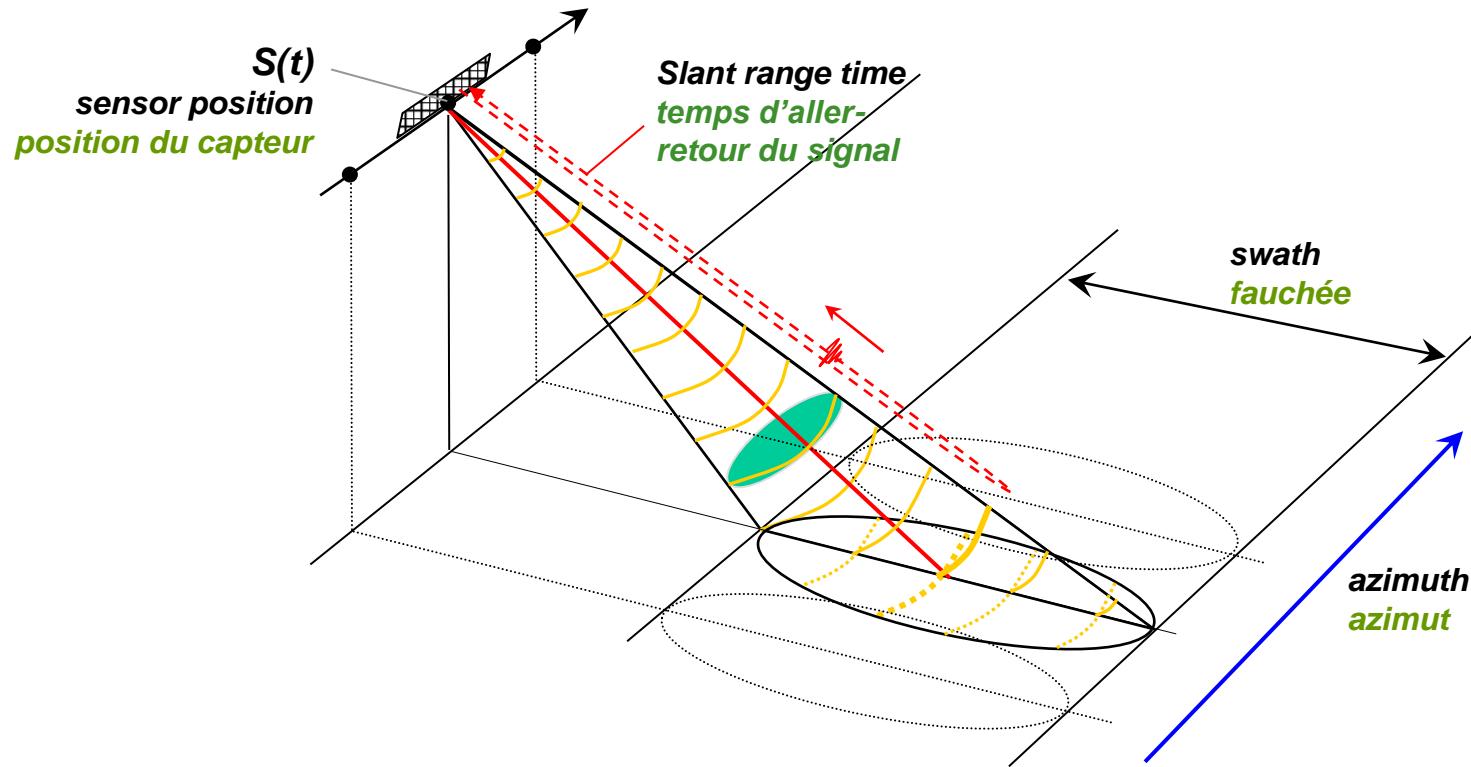
Physique de l'acquisition

RADAR \leftrightarrow **RAdio
Detection And Ranging**



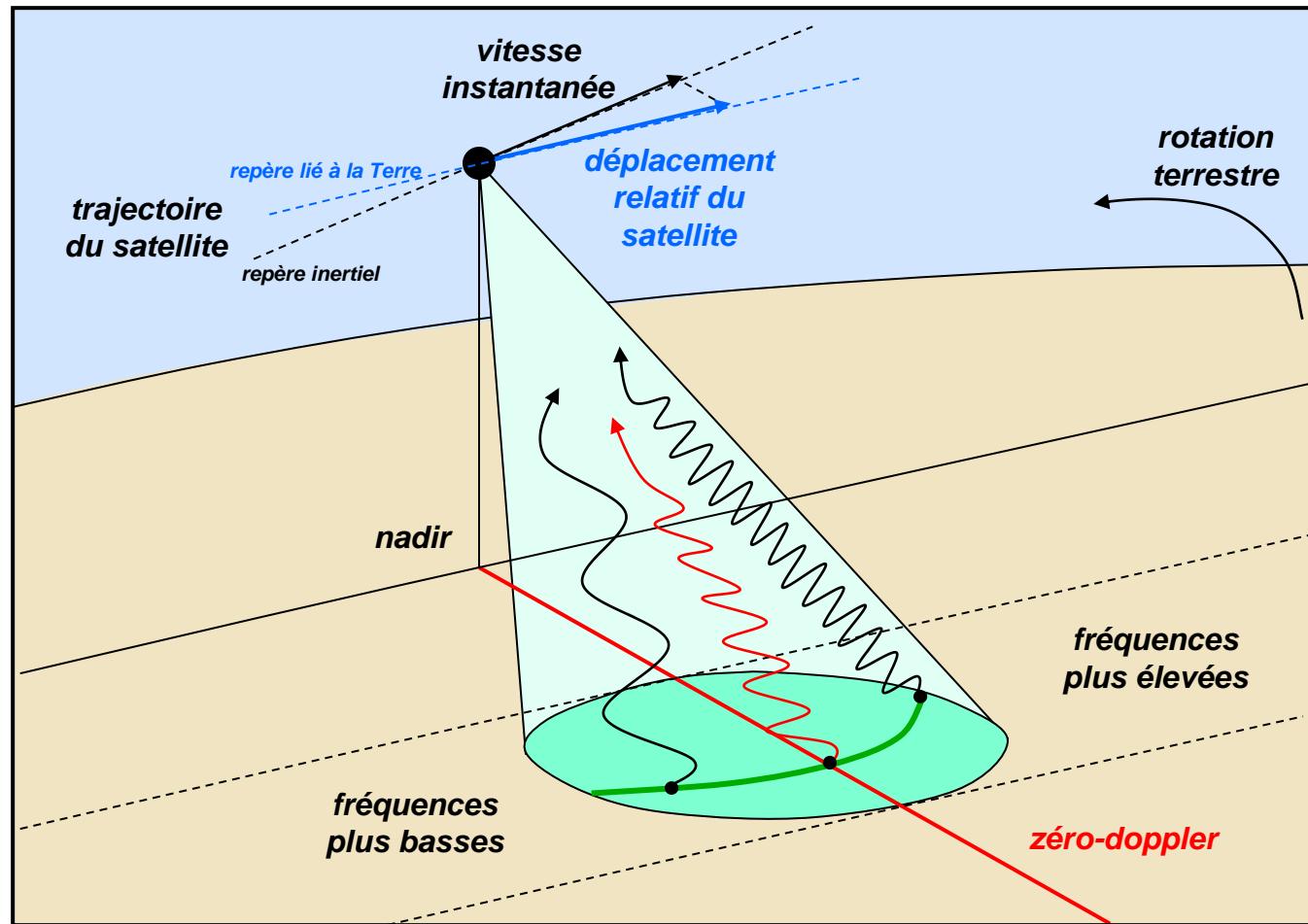


Positionnement en distance (range)





Positionnement en azimuth (azimuth)





Fréquence du signal radar

$$f = \frac{c}{\lambda}$$

(Hz) (m / s)
(m)

JERS-1/SAR – 1.2 GHz

Seasat – 1.3 GHz

Radarsat – 5.3 GHz

ERS/SAR – 5.3 GHz

TerraSAR-X – 9.65 GHz

Bandé	Fréquence (GHz)	Longueur d'onde (cm)
P	0.255 – 0.390	133 – 76.9
L	0.390 – 1.550	76.9 – 19.3
S	1.550 – 4.20	19.3 – 7.1
C	4.20 – 5.75	7.1 – 5.2
X	5.75 – 10.90	5.2 – 2.7
K	10.90 – 36.0	2.7 – 0.83
Ku	10.90 – 22.0	2.7 – 1.36
Ka	22.0 – 36.0	1.36 – 0.83
Q	36.0 – 46.0	0.83 – 0.65
V	46.0 – 56.0	0.65 – 0.53
W	56.0 – 100.0	0.53 – 0.30

How the trees are seen by the SARs ?



