



FLEGT Watch

Support de formation



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 événements 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-004-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 29 juillet 2019 - Introduction

Après-midi

- Présentation des participants
- Objectifs et organisation du projet « FLEGT Watch »
- Création des comptes utilisateurs : « Observateurs indépendants »
- Présentation des « Aires surveillées » (concessions forestières) actuellement actives
- Création éventuelle de nouvelles « Aires surveillées » - présentation du SIG d'appui

Mardi 30 juillet 2019 -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 31 juillet 2019 -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 1^{er} août 2019 -Mission de terrain

Vendredi 2 août 2019 -Exploitation des observations lors de la mission de terrain

Matin

- Visualisation / écoute des observations de terrain
- Edition du rapport 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

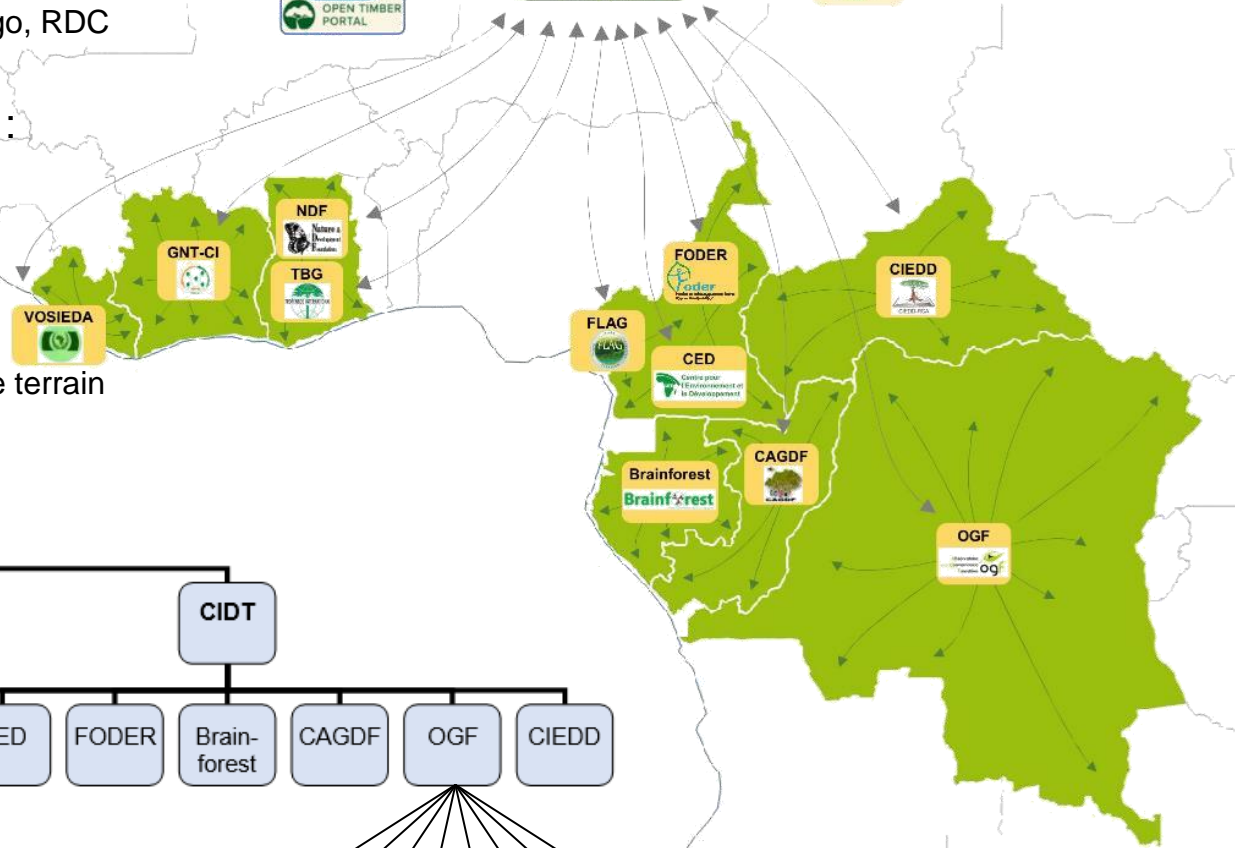
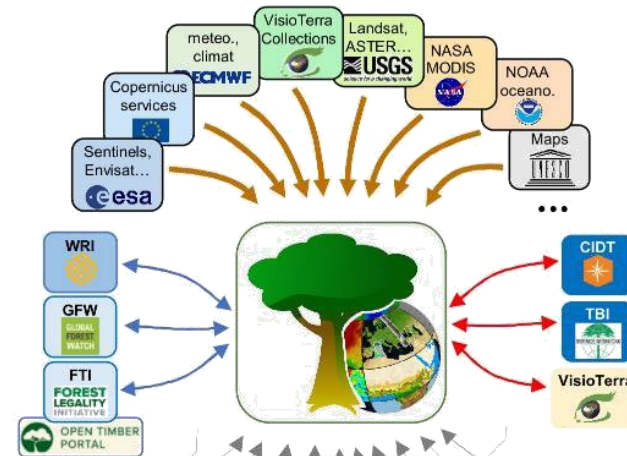
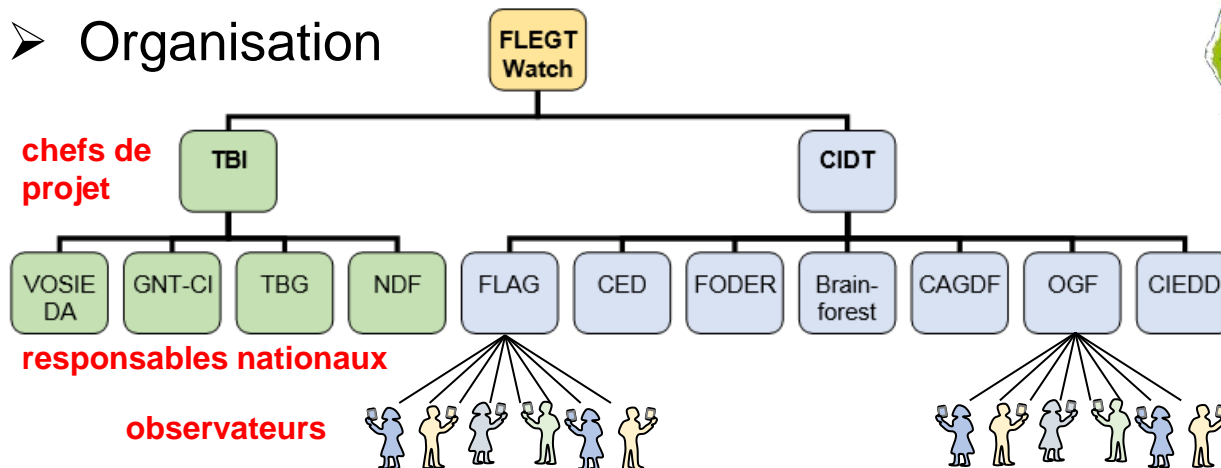
- “FLEGT Watch” offre les mêmes services aux deux sous-régions:

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

- Objectifs de “FLEGT Watch” :

- ❑ performances – en utilisant les toutes nouvelles technologies
- ❑ sécurité – en protégeant la communauté des observateurs
- ❑ traçabilité – en enregistrant les observations des satellites et de terrain

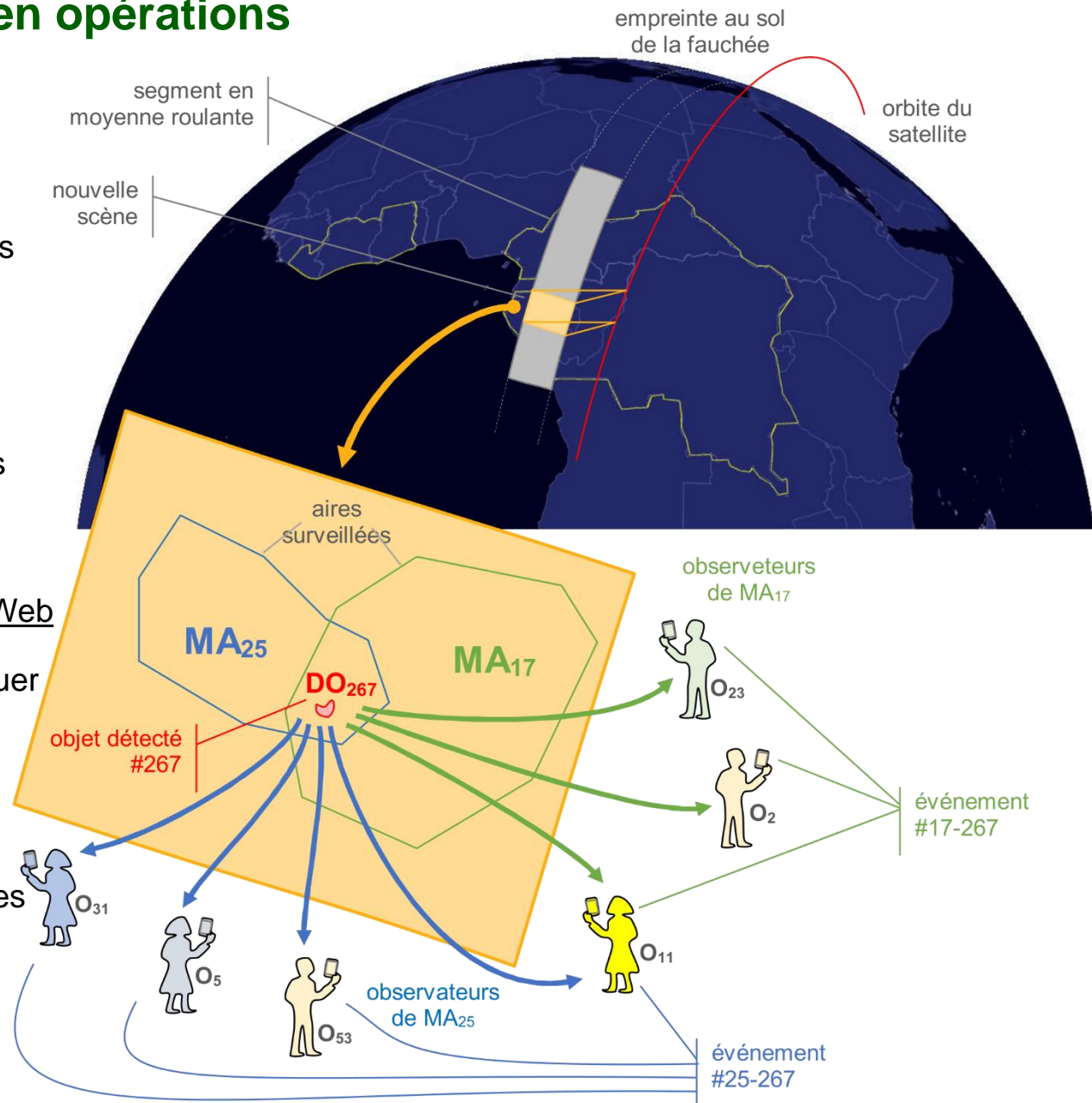
- Organisation





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





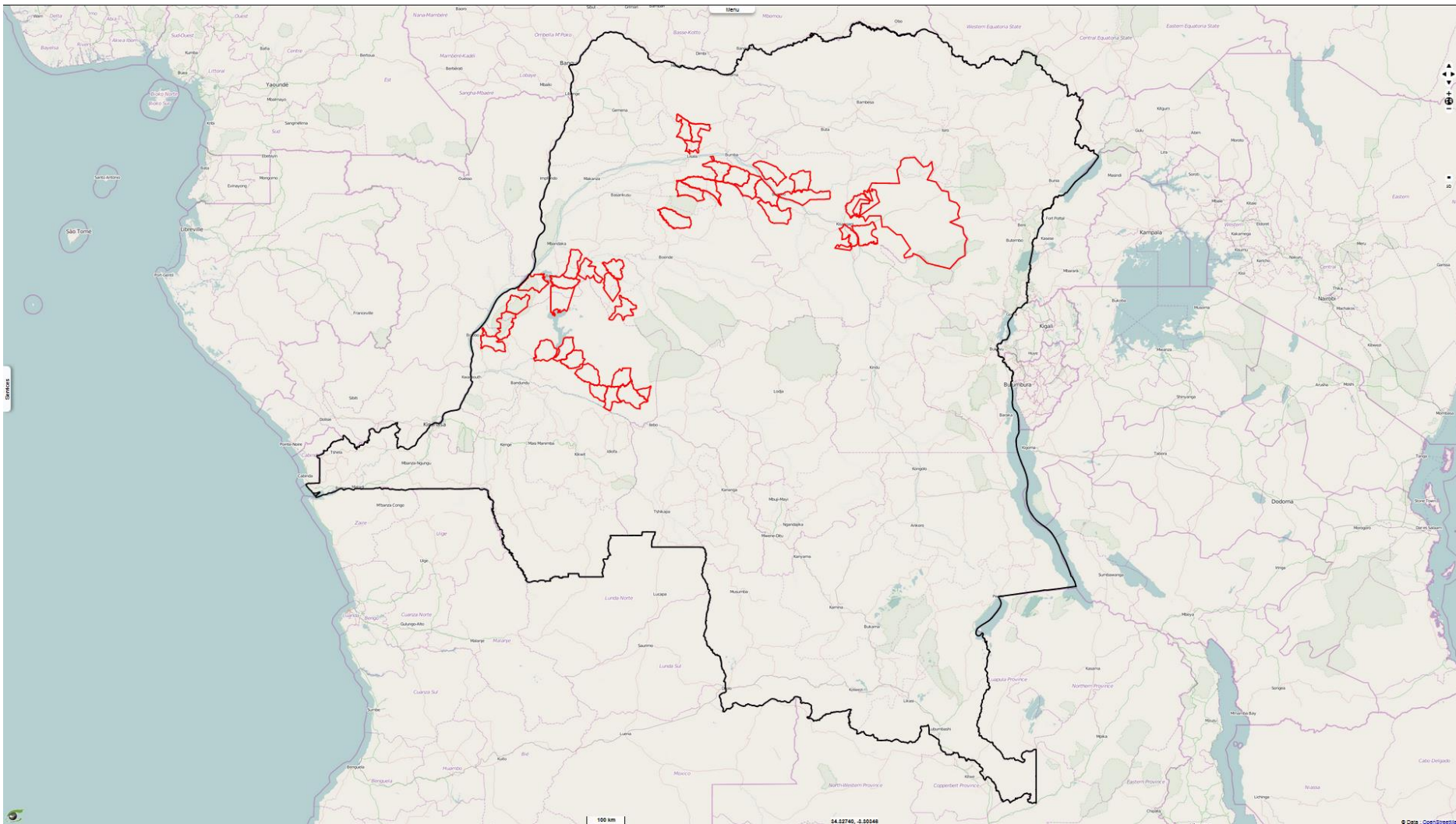
Observateurs en RDC (liste collectée le 29 juillet 2019)

