THE SPACE FOR CLIMATE OBSERVATORY (SCO)

The SCO: an international initiative that uses satellite data for climate change mitigation and adaptation

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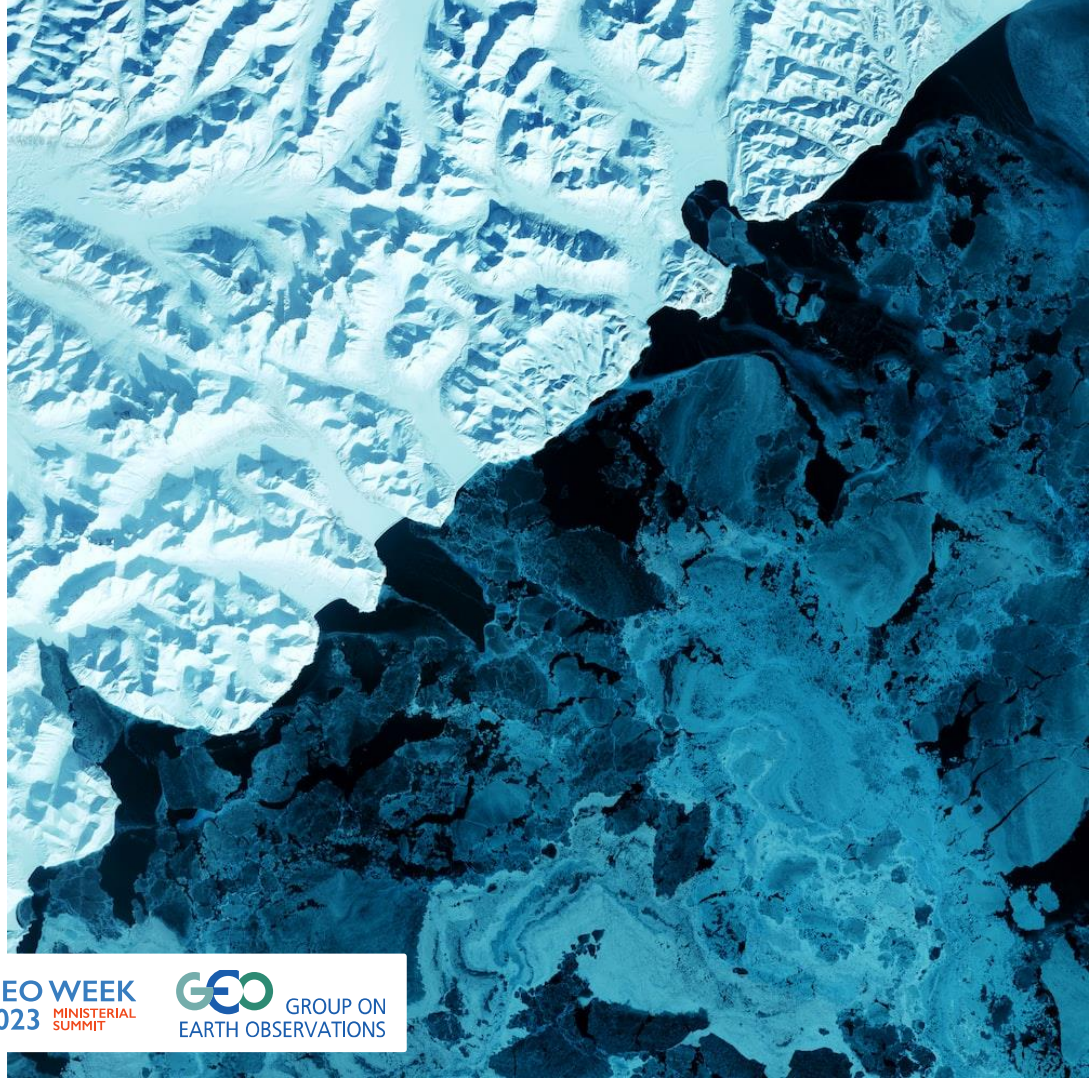


science & innovation
Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

GEO WEEK 2023 MINISTERIAL SUMMIT

GEO GROUP ON EARTH OBSERVATIONS

THE SCO INTERNATIONAL ALLIANCE

SCO INTERNATIONAL OBJECTIVES

- Provide **operational tools (SCO projects) and studies to help decision-makers to adapt to climate change**.
- **Foster cooperation around these applications** to favour their reuse and communicate on them
- **Build a network for space agencies and public and private entities** involved in the use of EO data for operational climate action