Pinus Nigra

X-band
 $\lambda=3 \text{ cm}$

TerraSAR-X
COSMO-SkyMed

C-band
 $\lambda=5 \text{ cm}$

Sentinel-1
RADARSAT

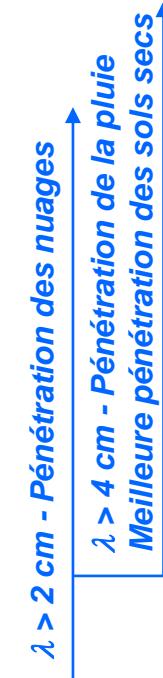
L-band
 $\lambda=27 \text{ cm}$

PALSAR(-2)
NISAR (2022)

P-band
 $\lambda=70 \text{ cm}$

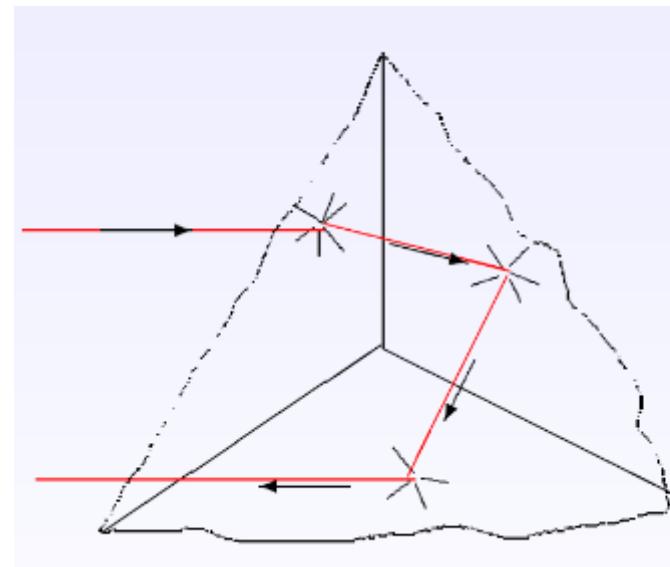
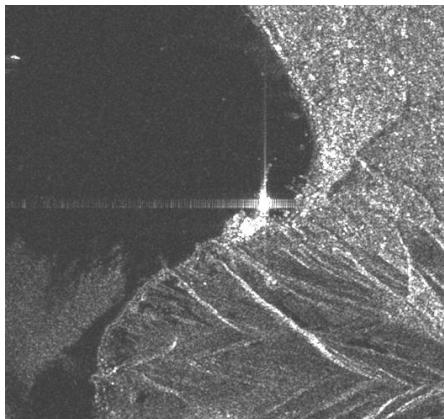
BIOMASS (2021)

Low frequency SARs: interact with woody tree elements
→ linked to above ground biomass

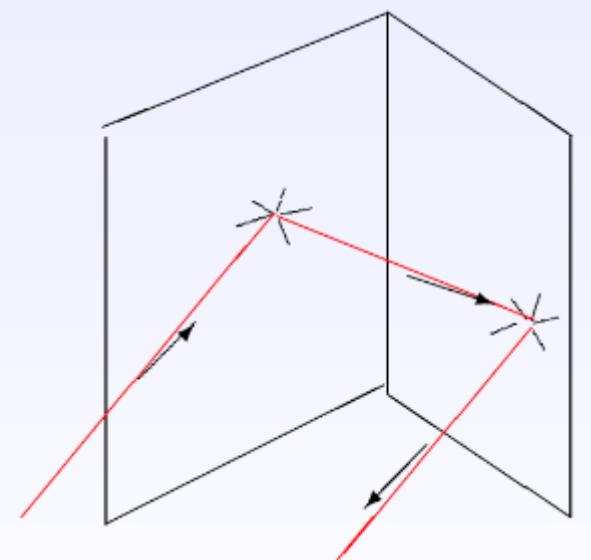




Mécanisme de rétrodiffusion (*back-scattering*)



**trièdre
(corn-reflector)**



bièdre

http://smsc.cnes.fr/PLEIADES/Fr/PDF/methodo/presPolar_englada.pdf



La polarisation de la lumière



filtre vertical (V)



filtre horizontal (H)



Sentinel-1 – HR Radar

<https://sentinel.esa.int/web/sentinel/missions/sentinel-1>

Sentinel-1



12 days cycle
launch 1st data

S1A 03.04.2014 03.10.2014
S1B 22.04.2016 26.09.2016
+6 days phase

Series of 3 scenes
acquired on 21.09.2017
00:24:24 GMT
in descending orbit (left)
2D-view-left

Series of 3 scenes
acquired on 21.09.2017
12:49:54 GMT
in ascending orbit (right)
2D-view-right

Instrument

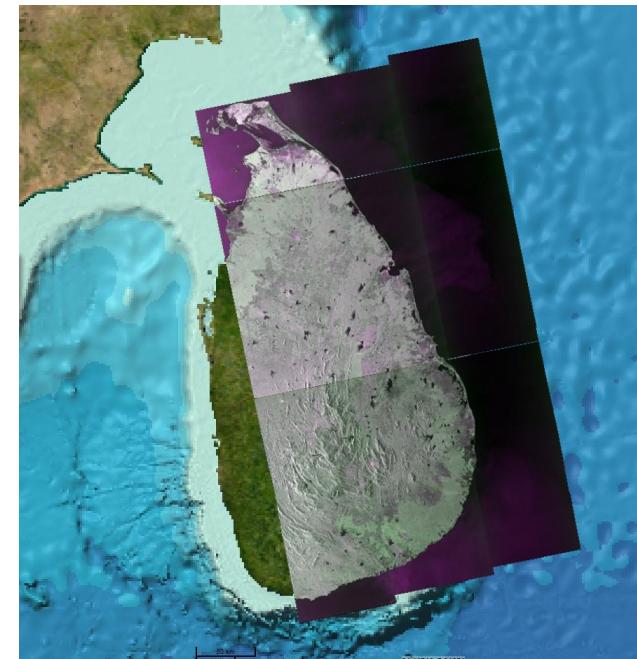
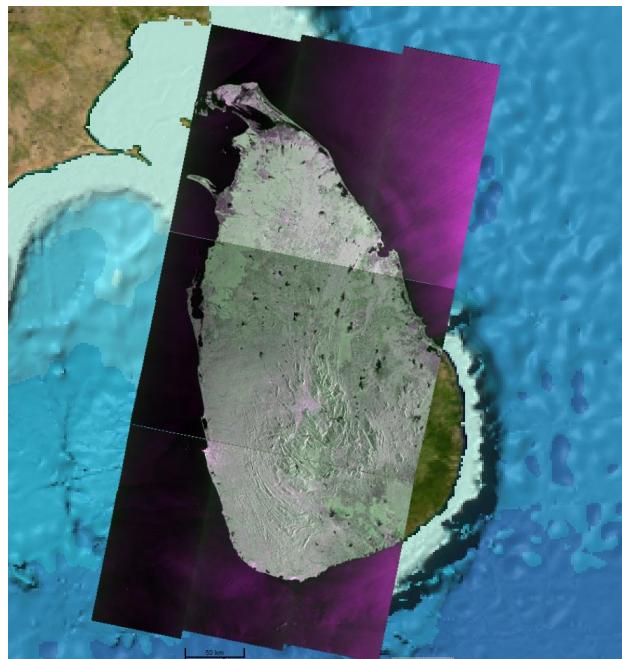
- C-SAR (Synthetic Aperture Radar), 5.405 GHz,

Modes

- IW (Interferometry Wide Swath) – swath=240km – GSD=10m
- EW (Extended Wide Swath) – swath=400km – GSD=40m
- SM (Stripmap) – swath=80-100km – GSD=6-10m