Prénom(s)	NOM	Organisation	adresse e-mail
Chef de projet			
Aurelian	MBZIBAIN	CIDT	A.Mbzibain2@wlv.ac.uk
Responsable national			
Serge	BONDO	OGF	skayembeb@gmail.com
Observateurs			
Michel	WOTOKO	BERDA	mwotoko@gmail.com
Nicole	LWANZO	CFLEDD	nickylwanzo@gmail.com
Olga	MBULA	DYJEDD	olgaitumba@gmail.com
Prince	MABUSU	GTCRR	mabusuprince@yahoo.fr
Jean-Claude	LUKUSA	IFCO	jclukusa14@gmail.com
John	KATEMBO	LECAFOR	jmukirania1@yahoo.fr
Florent	KAY	OCEAN	florentkay@gmail.com
Papy	MOLIMA	OCEAN	papymolima@yahoo.fr
Daudet	TOKINDA	OCEAN	daudettokinda@gmail.com
Céline	EKAVU	OGF	cekavu@gmail.com
Childerick	KILOLO	OGF	papykilolos@gmail.com
Baudouin	LIFEE	OSAPY	baudlifee@gmail.com
Stanis	BITABOTO	PCN	bitabotostanis@gmail.com
Serge	BUBALA	RRN	sergebubala2013@gmail.com
Grâce	KOMBA	SOS NATURE	gracekomba28@gmail.com
Masimo	KABUANGA	Tropenbos RDC	mkabuang@hotmail.com
Justin	KYALE	Tropenbos RDC	koykyale@yahoo.fr



Les aires à surveiller (*monitored areas*) en RDC

Hyperlook





Hyperlooks à examiner

➤ Hyperlook document

- ❑ [HYP-072-Sentinels](#) – FLEGT Watch in Ghana, Ivory Coast and Cameroon

➤ Layer stacks – A photo-interpretation work of Elisée TCHANA

1. <https://visioterra.org/FlegtWatch/hyperlook/9dad2acef95b4bbb909fd13477b99df9>
2. <https://visioterra.org/FlegtWatch/hyperlook/f1bad3e30a604305ae2da851641f1363>
3. <https://visioterra.org/FlegtWatch/hyperlook/d99be89aa3d746bc99c942162d8fcad2>
4. <https://visioterra.org/FlegtWatch/hyperlook/e3ccf94a1ffb4ee59cd750547e43ab22>
5. <https://visioterra.org/FlegtWatch/hyperlook/8280812c35444739a8d957dc304f09ae>
6. <https://visioterra.org/FlegtWatch/hyperlook/c024ff96e4bd4bfba096970f47840662>
7. <https://visioterra.org/FlegtWatch/hyperlook/2593e91bd22e4d5d8fb6ccb86d65b28e>
8. <https://visioterra.org/FlegtWatch/hyperlook/66cc918cdd6d41d98d2bd961e6990c2e>

“From my observation this image surely shows an old forest unit or an old wood processing area”

➤ Layer stacks – A photo-interpretation work of Zhour NAJOUÏ (09.04.2019)

1. <https://visioterra.org/FlegtWatch/hyperlook/21b4b3b52c064dcda5d5c3c438676362>
2. <https://visioterra.org/FlegtWatch/hyperlook/16f1291133c848329a14da4d4d9638de>
3. <https://visioterra.org/FlegtWatch/hyperlook/fa9e7fab242b4469b76551b8581dd5d1>
4. <https://visioterra.org/FlegtWatch/hyperlook/f6c838678ef14092af7012d08f3a6207>



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 opération (français)

➤ Manuels utilisateur

- ❑ [VT-P281-SUM-005-E-01-01](#) – FLEGT Watch user's manual
- ❑ [VT-P281-SUM-005-F-01-01](#) – 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



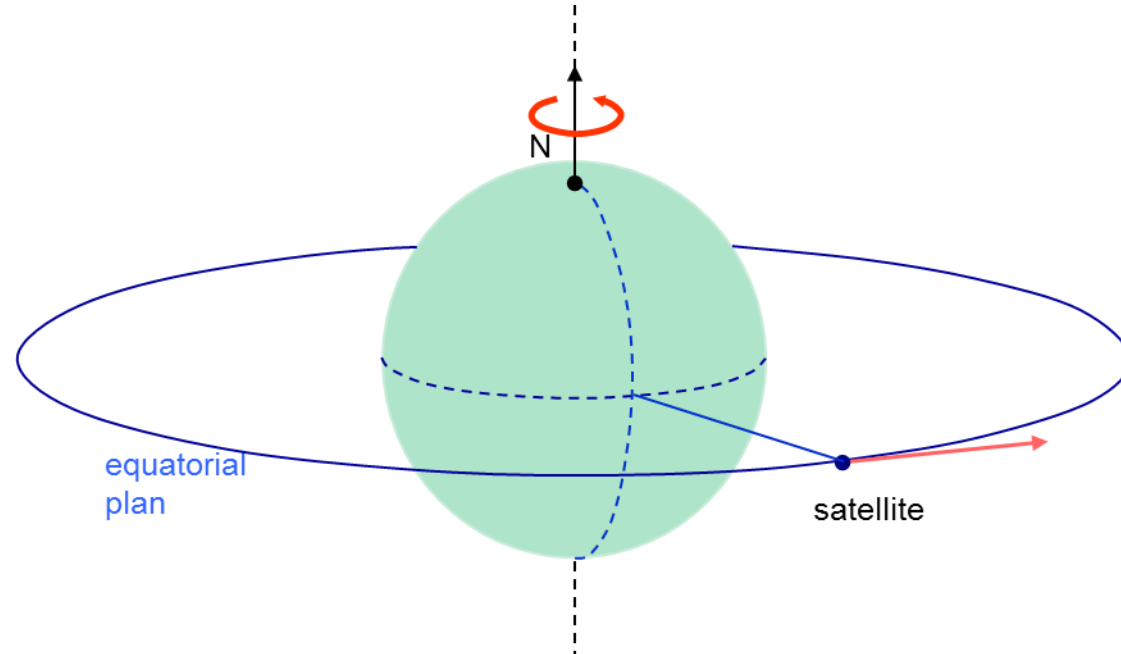
Les satellites

Plateformes, orbites et instruments

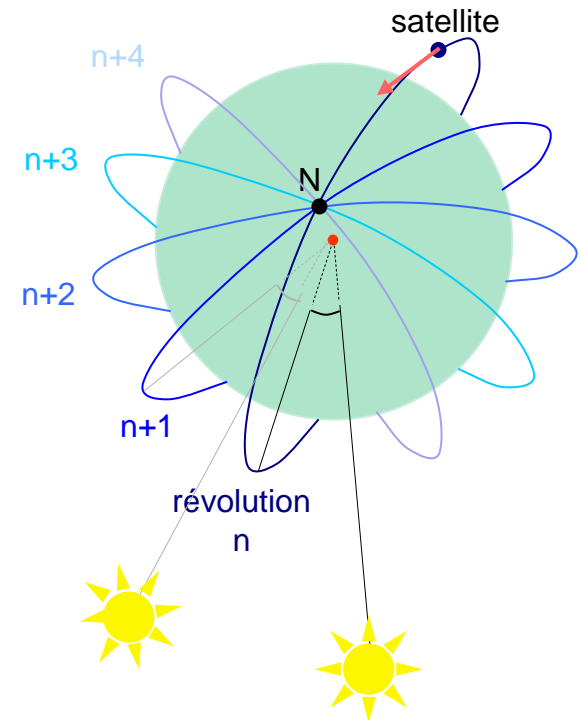


Types d'orbites, révolutions et temps de cycle

satellite géostationnaire



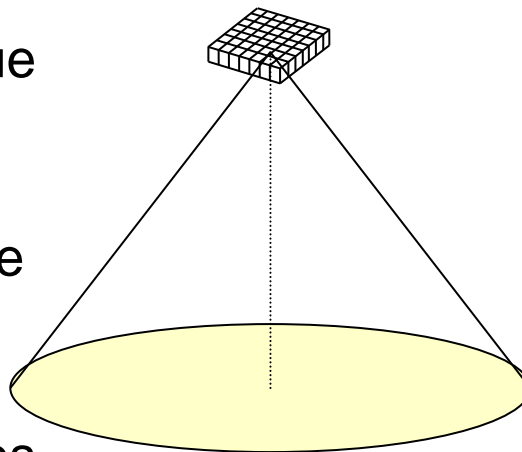
satellite héliosynchrone



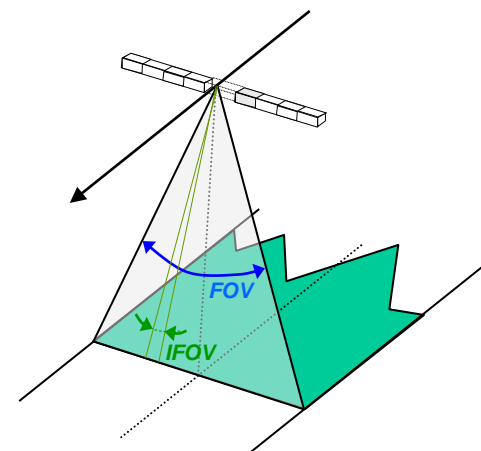


➤ Satellites et instruments – Géométrie de prise de vue

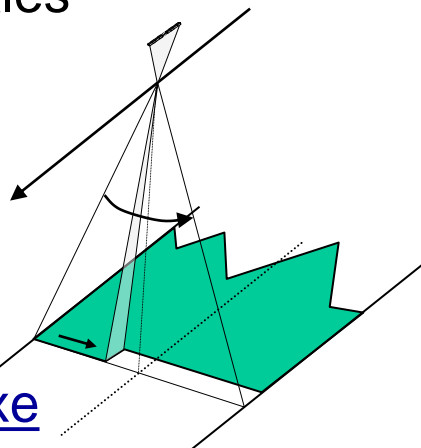
- ❑ Capteur matriciel
Géométrie conique
(*frame camera*)



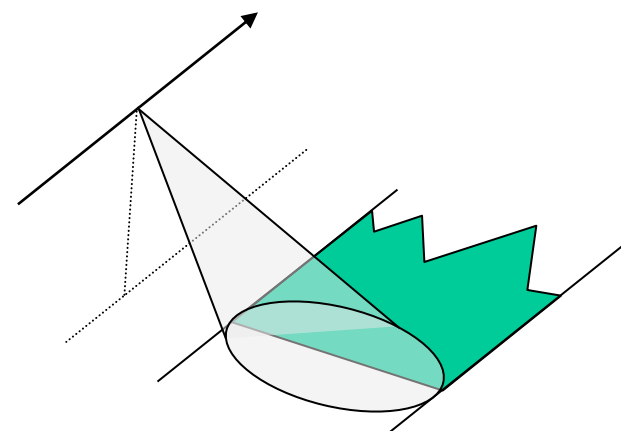
- ❑ Capteur en peigne
(*pushbroom*)



- ❑ Fauchées latérales
(*whiskbroom*)