Polarization

- Single: Vertical (V) or horizontal (H)
- Dual: VV,VH (V emission, V or H reception) or HH, HV (H emission, V or H reception)





Sentinel satellites (S3)

<https://sentinel.esa.int/web/sentinel/missions/sentinel-3>

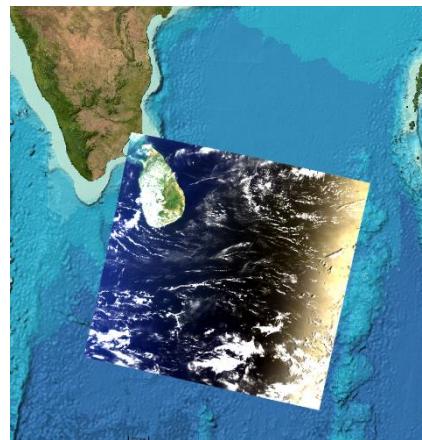
Sentinel-3



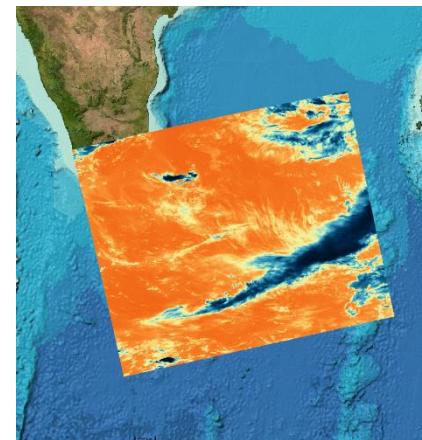
27 days cycle
launch 1st data
S3A 16.02.2016 18.10.2016
S3B ???.???.2018
+?? days phase

Sri-Lanka seen by:

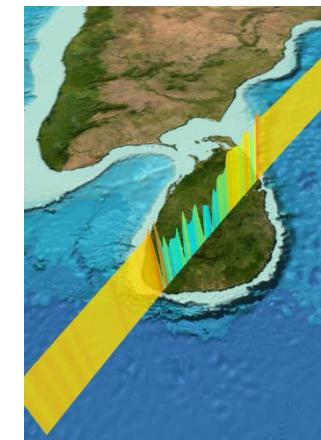
OLCI on
30.09.2017 09:30:04 GMT.
2D-view-left



SLSTR on
01.10.2017 16:28:18 GMT.
2D-view-middle



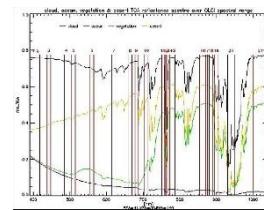
SRAL on
29.09.2017 04:35:48 GMT.
2D-view-right





Sentinel-3 OLCI – Spectral bands

See fig.48 of
eoPortal Directory



OLCI bands function: <https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci/resolutions/radiometric>
Envisat MERIS heritage (<https://sentinel.esa.int/web/sentinel/user-guides/sentinel-3-olci/overview/heritage>)

Band	λ centre (nm)	Width (nm)	Function
Oa1	400	15	Aerosol correction, improved water constituent retrieval
Oa2	412.5	10	Yellow substance and detrital pigments (turbidity)
Oa3	442.5	10	Chlorophyll absorption max., biogeochemistry, vegetation
Oa4	490	10	High Chlorophyll , other pigments
Oa5	510	10	Chlorophyll , sediment , turbidity, red tide
Oa6	560	10	Chlorophyll reference (Chlorophyll minimum)
Oa7	620	10	Sediment loading
Oa8	665	10	Chlorophyll (2nd Chlorophyll absolute max.), sediment , yellow substance / vegetation
Oa9	673.75	7.5	For improved fluorescence retrieval and to better account for smile together with the bands 665 and 680 nm
Oa10	681.25	7.5	Chlorophyll fluorescence peak, red edge
Oa11	708.75	10	Chlorophyll fluorescence baseline, red edge transition
Oa12	753.75	7.5	O2 absorption / clouds, vegetation
Oa13	761.25	2.5	O2 absorption band / aerosol correction
Oa14	764.375	3.75	Atmospheric correction
Oa15	767.5	2.5	O2A used for cloud top pressure, fluorescence over land
Oa16	778.75	15	Atmos. corr./aerosol corr.
Oa17	865	20	Atmos. corr./aerosol corr., clouds, pixel co-registration
Oa18	885	10	Water vapour absorption reference band. Common reference band with SLSTR instrument. Vegetation monitoring
Oa19	900	10	Water vapour absorption/vegetation monitoring (maximum reflectance)
Oa20	940	20	Water vapour absorption, atmosphere / aerosol correction
Oa21	1 020	40	Atmosphere / aerosol correction



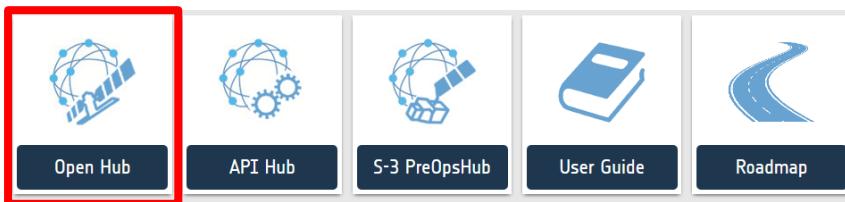
Sentinel infrastructures

<https://sentinel.esa.int/web/sentinel/sentinel-data-access>

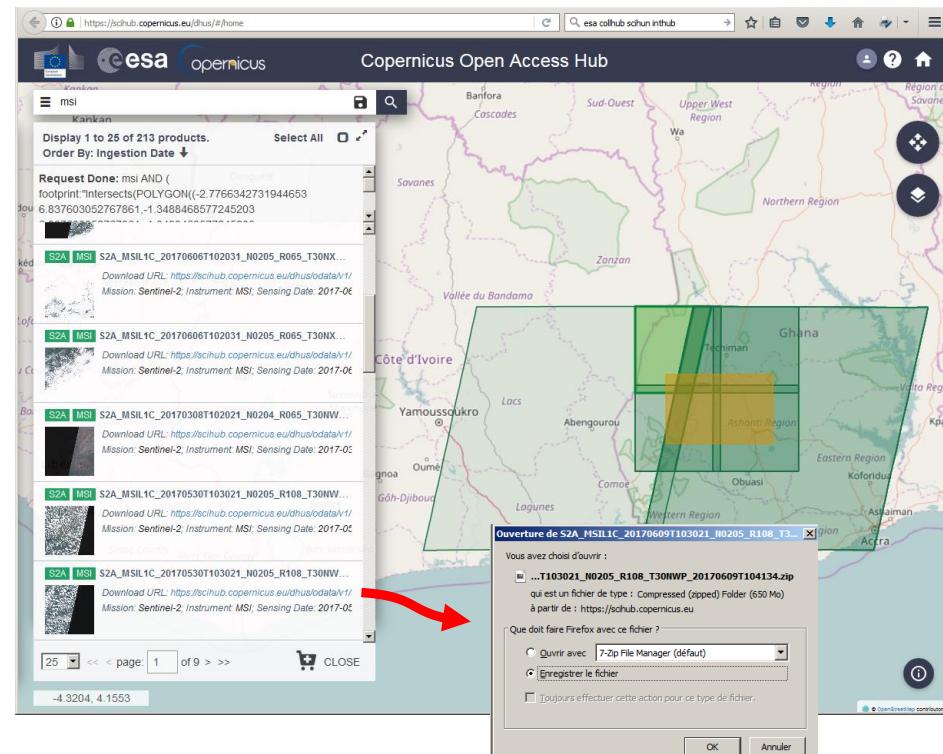
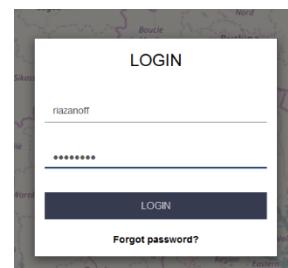


Copernicus Open Access Hub (COA)

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



<https://scihub.copernicus.eu/dhus>





Traitement d'images

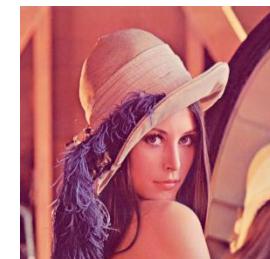
Histogramme, stretching linéaire



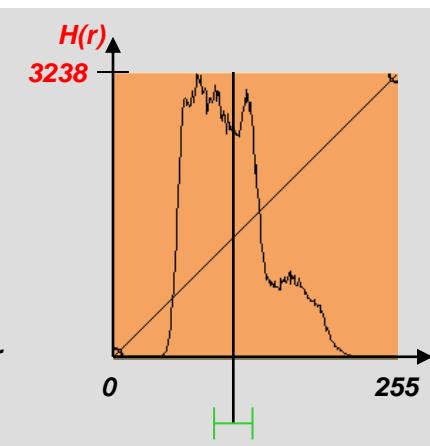
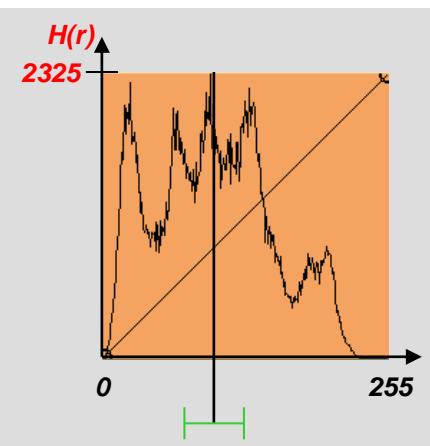
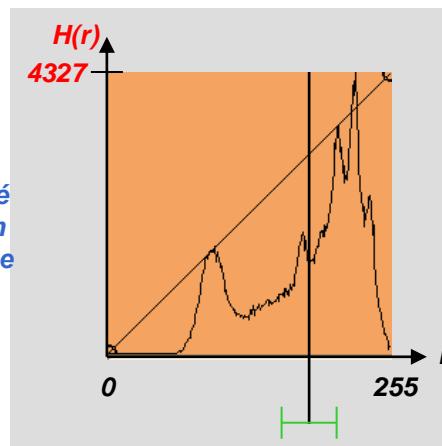
➤ Histogramme

$\forall r = 0 \dots 2^d-1, H(r) = \text{Card} (\{ R(i,j)=r, i=0..(M-1), j=0..(N-1) \})$ avec d : nombre de bits par pixels

$H(r)$
Occurrences de la radiométrie r dans l'image entière



affichage calibré sur le maximum de l'histogramme ($\max(H(k))$)

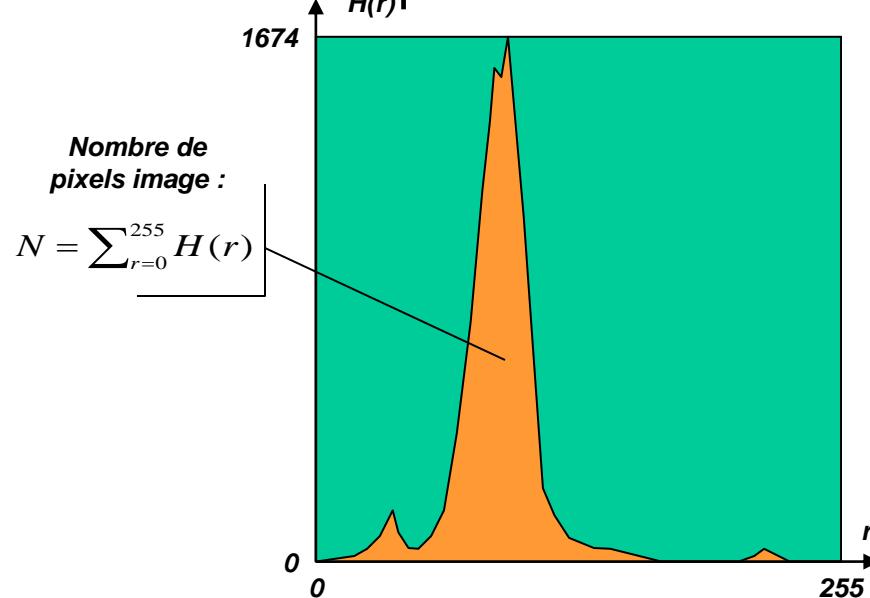




➤ Stretching linéaire automatique

Déterminer automatiquement les bornes a et b du stretching linéaire

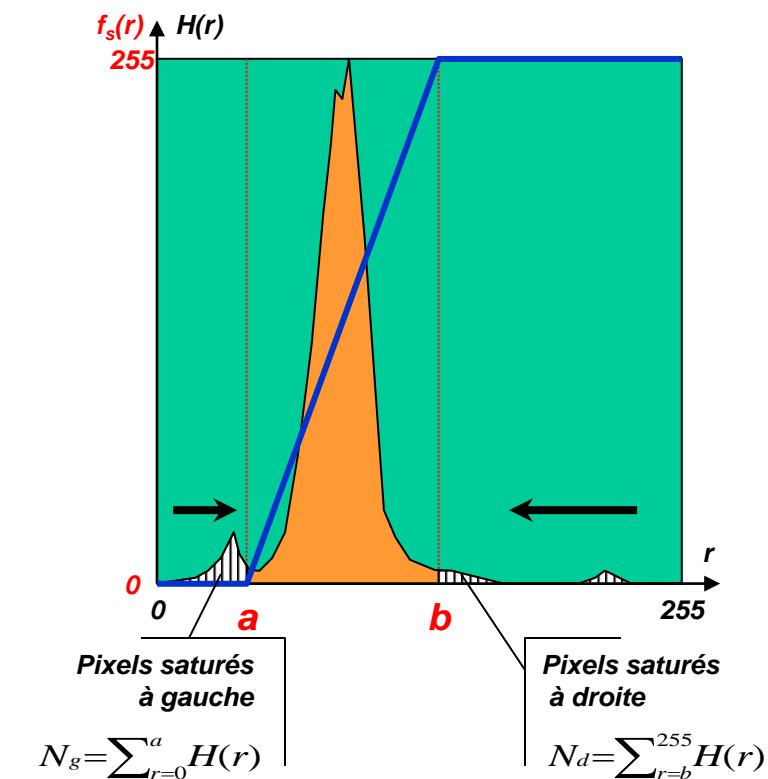
□ Principe



α_s : Pourcentage de saturation

$N_s = N \times \alpha_s$: Nombre de pixels image saturés

$N_s = N_g + N_d$



2 méthodes:

- saturer $N_s/2$ pixels à gauche puis $N_s/2$ pixels à droite
- saturer du côté où l'histogramme est minimal



FLEGT Watch Web

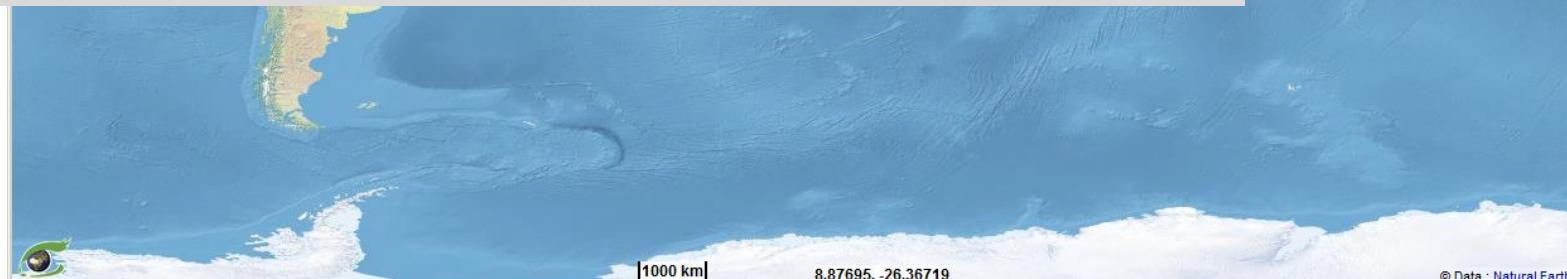
Utilisation pas-à-pas



Launch FLEGT Watch (Web)

The screenshot shows a web browser window with multiple tabs open. The active tab is 'Flegt Watch' at <https://visioterra.org/FlegtWatch/>. The page title is 'FLEGT Watch' with the subtitle 'Forest Law Enforcement, Governance and Trade'. A search bar contains the query 'prise électrique ghana'. The main content area features a world map with a green tree icon in the top left corner. A vertical sidebar on the left has a 'Services' button. On the right, there are buttons for 'Report a problem', 'Help', and 'Login', along with a search bar for 'Search place, coordinates...' and a language dropdown set to 'English'. A 'Menu' button is located in the top right of the map area.