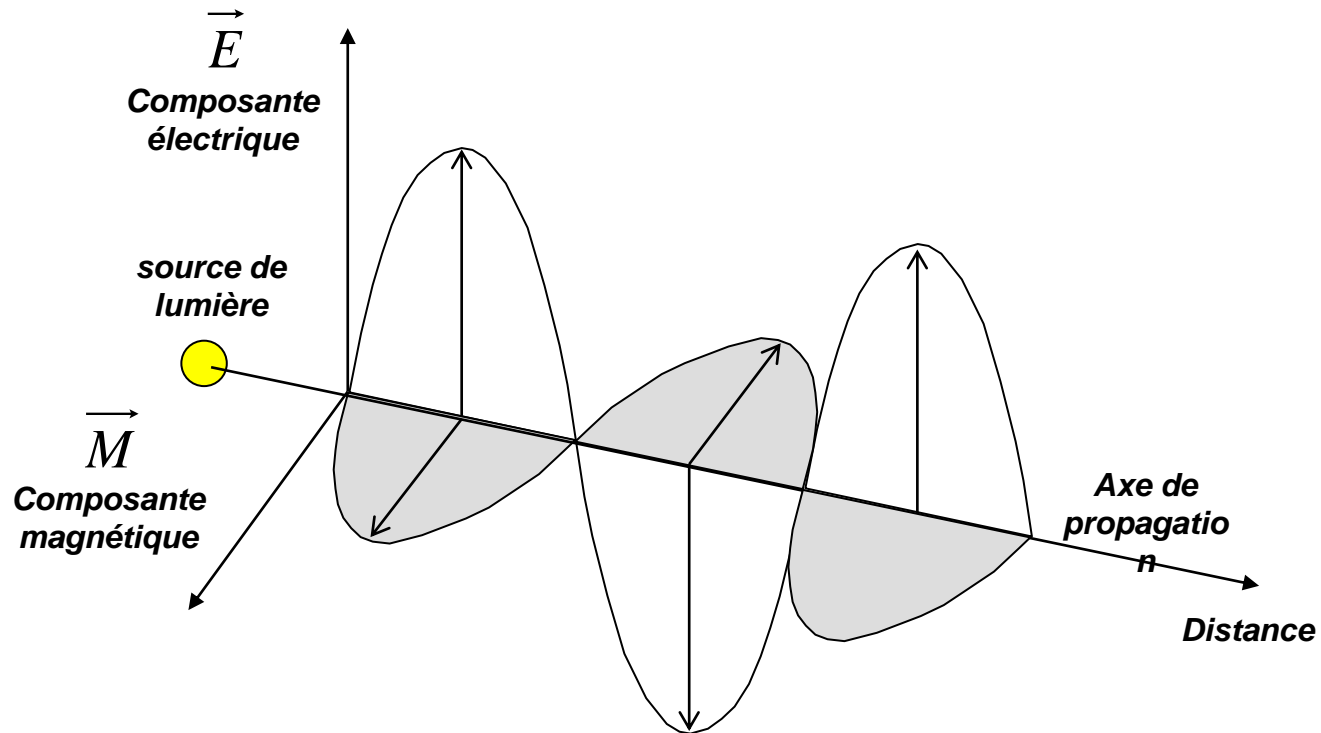
- ❑ Radar



Erreurs de parallaxe

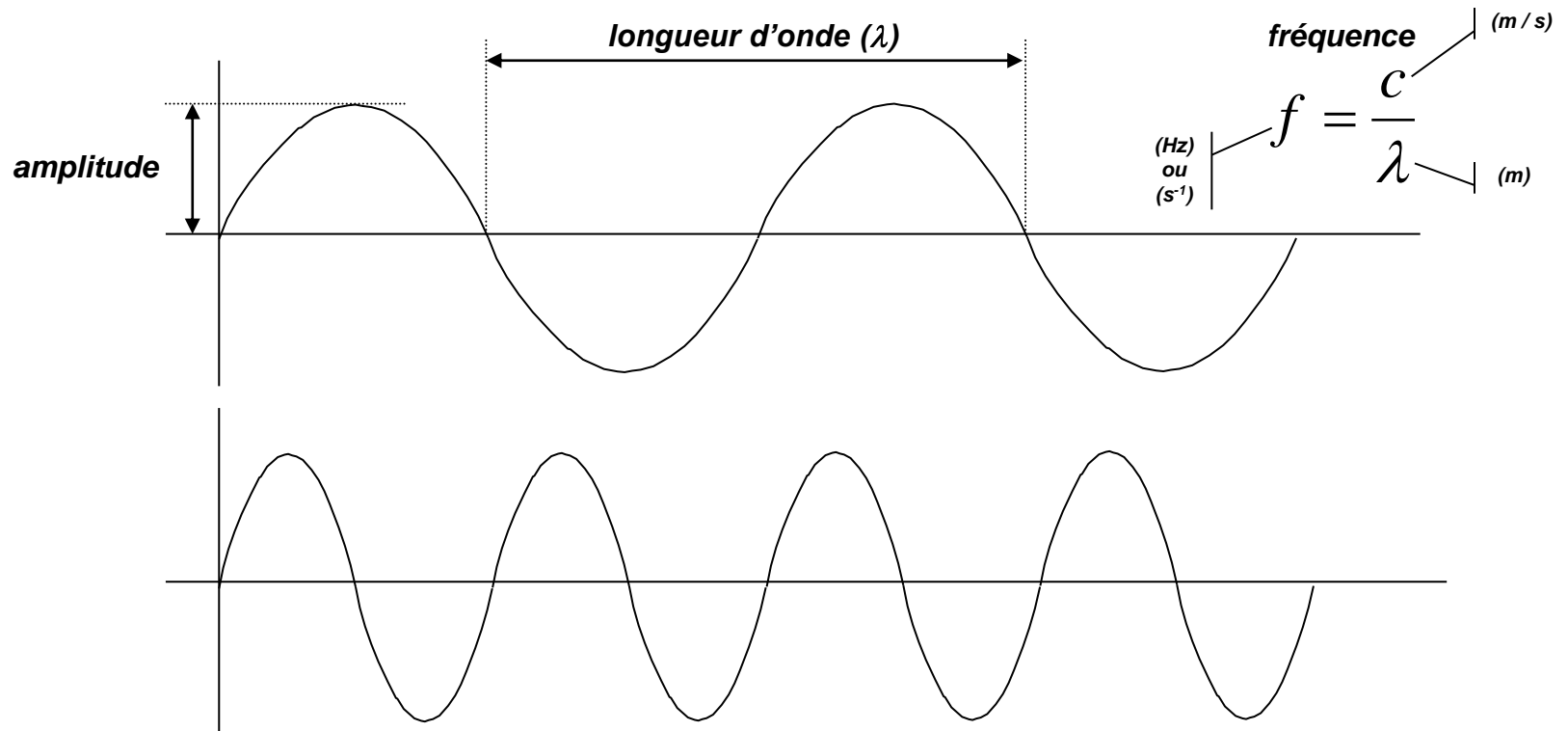


La radiation électromagnétique





➤ L'onde électromagnétique

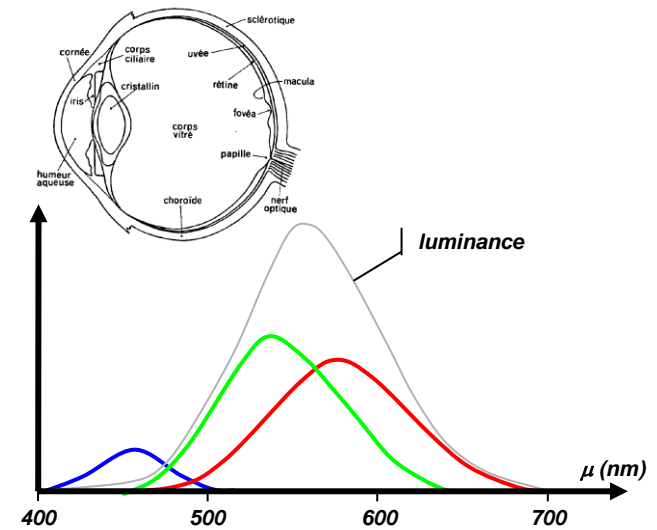
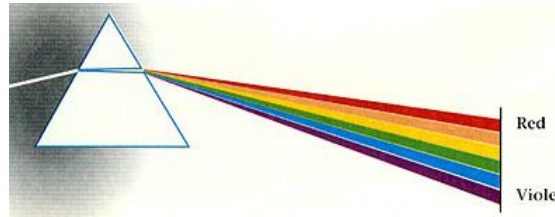




➤ Le spectre électromagnétique

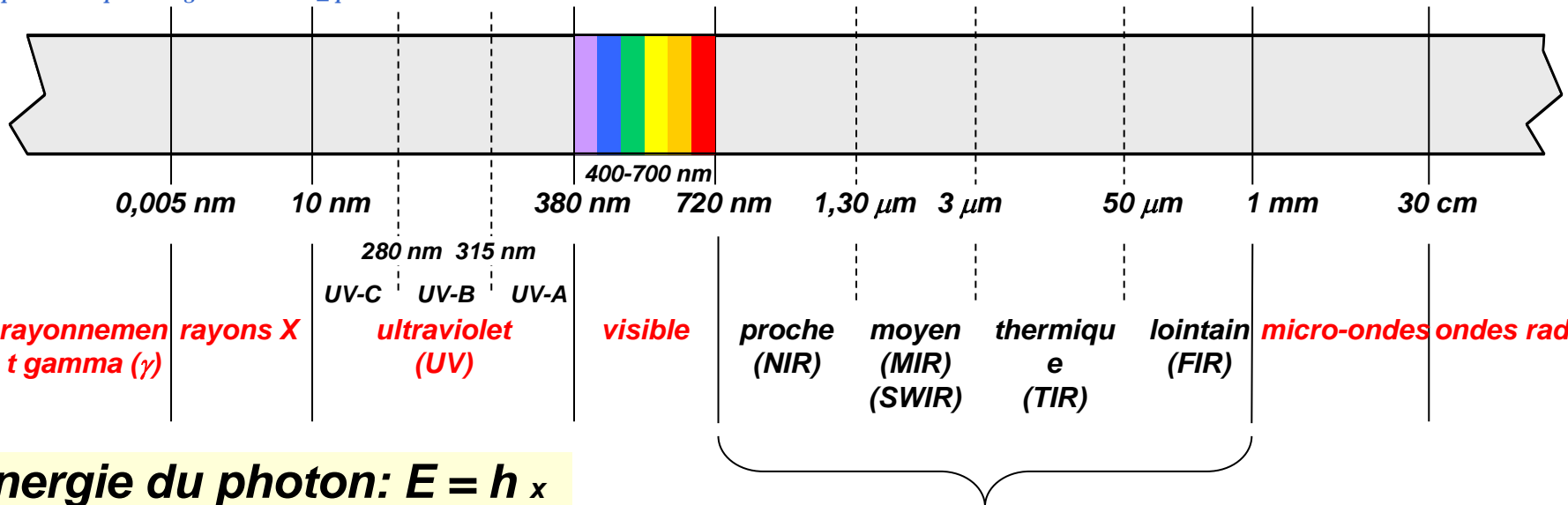
Spectre visible	
violet	380–450 nm
blue	450–495 nm
green	495–570 nm
yellow	570–590 nm
orange	590–620 nm
red	620–750 nm

http://en.wikipedia.org/wiki/Visible_spectrum



Sensibilité spectrale des cônes de l'œil

<http://www.rennes.supelec.fr/ren/perso/jweiss/tv/perception/percept4.html>



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

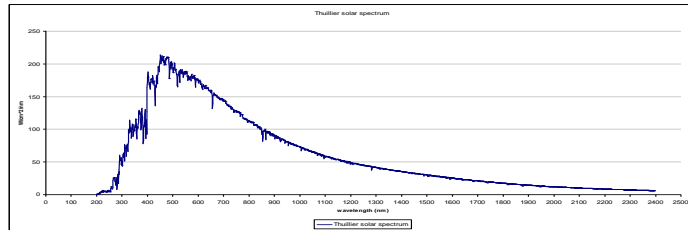
ν

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

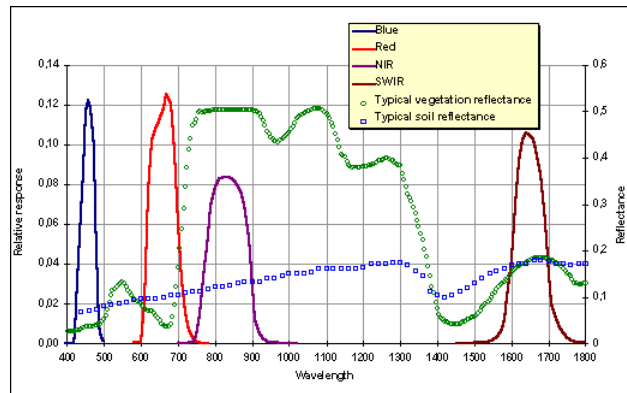
J.s



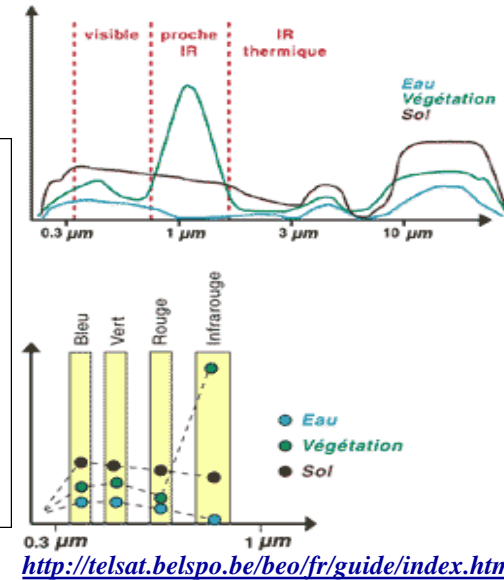
➤ Instrument passif



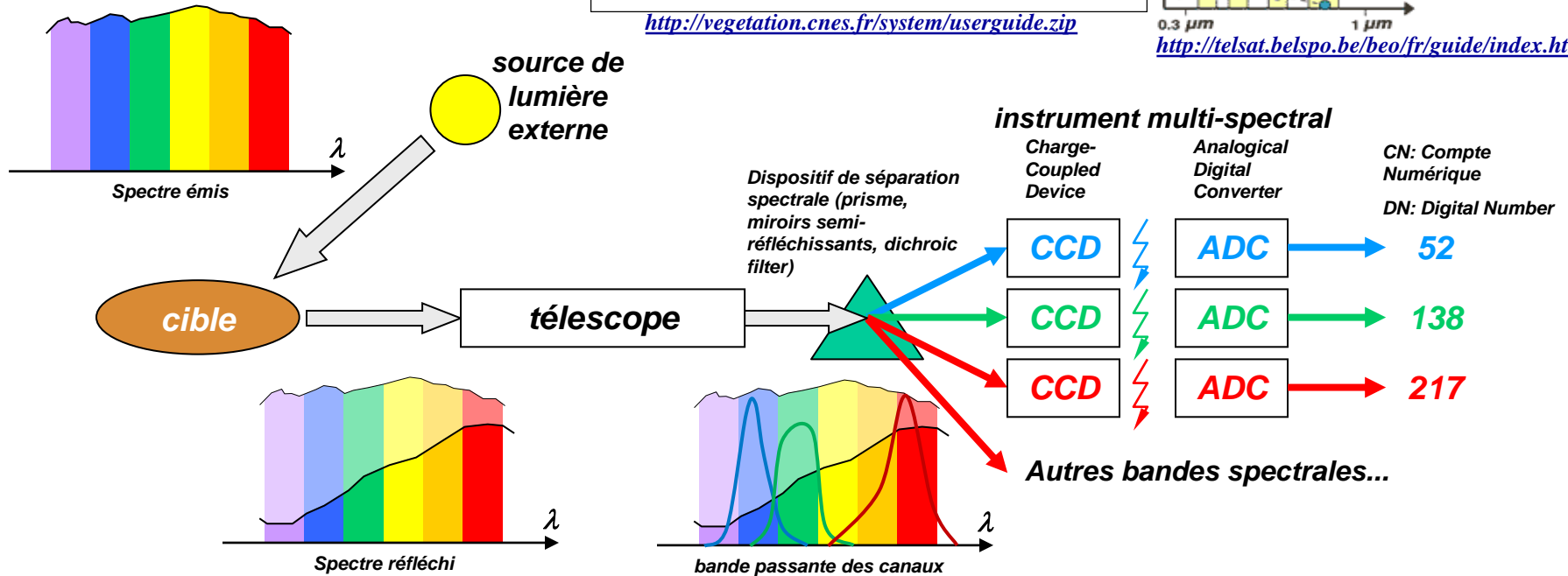
Thuillier (2003) solar spectrum - wavelength range 200 - 2397nm
 Thuillier, G., M. Hersé, P. C. Simon, D. Labs, H. Mandel, D. Gillotay, and T. Foujols, 2003,
 "The solar spectral irradiance from 200 to 2400 nm as measured by the SOLSPEC
 spectrometer from the ATLAS 1-2-3 and EURECA missions, Solar Physics, 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 ???.??.????