<https://visioterra.org/FlegtWatch>





Enter your e-mail and password

The screenshot shows a web browser window with the URL <https://visioterra.org/FlegtWatch/#>. The page title is "FLEGT Watch" with the subtitle "Forest Law Enforcement, Governance and Trade". A search bar contains the query "prise électrique ghana". The main content area features a 3D world map. A vertical sidebar on the left has a "Services" button. An "Authentication" dialog box is open in the center, displaying the message "Not logged in". It contains fields for "Login (email)" with the value "myaddress@myserver.xo" and "Password" with the value "*****". Below the fields are buttons for "Login", "Logout", "Edit profil", and "Close".

default value of password
for observers is “fw”





Check that you login has been accepted

The screenshot shows a web browser window with the following details:

- Tab Bar:** Fichier, Édition, Affichage, Historique, Marque-pages, Outils, ?; comble de - Traduction X, Google Traduction X, Adresse introuvable X, Paris Aéroport | Site officiel X, Flegt Watch X, Flegt Watch X, Flegt Watch X.
- Address Bar:** https://visioterra.org/FlegtWatch/#
- Search Bar:** prise électrique ghana
- Header:** FLEGT Watch, Forest Law Enforcement, Governance and Trade. Includes "Manage monitored areas" and "Manage user" buttons, and a success message "Login successfully".
- Map:** A world map showing landmasses in green and brown, representing forested and non-forested areas respectively. A "Services" button is visible on the left side of the map.
- Bottom Status Bar:** 1000 km, -22.76367, -13.53516, © Data : Natural Earth



Open the “Services” panel and actualise the “Monitored areas”

The screenshot shows a web browser window with multiple tabs open, including "Flegt Watch" and "Google Traduction". The main content is the Flegt Watch application interface. On the left, there's a sidebar with tabs like "FlegtWatch", "Finder", "Missions", "GFW", "Base Maps", and "Elevations". Below these are sections for "Monitored Area" (with a dropdown menu), "Confidence" (radio buttons for Low, Medium, High), and "Events" (with a search bar). A red circle highlights the "Services" button, which is a small white button with a black outline and the word "Services" written vertically on it. Another red circle highlights the refresh icon in the top right corner of the main map area. The main area displays a 3D relief map of the world, with Europe and Africa visible. The bottom of the screen shows a status bar with "100 km", coordinates "-106.08398, 10.01953", and a copyright notice "© Data : Natural Earth".



Select one of you monitored areas

The screenshot shows a web-based application window titled "Flegt Watch". The top navigation bar includes "Fichier", "Édition", "Affichage", "Historique", "Marque-pages", "Outils", and a help icon. The tabs are "FlegtWatch", "Finder", "Missions", "GFW", "Base Maps", and "Elevations". The "Finder" tab is active. A search bar at the top right contains the text "prise électrique ghana". Below the tabs, there are three sections: "Monitored Area", "Confidence", and "Events". The "Monitored Area" section displays a list of items, with "GHA VT01 - Kumasi / flegtwatch@visioterra.fr" highlighted in blue. The main area features a 3D world map with green and brown terrain. On the right side of the map are zoom controls (+, -, 3D, and a menu icon). The bottom status bar shows "100 km" and coordinates "-106.08398, 10.01953". The copyright notice "© Data : Natural Earth" is visible in the bottom right corner.

- / -
- CMR FODER01 - Dep. Haut Nyong / angeline.modjo@gmail.com
- CMR FODER02 - Arr. Ngambé Tikar / angeline.modjo@gmail.com
- CMR FODER03 - Dep. Ocean / angeline.modjo@gmail.com
- CMR FODER04 - Dep. Sanaga Maritime / angeline.modjo@gmail.com
- CMR FODER05 - Arr. Yoko / angeline.modjo@gmail.com
- Cameroun / flegtwatch@visioterra.fr
- Central Africa / flegtwatch@visioterra.fr
- Central African Republic / flegtwatch@visioterra.fr
- Congo / flegtwatch@visioterra.fr
- Democratic Republic of the Congo / flegtwatch@visioterra.fr
- GHA NDF01 - FR Krokosua / awoode@ndfwestafrica.org
- GHA NDF02 - FR Suhuma / awoode@ndfwestafrica.org
- GHA TBG01 - FR Sui / dannyrock51@yahoo.com
- GHA TBG02 - FR Tano-Suhen / dannyrock51@yahoo.com
- GHA VT01 - Kumasi / flegtwatch@visioterra.fr**
- Gabon / flegtwatch@visioterra.fr
- Ghana / flegtwatch@visioterra.fr
- Ivory Coast / flegtwatch@visioterra.fr
- Liberia / flegtwatch@visioterra.fr
- West Africa / flegtwatch@visioterra.fr

Here, I am super-user and this is why I see all the monitored areas



You see the polygon of your monitored area

The screenshot shows a web browser window with multiple tabs open. The active tab is 'Flegt Watch' at <https://visioterra.org/FlegtWatch/#>. The interface includes a navigation bar with 'FlegtWatch', 'Finder', 'Missions', 'GFW', 'Base Maps', and 'Elevations' buttons. A search bar shows 'prise électrique ghana'. On the left, there's a sidebar for 'Monitored Area' with 'GHA VT01 - Kumasi / flegtwatch@visioterra.fr' and a 'Search' button. Below it are 'Confidence' filters ('Low', 'Medium', 'High') and an 'Events' section showing '1-1 of 0'. The main area is a map with a large red polygon outline. A small white box labeled 'Services' is visible near the bottom of the map. At the bottom of the map, there's a scale bar '5 km' and coordinates '-106.08398, 10.01953'. The background map is a low-resolution green grid. A text box overlaid on the bottom left says: 'The default basemap is poor not to penalize the Internet transfer'.

The default basemap is poor not to penalize the Internet transfer



Get the list of events – Medium confidence index

The screenshot shows the Flegt Watch interface on a web browser. The top navigation bar includes links for FlegtWatch, Finder, Missions, GFW, Base Maps, and Elevations. A search bar at the top right contains the query "prise électrique ghana". The main content area has a sidebar on the left with the following details:

- Monitored Area: GHA VT01 - Kumasi / flegtwatch@visioterra.fr
- Confidence: Radio buttons for Low, Medium (selected), and High, with a "Search" button.
- Events: A list of 11 entries, each showing an event type (Forest cover change), date (e.g., 2019/03/17), time (e.g., 18:17:40), ID (e.g., #49980), and location (GHA VT01 - Kumasi). The first entry is highlighted with a yellow background.

The main map area shows a green landscape with a large red circle drawn around a specific area. A legend on the right indicates a scale of 5 km and a coordinate of -106.08398, 10.01953. The bottom right corner of the map area says "© Data : Natural Earth".



Get the list of events – Low confidence index

The screenshot shows the Fleg Watch application interface. On the left, there is a sidebar with tabs: FlegWatch, Finder, Missions, GFW, Base Maps, and Elevations. The 'FlegWatch' tab is selected. Below it, the 'Monitored Area' is set to 'GHA VT01 - Kumasi / flegtwatch@visioterra.fr'. The 'Confidence' filter is set to 'Low' (radio button selected), and the 'Search' button is highlighted with a red circle. The main area displays a map of Kumasi, Ghana, with a large red circle drawn around the city center. A legend indicates a scale of 5 km. The search results table shows 2,322 events, with the first few listed as follows:

Event	Description
#51333	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51332	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51331	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51330	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51329	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51328	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51327	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51326	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51325	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51324	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51323	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51322	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51321	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51320	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51319	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
#51318	Forest cover change - 2019/04/04 18:18:24 GHA VT01 - Kumasi
Event	Forest cover change - 2019/04/04 18:18:24



Select one event → GHA VT01 / #50900

The figure shows a screenshot of the Flegt Watch software interface. The top navigation bar includes links to 'Fichier', 'Édition', 'Affichage', 'Historique', 'Marque-pages', 'Outils', and 'Flegt Watch'. The main search bar contains the URL 'https://visioterra.org/FlegtWatch/#' and the query 'prise électrique ghana'. The interface features several tabs: 'FlegtWatch' (selected), 'Finder', 'Missions', 'GFW', 'Base Maps', and 'Elevations'. On the left, a sidebar displays 'Monitored Area' as 'GHA VT01 - Kumasi / flegtwatch@visioterra.fr', 'Confidence' levels (Low, Medium, High), and a list of 'Events' from page 101 to 125 of 2,322. The events listed are all 'Forest cover change' events from March 29, 2019, at 18:17:40, with event IDs #50915, #50914, and #50913. A large central map shows a forest area with a yellow polygon highlighting a specific change detection. A callout box for event #50900 provides details: 'Event #50900 - Forest cover change' occurring '2019/03/29 18:17 - Now'. The bottom status bar shows coordinates '-1.50506, 6.74912' and a scale of '00 m'.