+5 days phase

Instrument

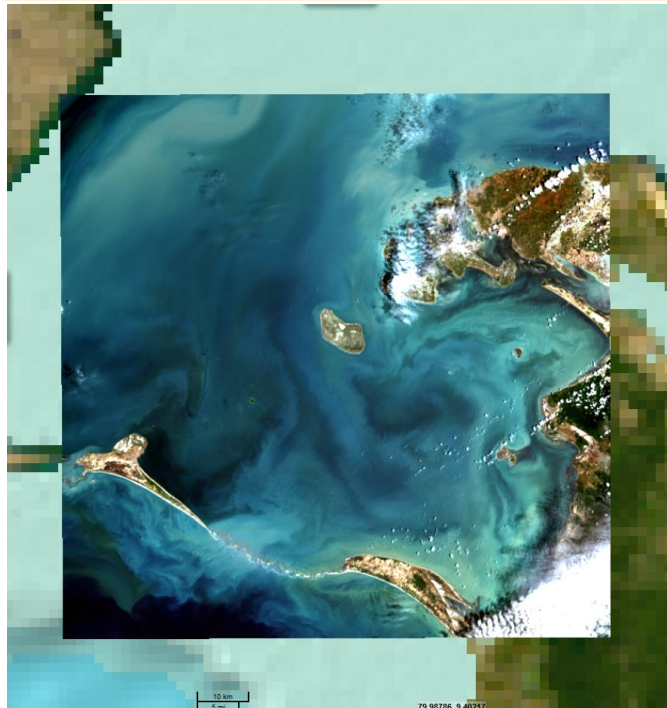
- MSI (Multi-Spectral Instrument) – optical – 290km swath

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)

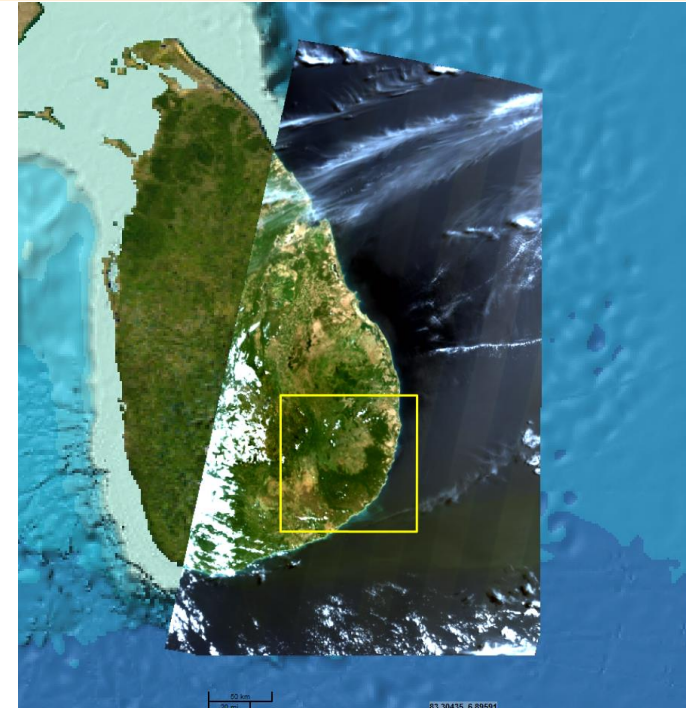
Bay of Kachchativu (North) on
18.09.2017 04:56:51 GMT
One tile (100km x 100km).

2D-view-left



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

2D-view-right



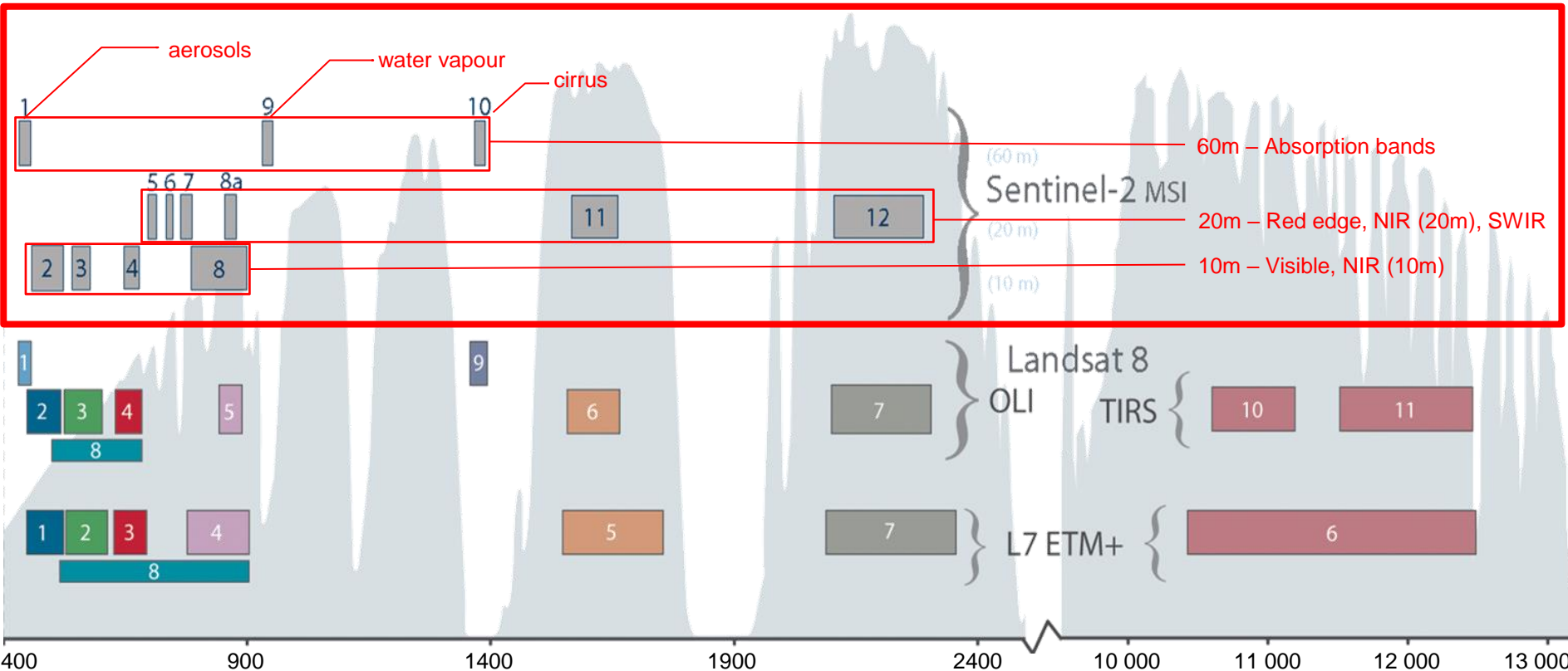


Sentinel-2 MSI – Spectral bands

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>



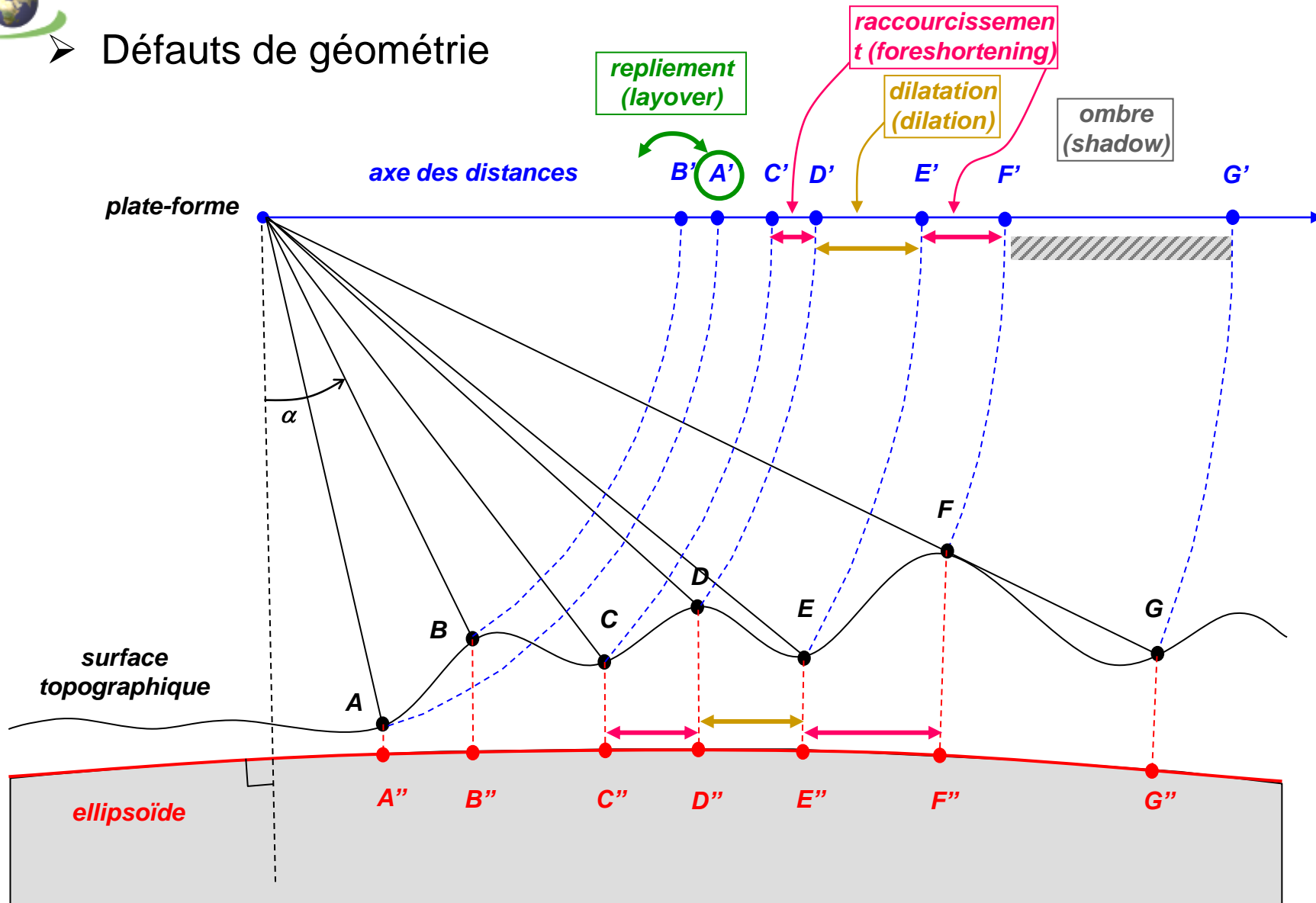


Sentinel-1

radar Haute résolution (HR)



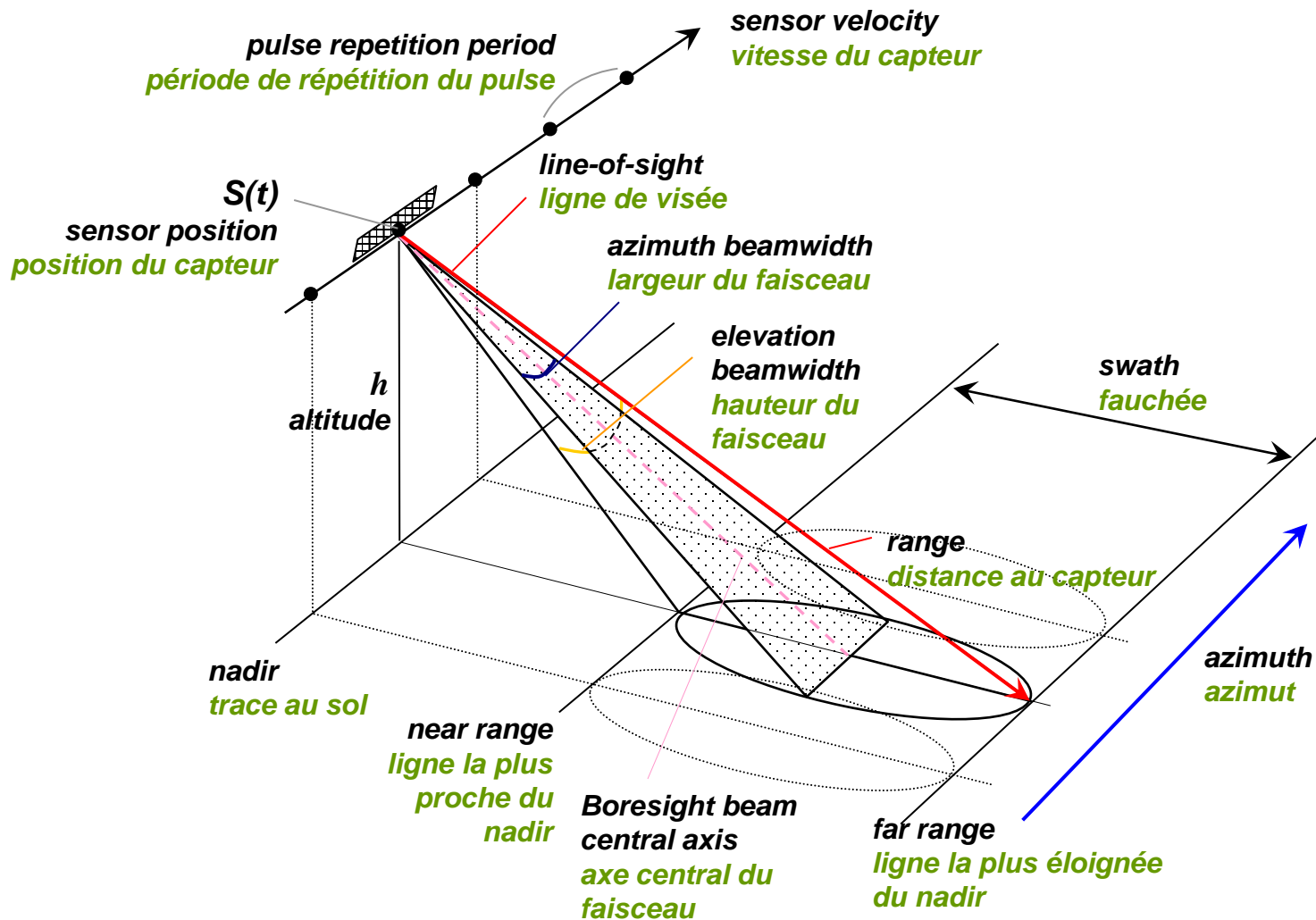
➤ Défauts de géométrie





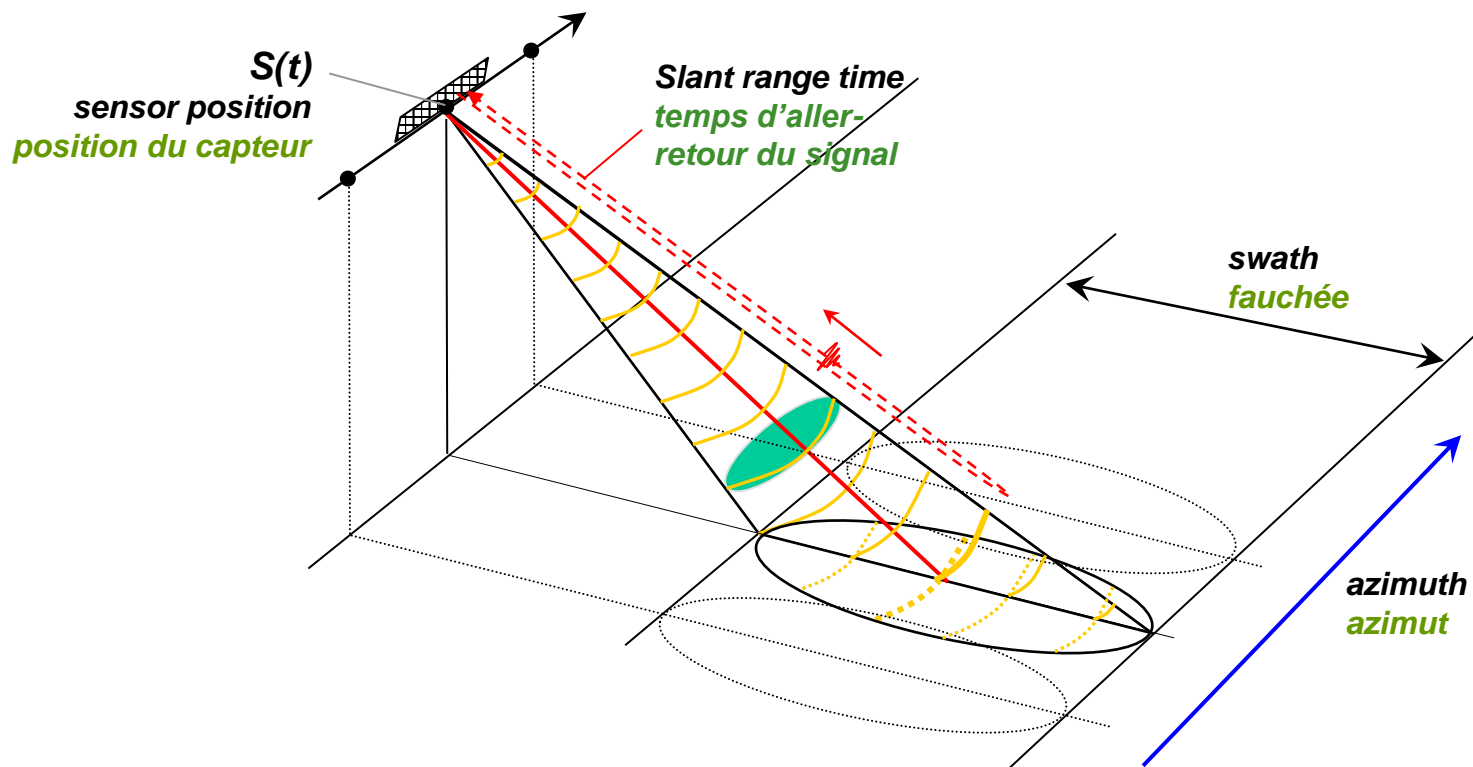
Physique de l'acquisition

**RADAR ↔ RAdio
Detection And Ranging**



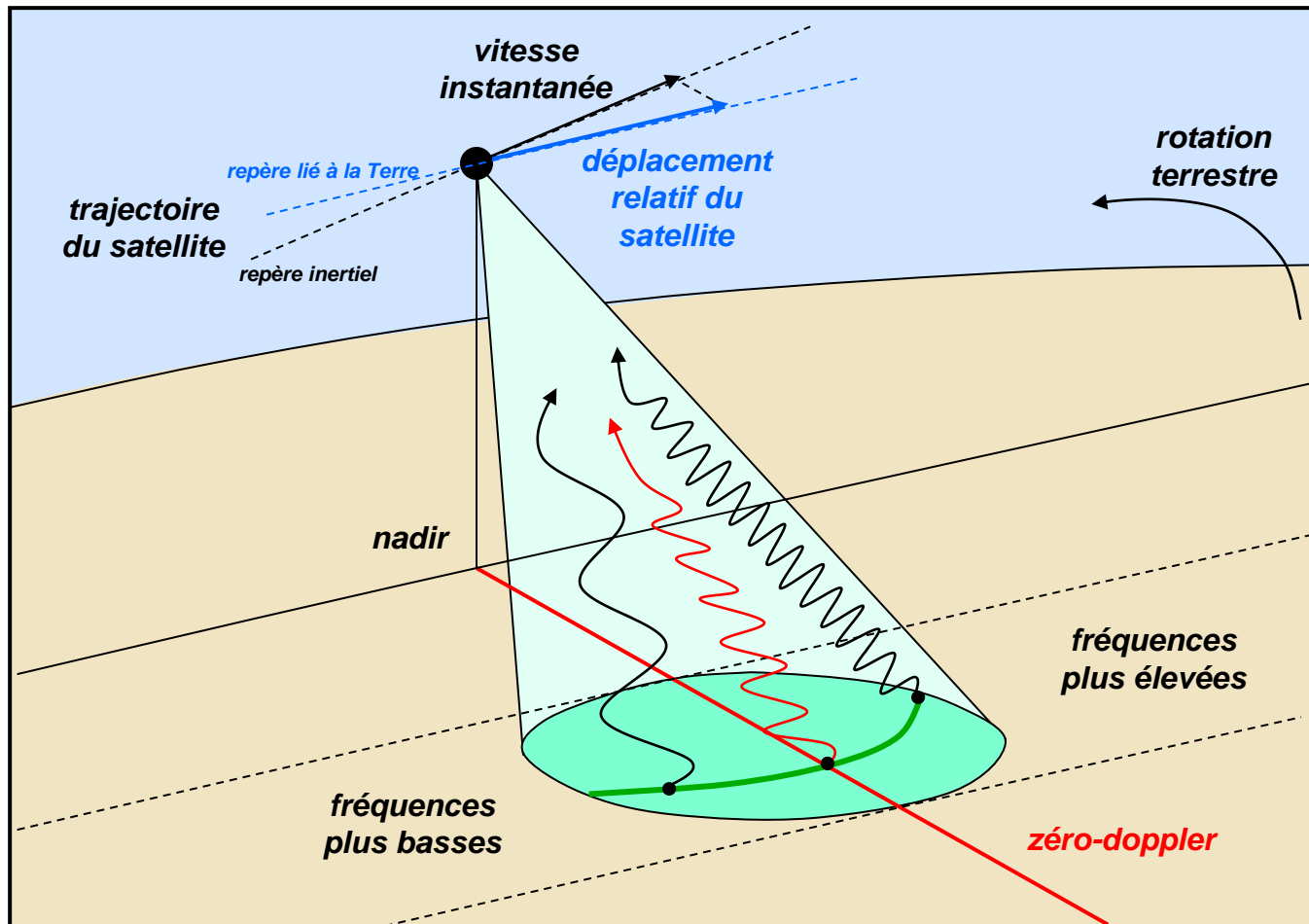


Positionnement en distance (range)





Positionnement en azimut (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

Bande	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

λ > 2 cm - Pénétration des nuages
λ > 4 cm - Pénétration de la pluie
Meilleure pénétration des sols secs

How the trees are seen by the SARs ?



Pinus Nigra



X-band
λ= 3 cm

TerraSAR-X
COSMO-SkyMed



C-band
λ= 5 cm

Sentinel-1
RADARSAT



L-band
λ= 27 cm

PALSAR(-2)
NISAR (2022)



P-band
λ= 70 cm

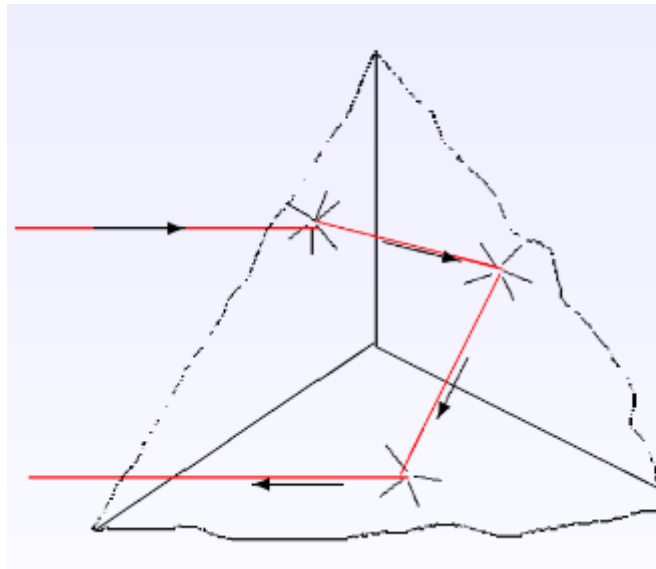
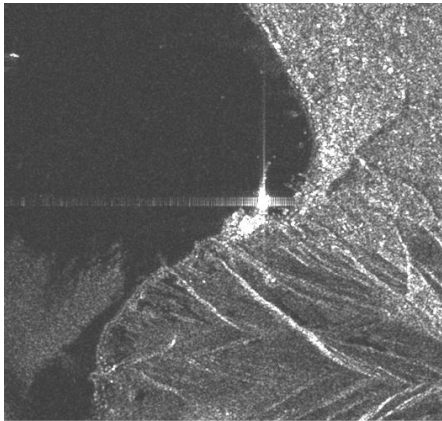
BIOMASS (2021)

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

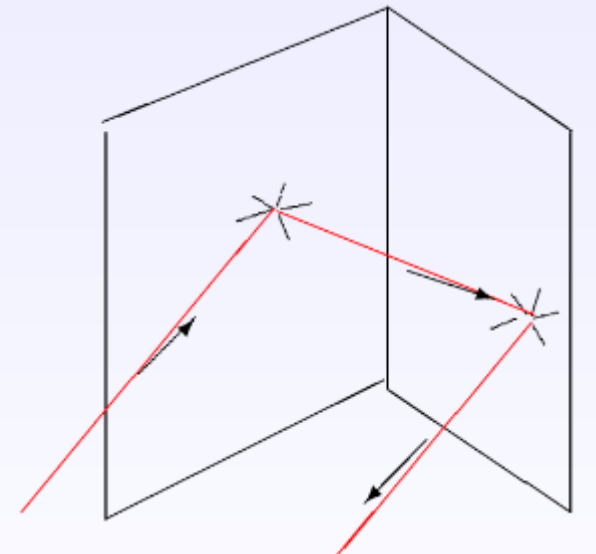




Mécanisme de rétrodiffusion (*back-scattering*)



trièdre
(corn-reflector)



bièdre

http://smc.cnes.fr/PLEIADES/Fr/PDF/methodo/presPolar_inglada.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

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)

Series of 3 scenes
acquired on 21.09.2017
00:24:24 GMT

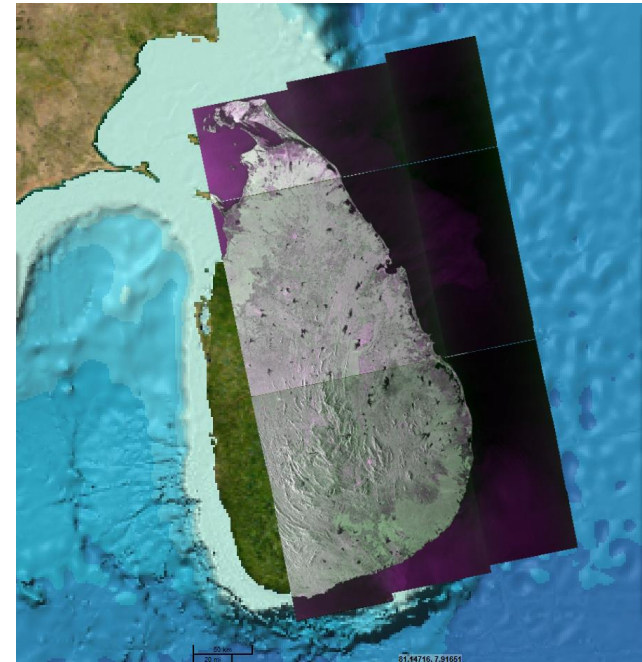
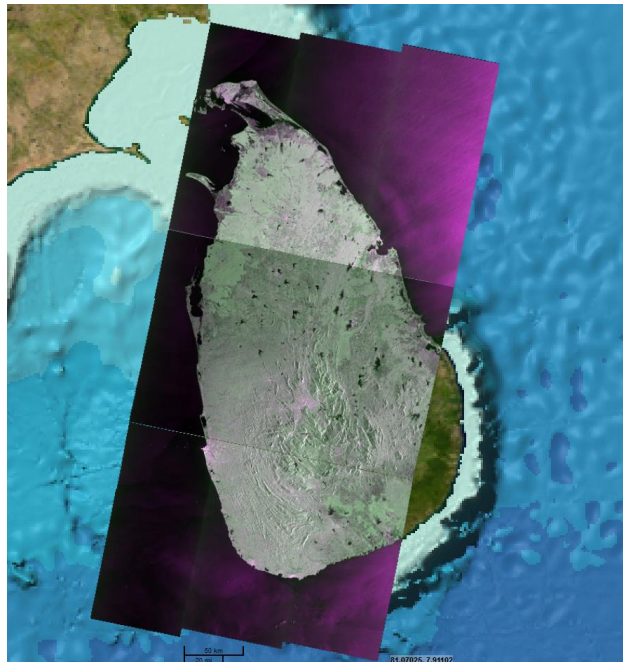
in descending orbit (left)

2D-view-left

Series of 3 scenes
acquired on 21.09.2017
12:49:54 GMT

in ascending orbit (right)

2D-view-right





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

Instruments

- OLCI (Ocean Land Colour Instrument) – optical
 - 21 bands [0.4-1.02] μm
 - GSD = 300m
 - swath width = 1270 km
- SLSTR (Sea and Land Surface Temperature Radiometer)
 - 9 bands [0.55-12] μm , NADIR + backward
 - GSD = 500m (VIS, SWIR), 1 km (MWIR, TIR)
 - swath width = 1420 km (NADIR), 750 km (backward)
- SRAL (SAR Radar Altimeter)
 - Range measurement: Ku-band (13.575 GHz) and C-band (5.41 GHz)
 - Sampling rate: 1 Hz ($\approx 850\text{m}$) and 10 Hz ($\approx 85\text{m}$)

Sri-Lanka seen by:

OLCI on
30.09.2017 09:30:04 GMT.