WT-P281-SLD-008-F-01-00 – FLEGT Watch, Support de formation – 27 au 31 janvier 2020

page 44



Check the difference with the previous acquisitions (mean of 4)

Screenshot of the Flegt Watch application interface showing a satellite map and a list of events.

The application window title is "Flegt Watch". The URL in the address bar is <https://visioterra.org/FlegtWatch/#>. The search bar contains "prise électrique ghana".

The left sidebar shows the "FlegtWatch" tab is active, along with "Finder", "Missions", "GFW", "Base Maps", and "Elevations".

Monitored Area: GHA VT01 - Kumasi / flegtwatch@visioterra.fr

Confidence: Low (radio button selected), Medium, High

Events: 101-125 of 2,322

Event list (partial):

- #50915 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50914 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50913 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50912 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50911 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50910 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50909 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50908 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50907 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50906 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50905 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50904 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50903 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50902 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50901 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40** (highlighted in blue)
- #50900 GHA VT01 - Kumasi
- Event Forest cover change - 2019/03/29 18:17:40
- #50899 GHA VT01 - Kumasi

The main map view shows a forest area with a yellow crosshair marker indicating the event location. A callout box for the highlighted event #50900 displays the details: "Event #50900 - Forest cover change" and "2019/03/29 18:17 - Before".

Map controls include zoom (+/-), orientation (compass), and 3D view.

Bottom status bar: 00 m, -1.49721, 6.73694, © Data : Natural Earth.



You may use the layer stack

The screenshot shows the Fleg Watch application interface. On the left, there is a sidebar with tabs for 'FlegWatch', 'Finder', 'Missions', 'GFW', 'Base Maps', and 'Elevations'. Below these tabs, there are sections for 'Monitored Area' (set to 'GHA VT01 - Kumasi'), 'Confidence' (radio buttons for Low, Medium, High), and 'Events' (listing 101-125 of 2,322 events). The main area displays a satellite map of a forested area with several green and purple spots indicating events. A yellow crosshair is overlaid on the map. In the bottom right corner, a small window shows details for 'Event #50900 - Forest cover change' from '2019/03/29 18:17 - Before' at coordinates '-1.51983, 6.74110'. On the right side of the screen, a 'Layer stack' dialog box is open, listing items such as 'Temporary display', 'Layer stack' (which is selected and expanded to show 'Event #50900'), and 'Base display' (which is also expanded to show 'Natural Earth From VisioTerra' and 'GEBCO Bathymetry'). A red box highlights the 'Layer stack' button in the top right corner of the dialog, and another red box highlights the '3D' button in the bottom right corner of the same dialog.

Fichier Édition Affichage Historique Marque-pages Outils ?

comble de - Traduction X Google Traduction X Adresse introuvable X Paris Aéroport | Site of... X Flegt Watch X Flegt Watch X

https://visioterra.org/FlegtWatch/#

FlegtWatch Finder Missions GFW Base Maps Elevations

Monitored Area GHA VT01 - Kumasi / flegtwatch@visioterra.fr

Confidence Low Medium High Search

Events 101-125 of 2,322

#50915 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50914 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50913 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50912 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50911 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50910 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50909 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50908 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50907 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50906 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50905 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50904 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50903 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50902 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50901 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50900 GHA VT01 - Kumasi

Event Forest cover change - 2019/03/29 18:17:40

#50899 GHA VT01 - Kumasi

Services

Menu

Layer stack

Items

- Temporary display
 - GHA VT01 - Kumasi
- Layer stack
 - Event #50900
- Base display
 - Natural Earth From VisioTerra
 - GEBCO Bathymetry