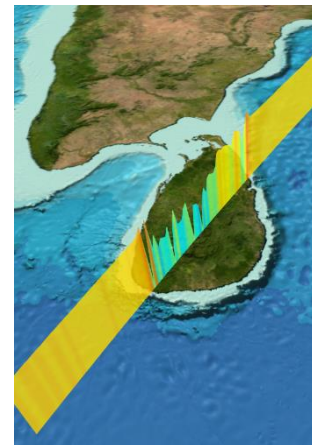
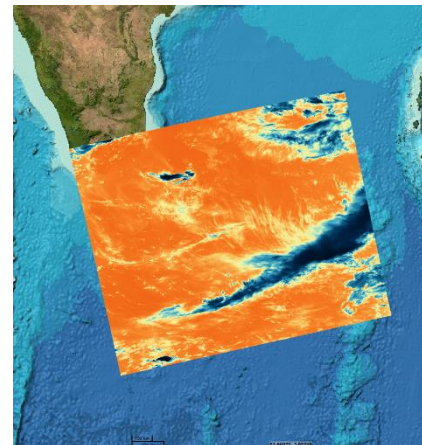
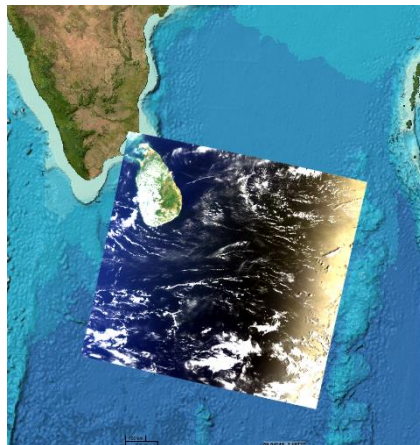
2D-view-left

SLSTR on
01.10.2017 16:28:18 GMT.

2D-view-middle

SRAL on
29.09.2017 04:35:48 GMT.

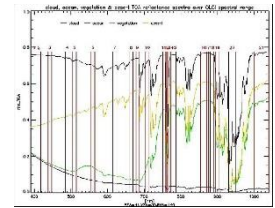
2D-view-right





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

bands absent in the previous
Envisat / MERIS instrument



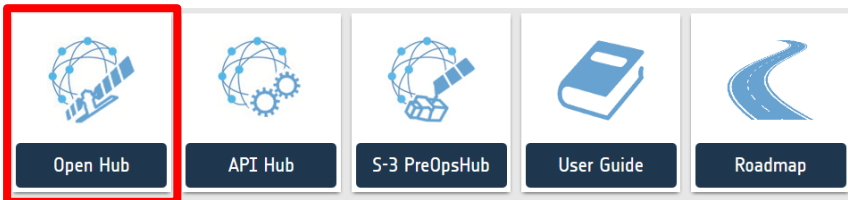
Sentinel infrastructures

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

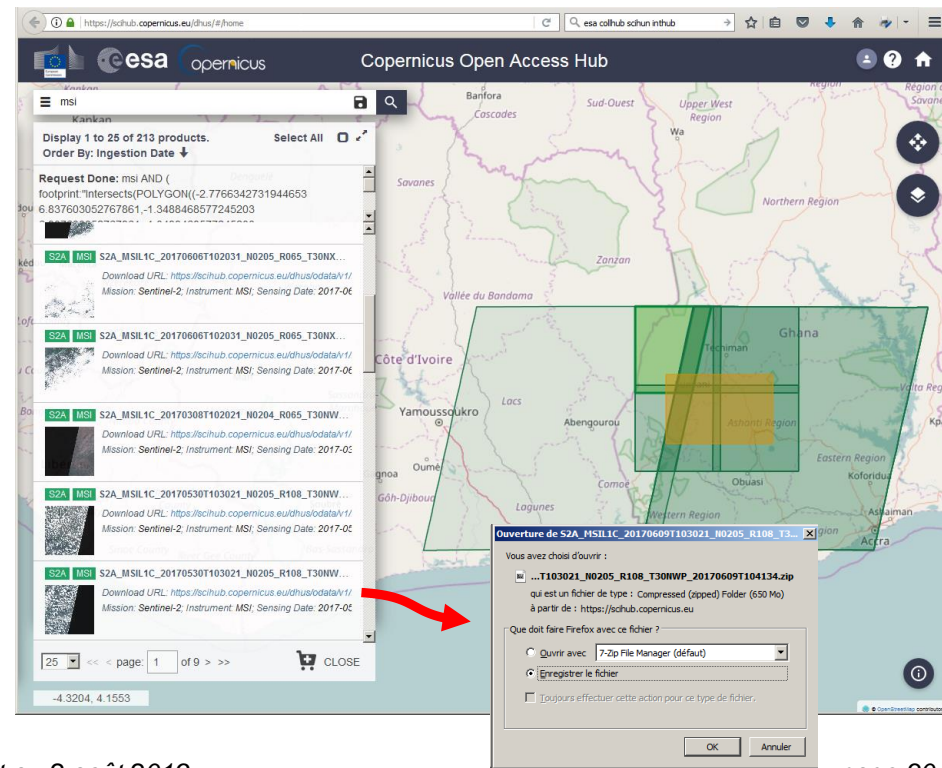


Copernicus Open Access Hub (COA)

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



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





Traitement d'images

Histogramme, stretching linéaire



➤ Histogramme

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

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

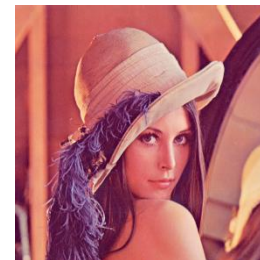
girl.r



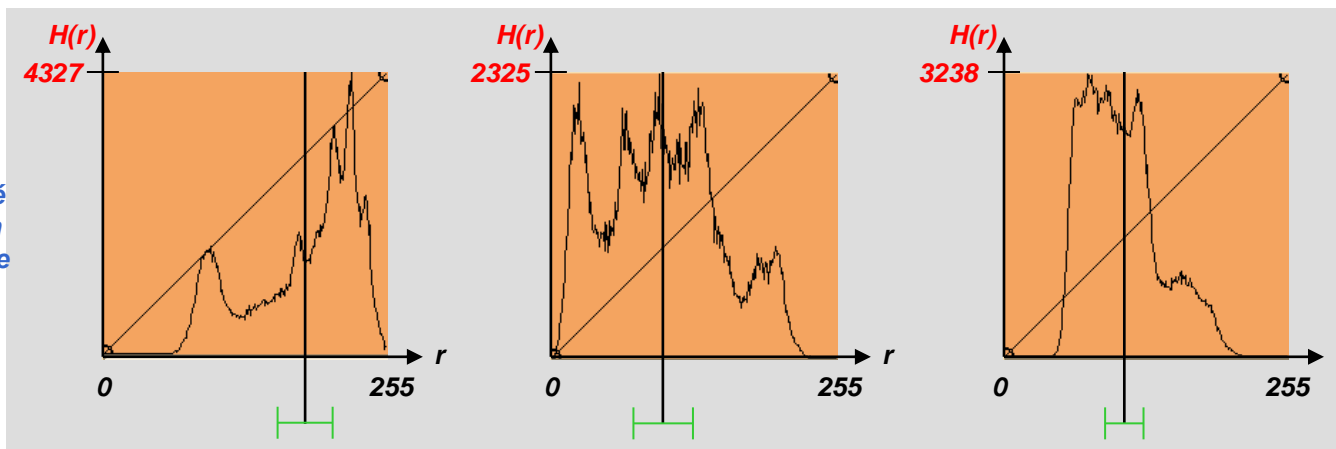
girl.g



girl.b



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



$m = 180,22$
 $\sigma = 49,05$

$m = 99,05$
 $\sigma = 52,88$

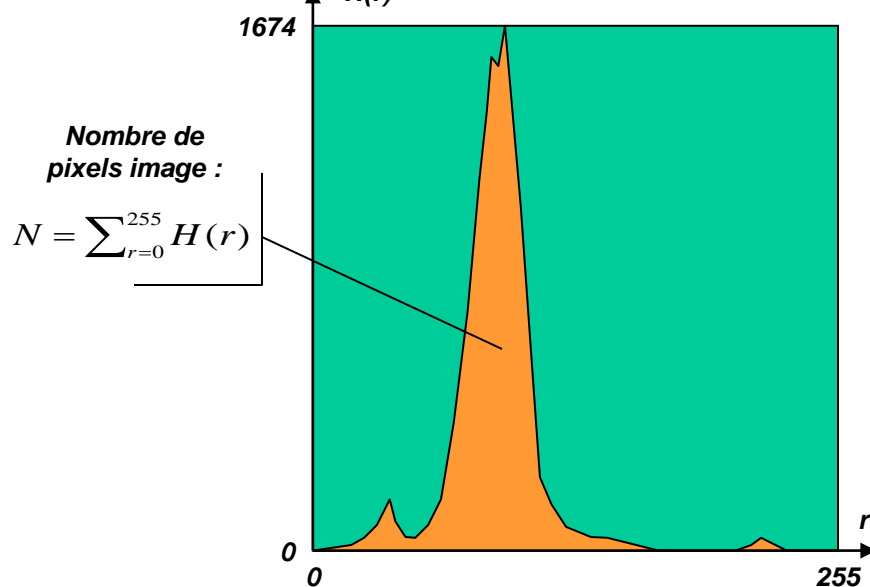
$m = 105,41$
 $\sigma = 34,06$



➤ Stretching linéaire automatique

Déterminer automatiquement les bornes a et b du stretching linéaire

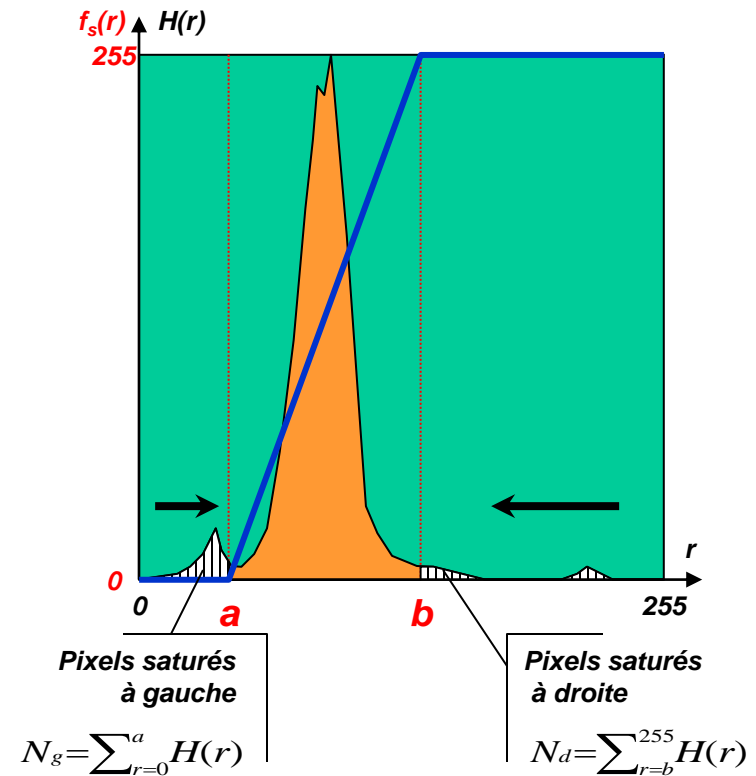
❑ Principe



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

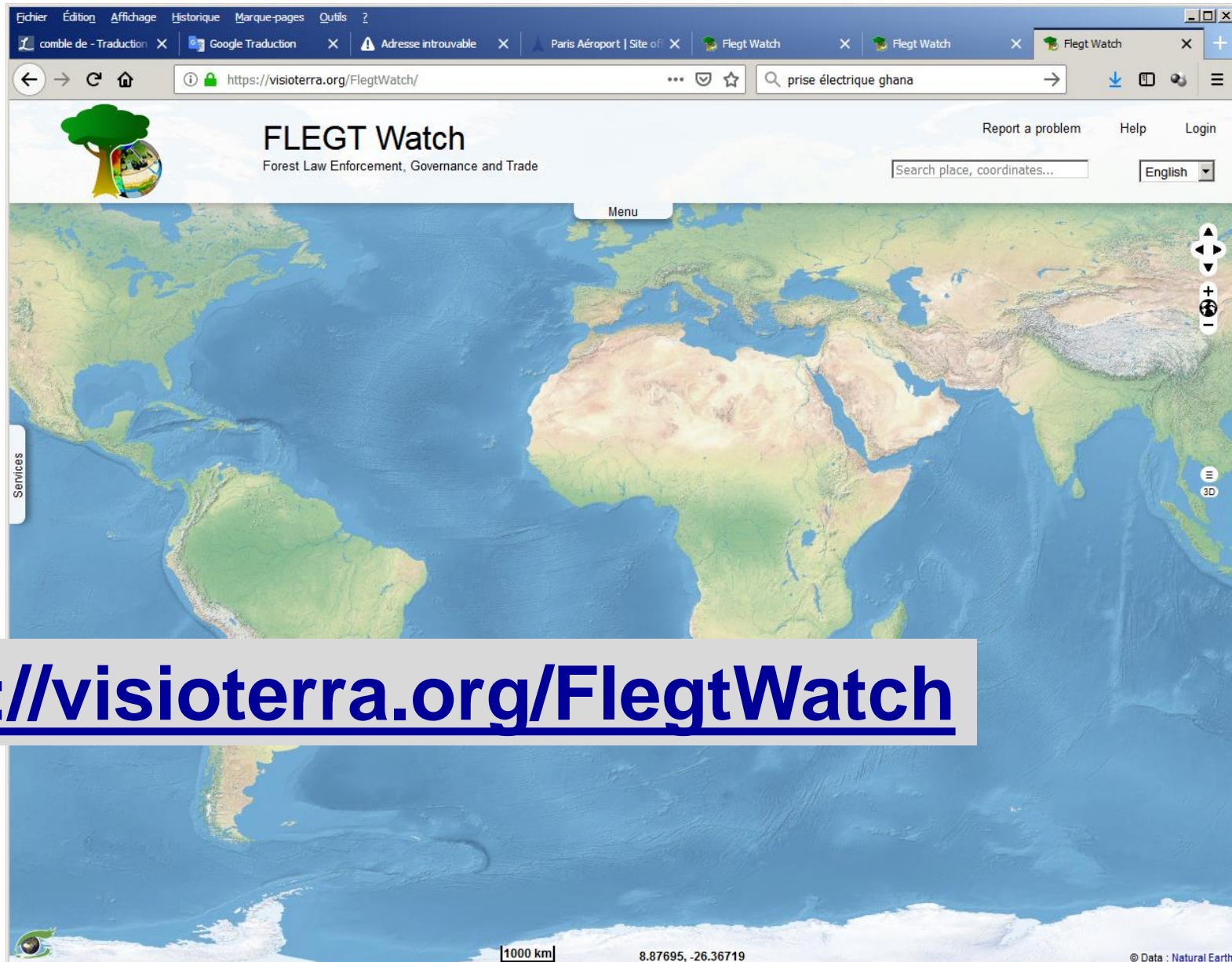


FLEGT Watch Web

Utilisation pas-à-pas



Launch FLEGT Watch (Web)



<https://visioterra.org/FlegtWatch>



Enter your e-mail and password

default value of password
for observers is “fw”