Event #50900 - Forest cover change

2019/03/29 18:17 - Before

-1.51983, 6.74110

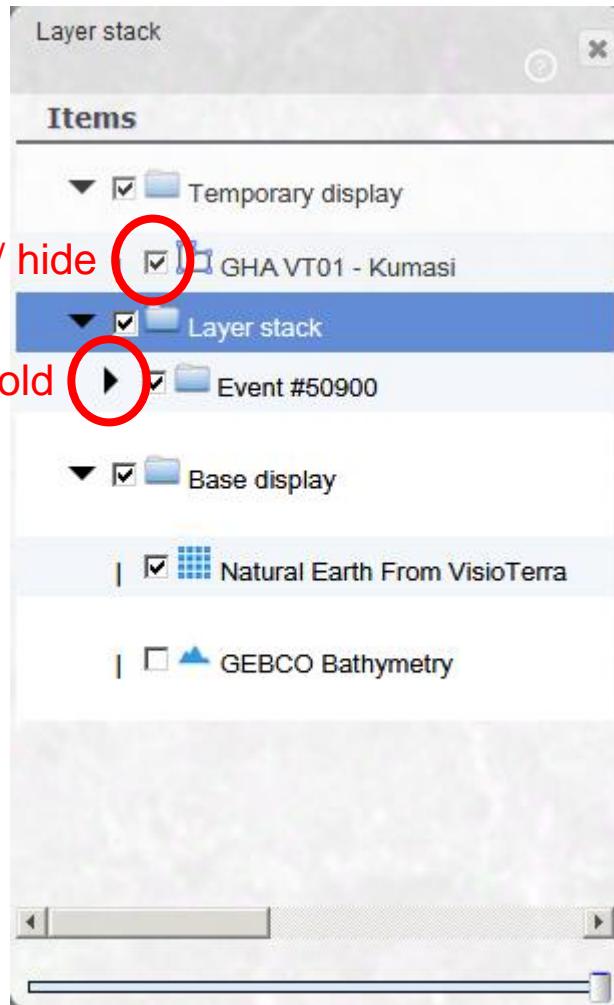
0 m

3D

3D

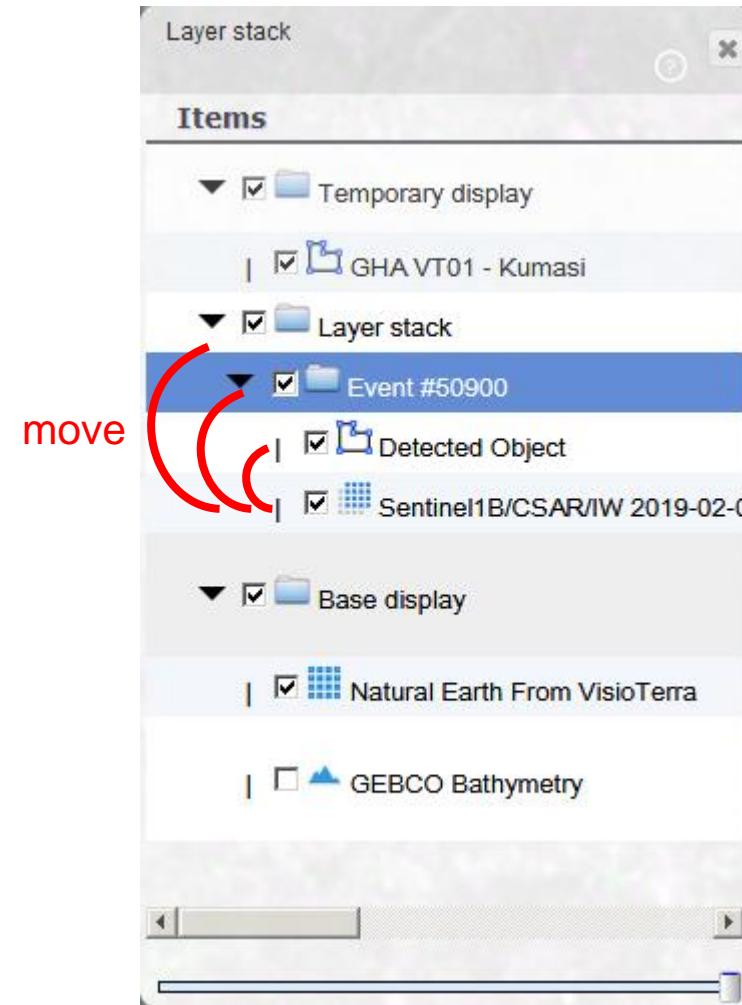


Handle items in a layer stack



display / hide

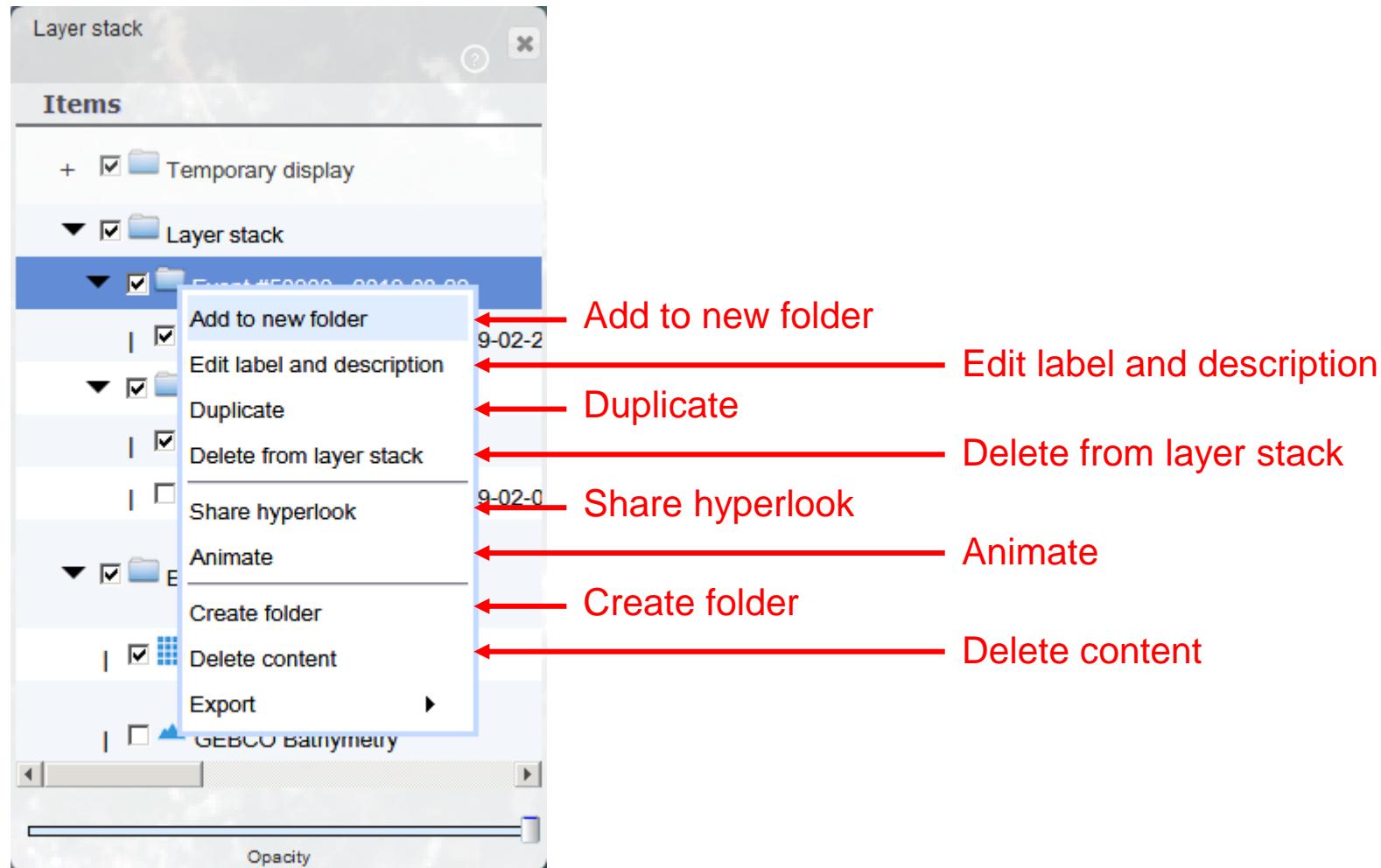
fold / unfold



move



Handle items in a layer stack (2)





Change basemap - OpenStreetMap

The screenshot shows the FLEGT Watch application interface. At the top, there is a menu bar with options like Fichier, Édition, Affichage, Historique, Marque-pages, Outils, and a Help icon. Below the menu is a toolbar with icons for comble de Traduction, Google Traduction, Adresse introuvable, Paris Aéroport | Site officiel, Flegt Watch, and a search bar containing "prise électrique ghana".

The main area features a map of a specific location with a grid overlay. On the left, there is a sidebar titled "Background Maps" containing several map options:

- VMap0 (OSGeo)
- Blue Marble (NASA)
- Landsat-7 (NASA)
- OpenStreetMap (Terrestris)** (highlighted with a red box)
- OSM Humanitarian
- Bing Map (Microsoft)
- Bing Map Road (Microsoft)
- Satellite imagery (two small thumbnail images)

Below the "Background Maps" section are two more sections: "Overlay Maps" and "Custom WMS source".

On the right side of the map, there is a "Layer stack" panel. It lists items under "Temporary display" and "Layer stack". Under "Layer stack", there is a tree view with "Event #50900" expanded, showing "Detected Object" and "Sentinel1B/CSAR/IW 2019-02-01". Other layers listed include "Base display" (with "OpenStreetMap" checked) and "GEBCO Bathymetry".

A yellow crosshair cursor is positioned over the map. A callout box on the map indicates "Event #50900 - Forest cover change" with a timestamp "2019/03/29 18:17 - Before".

At the bottom right, there is a copyright notice: "© Data : OpenStreetMap".



Change basemap (2) – Bing map

The screenshot shows the FLEGT Watch application interface. On the left, there is a sidebar titled "Background Maps" containing various map options:

- VMap0 (OSGeo)
- Blue Marble (NASA)
- Landsat-7 (NASA)
- OpenStreetMap (Terrestris)
- OpenStreetMap
- OSM Humanitarian
- Bing Map (Microsoft)** (highlighted with a red box)
- Bing Map Road (Microsoft)
- Satellite imagery

The main workspace displays a satellite view of a rural area with green fields and some buildings. A yellow crosshair cursor is positioned over a specific location. In the bottom right corner of the map, a small pop-up window reads "Event #50900 - Forest cover change". At the bottom center, there is a coordinate display: "00 m" and "-1.51167, 6.75166".

On the right side of the screen, there is a "Layer stack" panel which lists the currently active layers:

- Temporary display (checked)
- GHA VT01 - Kumasi (checked)
- Layer stack (checked)
- Event #50900 (checked)
 - Detected Object (checked)
 - Sentinel1B/CSAR/IW 2019-02-01 (unchecked)
- Base display (checked)
 - Bing Map (Microsoft) (checked)
 - GEBCO Bathymetry (unchecked)



Characterise the land cover

Background Maps

- VMap0 (OSGeo)
- Blue Marble (NASA)
- OpenStreetMap
- OSM Humanitarian
- Bing Map (Microsoft)
- Bing Map Road (Microsoft)

Services

Event #50900 - Forest cover change

2019/03/29 18:17 - Before

100 m -1.50698, 6.75256

© Data : Bing Maps

degraded forest
or agroforestry ?



Getting other data – 1. Define your area of interest

From screen extents
From layer stack
From external file
From the map



Getting other data – 2. Define (possibly) a date or a date interval

Screenshot of the Flegt Watch application interface showing the search parameters and a satellite map.

The search parameters on the left include:

- Area of interest (AOI)
- Minimum overlay (%)
- Date start (highlighted with a red box)
- Date stop
- Status
- Dataset
- Cloud Cover
- Limit: 100

The Date start field shows 2019-02-01 00:00:00. The Date stop field shows 2019-04-07 23:59:59. The Status dropdown is set to Ready. The Dataset dropdown is empty. The Cloud Cover dropdown is set to 25. The Search button is present.

The map on the right shows a satellite view of a landscape. A large yellow circle indicates the Area of Interest (AOI). A smaller yellow square highlights a specific point of interest within the AOI. A black circular area is visible in the bottom right corner of the map. The map includes standard controls for zooming and panning.

At the bottom of the interface, there are links for Settings, Clear temporary display, Help, and a coordinate reference (-1.59971, 6.77169).



Getting other data – 3. Define dataset(s)

The screenshot shows the FLEGT Watch software interface. On the left, a sidebar titled 'Dataset' is expanded, showing a list of datasets under 'ESA'. Under 'Sentinel2A', 'MSI' is checked. Under 'Sentinel2B', 'MSI' is also checked. Other options like 'Sentinel1A', 'Sentinel1B', 'MSIL2A', 'MSIL2B', 'Sentinel3A', 'NASA', 'GPM', and 'VisioTerra' are listed but not selected. A large yellow circle highlights the area of interest (AOI) on a satellite map of a forested area. A smaller yellow rectangle highlights a specific location within the AOI. The map includes a scale bar (5 km) and coordinates (-1.59971, 6.77169). The status bar at the bottom right indicates '© Data : Bing Maps'.

Select
Sentinel-2
optical
data

FleetWatch Finder Missions GFW Base Maps Elevations

Area of interest (AOI)

Minimum overlay (%)

Date start 2019-02-01 00:00:00

Date stop 2019-04-07 23:59:59

Status Ready

Dataset

Cloud Cover

Limit

S Datas

Properties

Services

Help

Clear temporary display

5 km

-1.59971, 6.77169

© Data : Bing Maps



Getting other data – 4. Launch “Search” and get result number

1. Adjust the max results
2. Launch “Search”
3. Press “Continue” or “Cancel”

The screenshot shows the FLEGT Watch software interface with two main windows. The top window displays a map of a forest area with a yellow polygon indicating the Area of Interest (AOI). A search results dialog box is overlaid on the interface, containing the text: "Search result", "Found 7 result(s) for Sentinel2A/MSI", and "Found 7 result(s) for Sentinel2B/MSI". It features "Cancel" and "Continue" buttons, with the "Continue" button circled in red and labeled "3". The bottom window shows the search parameters: Date start (2019-02-01), Date stop (2019-04-07), Dataset (S2A_MSI ; S2B_MSI), and a limit set to 100, which is also circled in red and labeled "1". The "Search" button is circled in red and labeled "2".



Getting other data – 5. Watch results (product footprint)

Screenshot of the Flegt Watch application interface showing search results and a satellite map.

The search results table shows the following data:

S	Dataset	Date	Properties
	S2B_MSI	2019-02-01 10:22:49	CCN=083%
✓	S2A_MSI	2019-02-06 10:22:11	CCN=021%
✓	S2B_MSI	2019-02-11 10:21:49	CCN=000%
	S2A_MSI	2019-02-16 10:21:11	CCN=006%
	S2B_MSI	2019-02-21 10:20:39	CCN=020%
✓	S2A_MSI	2019-02-26 10:20:21	CCN=000%
	S2B_MSI	2019-03-03 10:20:19	CCN=010%
	S2A_MSI	2019-03-08 10:20:21	CCN=048%
✓	S2B_MSI	2019-03-13 10:20:19	CCN=002%
✓	S2A_MSI	2019-03-18 10:20:21	CCN=045%
✓	S2B_MSI	2019-03-23 10:20:29	CCN=063%
✓	S2A_MSI	2019-03-28 10:20:21	CCN=078%
✓	S2B_MSI	2019-04-02 10:20:29	CCN=002%
✓	S2A_MSI	2019-04-07 10:20:21	CCN=077%

The satellite map shows a yellow rectangular area of interest (AOI) and a yellow circle indicating a specific location within it. A blue double-headed arrow below the map indicates a distance of 100 km between two points on the ground.

Map coordinates: -1.56950, 6.39060



Getting other data – 5. Watch results (product information)

The screenshot shows the FLEGT Watch application interface. A red arrow points from the 'Get information' option in the context menu of a dataset row to the detailed product information panel.

Missions **GFW** **Base Maps** **Elevations**

Temporary Geometries

2019/02/01 00:00:00

2019/02/01 00:00:00

Ready

S2A MSI; S2B MSI

25

100

Search

Dataset

Date

S2B MSI

2019-02-01 10:22:49

S2A MSI

2019-02-06 10:22:11

S2B MSI

2019-02-11 10:21:49

S2A MSI

2019-02-16 10:21:11

S2B MSI

2019-02-21 10:20:39

S2A MSI

2019-02-26 10:20:21

S2B MSI

2019-03-03 10:20:19

S2A MSI

2019-03-08 10:20:21

Granule Id

S2B_MSIL1C_20190201T102249_N0207_R065_T30NXN_20190201T123206

Dataset Id

Sentinel2B/MSI

Date start

2019/02/01 10:22:49

Date stop

2019/02/01 10:22:49

Cloud cover

CCN=083% 02%

Insertion date

2019/02/01 16:39:02

Processing status

Unprocessed

DHuS Ingestion date

2019/02/01 15:44:14

DHuS product link

[https://scihub.copernicus.eu/dhus/odata/v1/Products\('afcd0dff-7c5f-48bc-bccc-7200086df0cb'\)](https://scihub.copernicus.eu/dhus/odata/v1/Products('afcd0dff-7c5f-48bc-bccc-7200086df0cb'))

DHuS download link

[https://scihub.copernicus.eu/dhus/odata/v1/Products\('afcd0dff-7c5f-48bc-bccc-7200086df0cb'\)/\\$value](https://scihub.copernicus.eu/dhus/odata/v1/Products('afcd0dff-7c5f-48bc-bccc-7200086df0cb')/$value)

Settings

Clear temporary display

Help

20 km

-0.98722, 6.96464

© Data : Bing Maps



Getting other data – 5. Watch results (quick-look)

1. Activate “Settings”
2. In “Show thumbnail” select “In a window”
3. Select a product to display its thumbnail (quick-look) in the window

The screenshot shows the FLEGT Watch software interface. The 'Finder' tab is active. On the left, there is a search bar with the query 'prise électrique ghana'. Below it is a filter panel with various checkboxes and dropdowns, and a table of search results. The results table has columns for S, Dataset, Date, and Properties. The first result is highlighted. At the bottom of the interface, there is a 'Settings' button, a 'Clear temporary display' button, and a 'Help' button. On the right, there is a map of a forested area with a yellow rectangle and a yellow circle drawn on it. A 'Thumbnail' window is open, showing a quick-look image of the selected area. The 'Thumbnail' window has a dropdown menu with options 'Focus on last selected product' and 'Show thumbnail In a window'. The 'In a window' option is highlighted with a red box and a red circle labeled '2'. A red circle labeled '3' points to the thumbnail window itself.

S	Dataset	Date	Properties
1	S2B_MSI	2019-02-01 10:22:49	CCN=083%
✓	S2A_MSI	2019-02-06 10:22:11	CCN=021%
✓	S2B_MSI	2019-02-11 10:21:49	CCN=000%
	S2A_MSI	2019-02-16 10:21:11	CCN=006%
	S2B_MSI	2019-02-21 10:20:39	CCN=020%
✓	S2A_MSI	2019-02-26 10:20:21	CCN=000%
	S2B_MSI	2019-03-03 10:20:19	CCN=010%
	S2A_MSI	2019-03-08 10:20:21	CCN=048%
✓	S2B_MSI	2019-03-13 10:20:19	CCN=002%
✓	S2A_MSI	2019-03-18 10:20:21	CCN=045%
✓	S2B_MSI	2019-03-23 10:20:29	CCN=063%
✓	S2A_MSI	2019-03-28 10:20:21	CCN=078%
✓	S2B_MSI	2019-04-02 10:20:29	CCN=002%
	S2A_MSI	2019-04-07 10:20:21	CCN=077%



Merci de votre attention.
Thank you for your attention.

Questions ?



Serge RIAZANOFF Director
www.visioterra.fr

serge.riazanoff@visioterra.fr