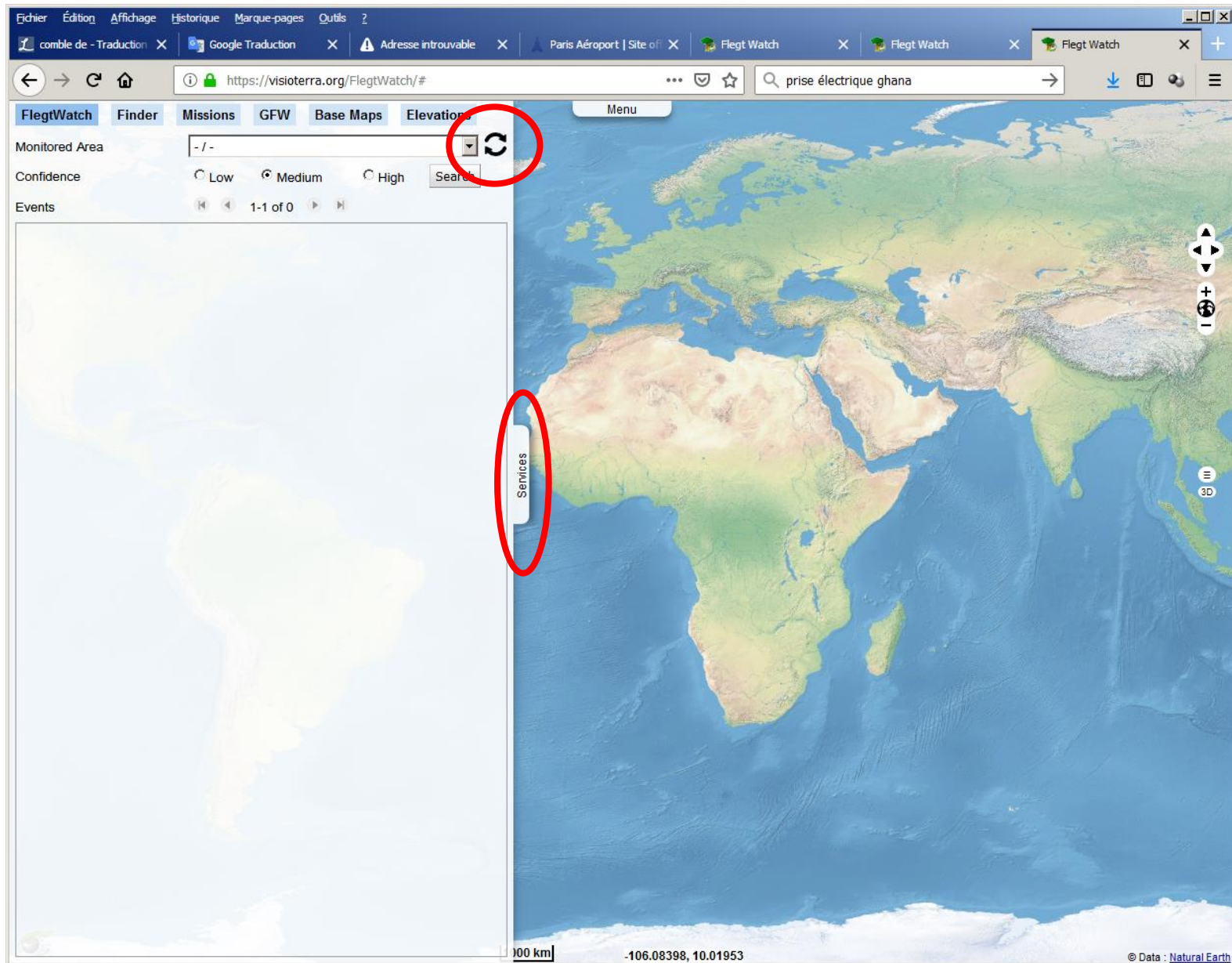


Check that you login has been accepted

The screenshot displays the FLEGT Watch web application interface. At the top, there is a navigation bar with the FLEGT Watch logo and the text "Forest Law Enforcement, Governance and Trade". A green notification box in the top right corner states "Login successfully". Below the navigation bar, there is a search bar with the text "prise électrique ghana" and a "Search place, coordinates..." button. The main content area features a world map with a "Menu" button and a "Services" sidebar. The map shows the continents of North America, South America, Africa, and Europe. A scale bar at the bottom indicates "1000 km". The coordinates "-22.76367, -13.53516" are displayed at the bottom center. The bottom right corner shows the copyright information "© Data : Natural Earth".



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





Select one of you monitored areas

Monitored Area

Confidence

Events

- 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
- Cameroon / 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

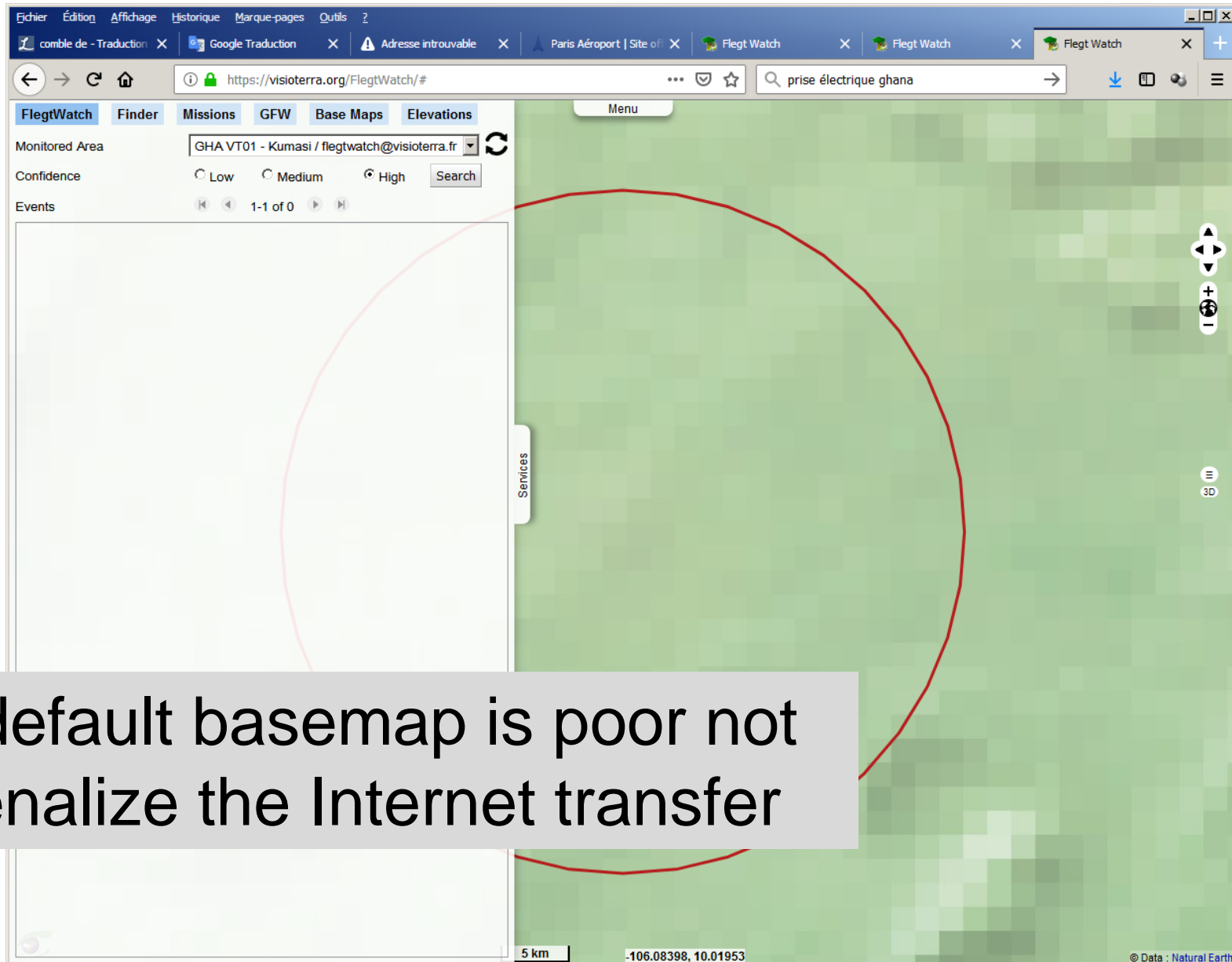
100 km

-106.08398, 10.01953

© Data : Natural Earth



You see the polygon of your monitored area



The default basemap is poor not to penalize the Internet transfer



Get the list of events – Medium confidence index

Flegt Watch | **Finder** | **Missions** | **GFW** | **Base Maps** | **Elevations**

Monitored Area:

Confidence: ☐ Low ☒ Medium ☐ High

Events: 1 of 11

Event #	Description	Date	Time	Action
#49980	Forest cover change	2019/03/17	18:17:40	<input type="checkbox"/>
#46432	Forest cover change	2019/02/27	18:18:24	<input type="checkbox"/>
#46328	Forest cover change	2019/02/21	18:17:40	<input type="checkbox"/>
#46308	Forest cover change	2019/02/21	18:17:40	<input type="checkbox"/>
#46305	Forest cover change	2019/02/21	18:17:40	<input type="checkbox"/>
#45775	Forest cover change	2019/01/16	18:17:41	<input type="checkbox"/>
#45438	Forest cover change	2018/12/23	18:17:42	<input type="checkbox"/>
#45262	Forest cover change	2018/12/11	18:17:42	<input type="checkbox"/>
#45158	Forest cover change	2018/10/18	18:18:27	<input type="checkbox"/>
#45157	Forest cover change	2018/10/18	18:18:27	<input type="checkbox"/>
#45037	Forest cover change	2018/09/30	18:17:43	<input type="checkbox"/>

5 km | -106.08398, 10.01953 | © Data : Natural Earth



Get the list of events – Low confidence index

Screenshot of the Flegt Watch web application interface. The browser address bar shows <https://visioterra.org/FlegtWatch/#>. The search bar contains "prise électrique ghana". The interface includes tabs for "FlegtWatch", "Finder", "Missions", "GFW", "Base Maps", and "Elevations". The "Monitored Area" dropdown is set to "GHA VT01 - Kumasi / flegtwatch@visioterra.fr". The "Confidence" filter is set to "Low", and the "Search" button is highlighted with a red circle. The "Events" list shows 25 of 2,322 events, all labeled "Forest cover change - 2019/04/04 18:18:24" and "GHA VT01 - Kumasi". The map on the right shows a satellite view of a forested area with a red circular boundary. The bottom status bar displays "5 km", coordinates "-106.08398, 10.01953", and "© Data : Natural Earth".

Event	Description	Date/Time	Location
#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



Select one event → GHA VT01 / #50900

**Radar Sentinel-1B
observed on
29.03.2019
18:17:42 CET**

Event #50900 - Forest cover change
2019/03/29 18:17 - Now

Event #50915 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50914 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50904 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50903 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50902 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50901 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50900 GHA VT01 - Kumasi
Event Forest cover change - 2019/03/29 18:17:40
Event #50899 GHA VT01 - Kumasi

Monitored Area: GHA VT01 - Kumasi / flegtwatch@visioterra.fr
Confidence: Low Medium High
Events: 101-125 of 2,322

Services

Menu

00 m 1.50506, 6.74912

© Data - Natural Earth



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

Screenshot of the Flegt Watch web application interface. The browser address bar shows <https://visioterra.org/FlegtWatch/#>. The interface includes a menu bar with options like 'Fichier', 'Édition', 'Affichage', 'Historique', 'Marque-pages', 'Outils', and 'Flegt Watch'. The main content area displays a satellite map of a forested area with a yellow outline indicating a specific region. A sidebar on the left lists events, with the following details:

Event	Description	Date/Time
#50915	GHA VT01 - Kumasi	
Event #50914	Forest cover change - 2019/03/29 18:17:40	
Event #50913	GHA VT01 - Kumasi	
Event #50912	Forest cover change - 2019/03/29 18:17:40	
Event #50911	GHA VT01 - Kumasi	
Event #50910	Forest cover change - 2019/03/29 18:17:40	
Event #50909	GHA VT01 - Kumasi	
Event #50908	Forest cover change - 2019/03/29 18:17:40	
Event #50907	GHA VT01 - Kumasi	
Event #50906	Forest cover change - 2019/03/29 18:17:40	
Event #50905	GHA VT01 - Kumasi	
Event #50904	Forest cover change - 2019/03/29 18:17:40	
Event #50903	GHA VT01 - Kumasi	
Event #50902	Forest cover change - 2019/03/29 18:17:40	
Event #50901	GHA VT01 - Kumasi	
Event #50900	Forest cover change - 2019/03/29 18:17:40	
Event #50899	GHA VT01 - Kumasi	

The event #50900 is highlighted in blue. A pop-up window for 'Event #50900 - Forest cover change' is visible, showing a date range of '2019/03/29 18:17 - Before'. Navigation arrows (left and right) are highlighted with red circles. The map shows a dense forest with a yellow outline indicating a specific region. The interface also includes a 'Monitored Area' dropdown menu, 'Confidence' settings (Low, Medium, High), and a 'Search' button. The bottom of the map displays coordinates: -1.49721, 6.73694.



You may use the layer stack

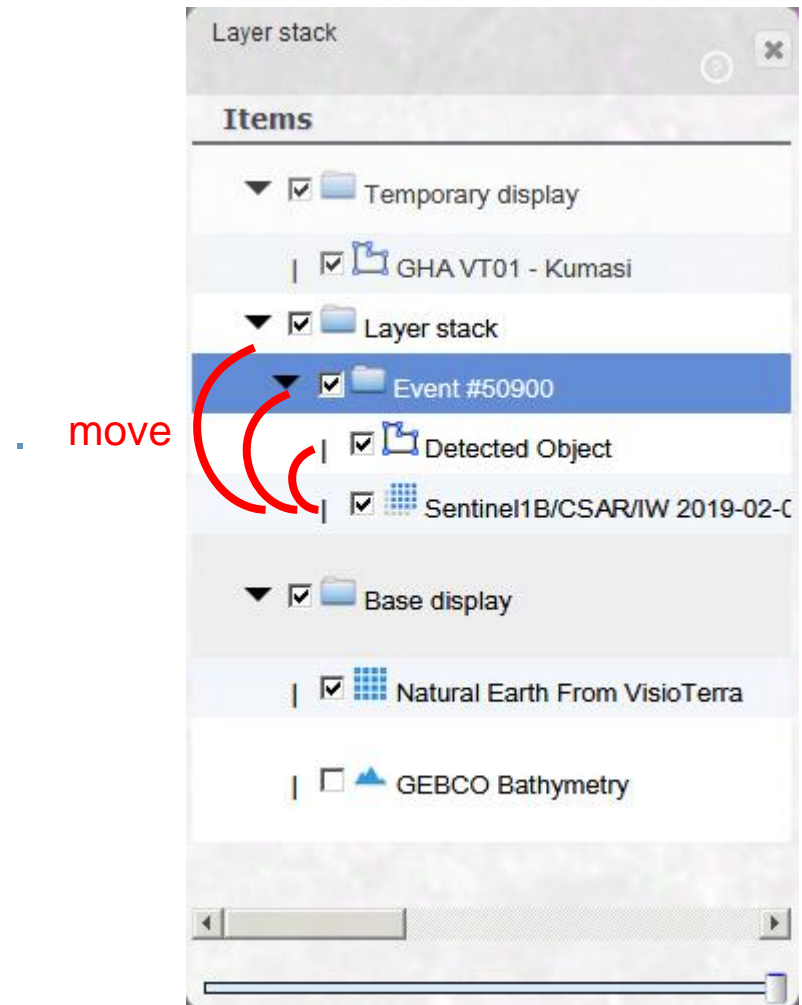
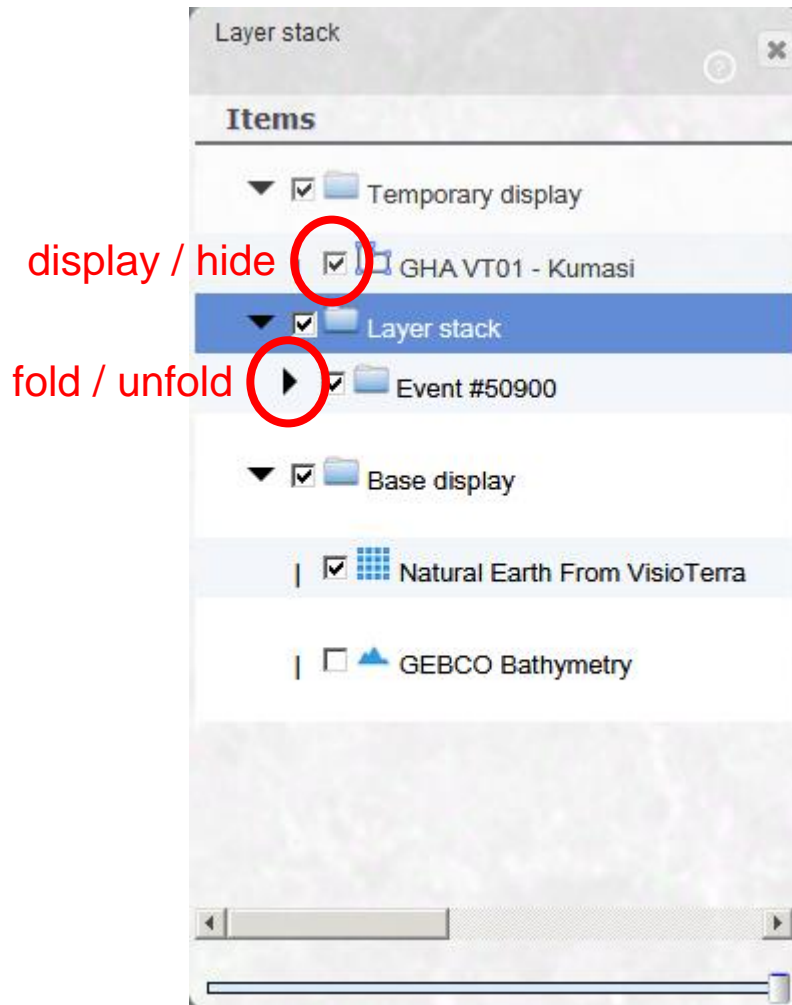
The screenshot shows the Flegt Watch web application interface. The top navigation bar includes tabs for 'Fichier', 'Édition', 'Affichage', 'Historique', 'Marque-pages', and 'Outils'. The main interface is divided into several sections:

- Monitored Area:** A dropdown menu showing 'GHA VT01 - Kumasi / flegtwatch@visioterra.fr'.
- Confidence:** Radio buttons for 'Low', 'Medium', and 'High'.
- Events:** A list of events with checkboxes. The selected event is #50900, 'Forest cover change - 2019/03/29 18:17:40'.
- Map:** A satellite map showing forest cover change events. A yellow outline highlights a specific area on the map.
- Layer stack:** A panel on the right showing the current layers. The layers are: 'Temporary display', 'GHA VT01 - Kumasi', 'Layer stack' (selected), 'Event #50900', 'Base display', 'Natural Earth From VisioTerra', and 'GEBCO Bathymetry'.
- Event #50900 - Forest cover change:** A pop-up window showing the event details, including a date and time selector.

A red box highlights the '3D' button in the top right corner, and another red box highlights the '3D' button in the layer stack panel.

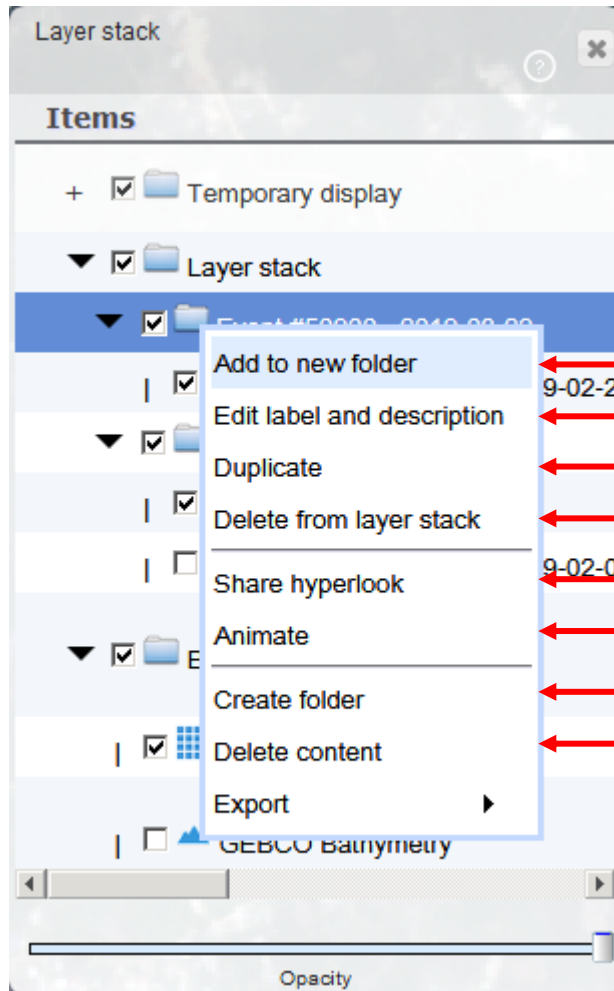


Handle items in a layer stack





Handle items in a layer stack (2)



Add to new folder

Edit label and description

Duplicate

Delete from layer stack

Share hyperlook

Animate

Create folder

Delete content



Change basemap - OpenStreetMap

The screenshot displays the Flegt Watch web application interface. The browser address bar shows the URL <https://visiorterra.org/FlegtWatch/#>. The application has a top navigation bar with tabs: FlegtWatch, Finder, Missions, GFW, Base Maps, and Elevations. The 'Base Maps' tab is active, showing a sidebar with various map options. Under 'Background Maps', the 'OpenStreetMap' option is highlighted with a red rectangle. Other options include VMap0 (OSGeo), Blue Marble (NASA), Landsat-7 (NASA), OpenStreetMap (Terrestris), OSM Humanitarian, Bing Map (Microsoft), and Bing Map Road (Microsoft). Under 'Overlay Maps', there is an option for 'Custom WMS source'. The main map area shows a street view of a city with a yellow outline of a building. A 'Layer stack' panel is open on the right, listing various layers: Temporary display, GHV VT01 - Kumasi, Layer stack, Event #50900, Detected Object, Sentinel1B/CSAR/IW 2019-02-0, Base display, OpenStreetMap, and GECBO Bathymetry. The 'OpenStreetMap' layer is currently selected. A 'Services' panel is also visible on the left side of the map. At the bottom, there is a status bar showing coordinates (-1.51382, 6.75037) and a scale bar (00 m). The bottom right corner of the map area shows the text '© Data : OpenStreetMap'.



Change basemap (2) – Bing map

Browser window showing the Flegt Watch application interface. The main map displays a satellite view of a forested area with a yellow lightning bolt icon. The left sidebar shows the 'Background Maps' section with a red box highlighting the 'Bing Map (Microsoft)' option. The 'Layer stack' panel on the right lists various layers, including 'Temporary display', 'GHA VT01 - Kumasi', 'Layer stack', 'Event #50900', 'Detected Object', 'Sentinel1B/CSAR/IW 2019-02-0', 'Base display', 'Bing Map (Microsoft)', and 'GECBO Bathymetry'. The bottom status bar indicates the event details: 'Event #50900 - Forest cover change' and the date '2019/03/29 18:17 - Before'.



Characterise the land cover

degraded forest
or agroforestry ?



Getting other data – 1. Define your area of interest

The screenshot shows the Flegt Watch web application interface. The 'Finder' tab is active, displaying search parameters for an Area of Interest (AOI). The 'Area of interest (AOI)' checkbox is checked. The search parameters include a date range from 2019-02-01 to 2019-04-07, a status of 'Ready', and a dataset of 'S2A_MSI ; S2A_MSI_L2A ; S2B_MSI'. A red circle on the satellite map indicates the defined AOI. A toolbar with four icons (globe, up arrow, menu, and diagonal arrow) is shown with red arrows pointing to them from the text 'From screen extents', 'From layer stack', 'From external file', and 'From the map'. A 'Select a layerstack item' dialog box is open, showing 'GHA VT01 - Kumasi' as the selected item.

From screen extents

From layer stack

From external file

From the map



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

The screenshot shows the Flegt Watch web application interface. The browser address bar displays <https://visioterra.org/FlegtWatch/#>. The search bar contains the text "prise électrique ghana". The left sidebar contains the following settings:

- FlegtWatch** (selected)
- Finder** (selected)
- Missions**
- GFW**
- Base Maps**
- Elevations**

Filters and settings on the left:

- ☒ Area of interest (AOI)
- ☐ Minimum overlay (%)
- ☒ **Date start** (highlighted with a red box)
- ☐ Date stop
- ☐ Status
- Dataset: [Empty field]
- ☐ Cloud Cover: 25
- Limit: 100
- Search button

The main map area shows a satellite view of a forested region. A large yellow circle indicates the search area. A smaller yellow rectangle highlights a specific point of interest within the circle. The bottom of the interface includes a status bar with "Search cancelled", a "Settings" link, a "Clear temporary display" link, a "Help" link, a scale bar (5 km), and coordinates (-1.59971, 6.77169). The bottom right corner shows "© Data - Bing Maps".



Getting other data – 3. Define dataset(s)

The screenshot shows the VisioTerra FlegtWatch web application. The 'Dataset' dropdown menu is open, displaying a tree structure of data sources. The 'ESA' folder is expanded, showing 'Sentinel1A', 'Sentinel1B', 'Sentinel2A', and 'Sentinel2B'. Under 'Sentinel2A' and 'Sentinel2B', the 'MSI' (MultiSpectral Image) option is selected. The main map area displays a satellite image of a forested region with a yellow circle and a yellow rectangle highlighting a specific location. The interface includes various tabs like 'Missions', 'GFW', 'Base Maps', and 'Elevations', and a search bar at the top.

Select
Sentinel-2
optical
data



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 displays the Flegt Watch web application interface. The main window shows a satellite map of a forested area with a yellow circle indicating the search area. A search results dialog box is open, showing 'Found 7 result(s) for Sentinel2A/MSI' and 'Found 7 result(s) for Sentinel2B/MSI'. The 'Continue' button is highlighted with a red circle and the number 3.

The search settings panel on the left includes the following fields:

- Area of interest (AOI):** Temporary Geomet
- Minimum overlay (%):** (empty)
- Date start:** 2019-02-01
- Date stop:** 2019-04-07
- Status:** Ready
- Dataset:** S2A_MSI ; S2B_MSI
- Cloud Cover:** 25
- Limit:** 100 (highlighted with a red circle and the number 1)
- Search:** (highlighted with a red circle and the number 2)

The search results dialog box shows:

- Search result
- Found 7 result(s) for Sentinel2A/MSI
- Found 7 result(s) for Sentinel2B/MSI
- Buttons: Cancel, Continue (highlighted with a red circle and the number 3)



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

Fichier Édition Affichage Historique Marque-pages Outils ?

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

https://visioterra.org/FlegtWatch/# prise électrique ghana

FlegtWatch Finder Missions GFW Base Maps Elevations

☒ Area of interest (AOI)
☐ Minimum overlay (%)
☒ Date start
☐ Date stop
☐ Status
Dataset
☐ Cloud Cover
Limit

Temporary Geomet
2019-02-01 00:00:00
2019-04-07 23:59:59
Ready
S2A_MSI ; S2B_MSI
25
100

Search

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%

Settings Clear temporary display Help

Menu

Services

100 km

20 km -1.56950, 6.39060 © Data - Bing Maps



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

The screenshot shows the Flegt Watch web application interface. A list of datasets is displayed on the left, with a context menu open over one of the rows. The context menu options are: "Add to layer stack", "Get information", "Focus on product", and "Prepare data". A red arrow points from the "Get information" option to the product information modal that is open in the center of the screen.

The product information modal displays the following details:

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%
Insertion date	2019/02/01 16:39:02
Processing status	Unprocessed
DHuS Ingestion date	2019/02/01 15:44:14
DHuS product link	\$value
DHuS download link	https://scihub.copernicus.eu/dhus/odata/v1/Products('afcd0df5-7c5f-48bc-bccc-7200086df0cb')/\$value

The background of the application shows a satellite map of a coastal area with a yellow circle indicating the location of the selected product. The bottom of the screen displays a scale bar (20 km) and coordinates (-0.98722, 6.96464).



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 web application interface. The browser address bar displays <https://visioterra.org/FlegtWatch/#>. The interface includes a top navigation bar with tabs: FlegtWatch, Finder, Missions, GFW, Base Maps, and Elevations. The 'Finder' tab is active, showing a list of products with columns for S, Dataset, Date, and Properties. A table of products is displayed below the filters.

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%

Annotations on the screenshot:

- 1**: A red circle highlights the 'Settings' link at the bottom left of the interface.
- 2**: A red rectangle highlights the 'Show thumbnail' dropdown menu, which is set to 'In a window'.
- 3**: A red circle highlights the 'Thumbnail' button in the top right corner of the map view.



Merci de votre attention.
Thank you for your attention.

Questions ?



VisioTerra

Serge RIAZANOFF

Director

serge.riazanoff@visioterra.fr

www.visioterra.fr