44 SIGNATORIES

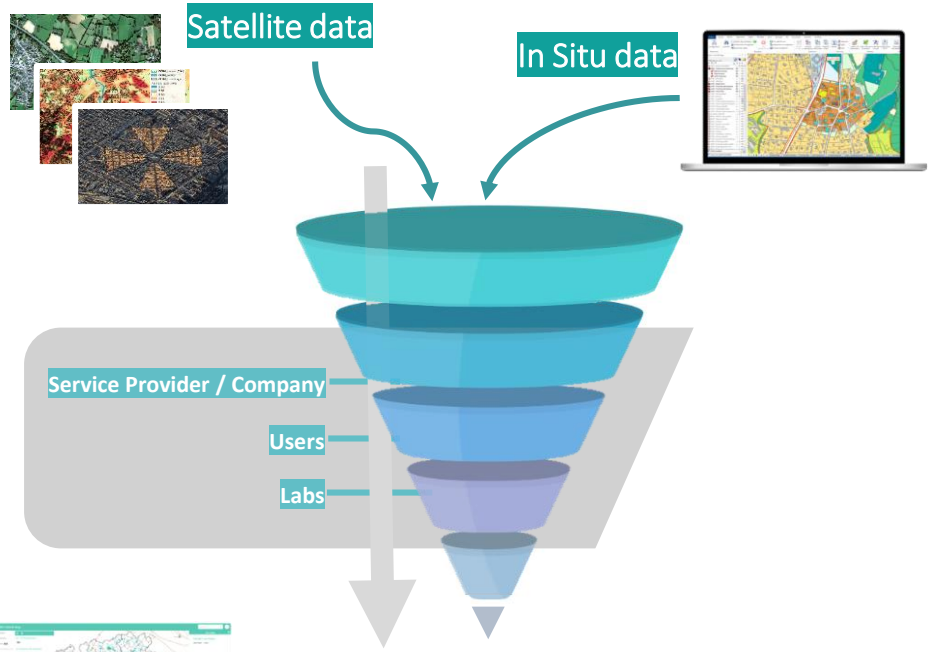
Charter on the establishment of the SCO

entry into force on 1st Sept. 2022

SCO USE CASE APPROACH AND OVERVIEW OF MAJOR STAKEHOLDERS INVOLVED

SCO PROJECTS CRITERIA

- **Addressing the needs of end users** within a specific geographic area;
- **Proposing operational and practical software(s)**;
- **Making the best use of available** satellite, environmental, climate, in situ and socio-economic **data**, at a resolution adapted to the problem;
- **Building on** (pre-)operational and research **infrastructures**, services and local data provision;
- **Having a** built-in **potential for extending** to several geographic areas.



SCO PROJECT

- Operational Climate Service in 2 years
- Prototype
- State-of-the-art technology
- Scientific content
- Private and public consortia


FRANCE
ADOPT Occitanie
Aleofeu Occitanie, Aude
Eagle Hedges Occitanie
EduSCO Occitanie
EO4AgriWater Occitanie, Gers
FLAude Occitanie, Aude
FloodDAM DT Garonne river
LITTOSAT Bretagne
Littoscope Occitanie, Hérault
MEO-Climate Occitanie, Gers
Migr-Safe Nouvelle-Aquitaine
Pleiades4UrbanFlood Occitanie
XtremQuality Southwest
Quantice Occitanie
SCO FrichesAgricoles Occitanie
SPACE4Irrig Occitanie, Tarn
Thermocity Occitanie, Toulouse
FRANCE
AEROLAB SPACE France
ALTELYS Rennes
BOSCO Bretagne
City Explorer Paris
C-Monitor France
EO4AgriWater Alsace
EO4InterTopo Normandie
Green Urban Sat Grand-Est, Nancy
SatLCZ Hauts-de-France, Lille
Thermocity Grand Est, Strasbourg
SWEDEN
HEMSCA South coast / Baltic sea
SFI Lakes Mälaren, Vänern and Vättan
THE NETHERLANDS
EO4Wetlands - Hedwige-Prosperpolder
ROMANIA
GreenSpace Bucarest
INDIA
BanD-SOS - Bengal delta
PODCAST-Demo
StockWater
CHINA
HABITAT Yangtze - Anhui
OpenGCS - Bassin de Ganshui
FRANCE
AlonWetlands Mediterranean Sea
EDISON PACA, Nice
EO4Mountain-Pastoralism PACA, Marcantour
ORION Alpes, Mont-Blanc
Sat4BDNB Major Cities
SCOLive PACA, Côte d'Azur
Space4Irrig PACA
Thermocity PACA, Marseille
USA
FloodDAM DT - Mississippi river
MEXICO
MexiCorn - Huamantla
HAITI
Gade Lapli
WEST INDIES
Arbocarto-V2
Mangroves
SaSAM
SPAIN
FloodDAM - Ebro delta
GreenSpace - Valence
MOROCCO
AssurAgri
IRRISAT
FRENCH GUIANA
OpHySE
AMAZONIA
AMSudSAT
TropiSCO
POLYNESIA
TAHATAI - France
BRAZIL
ALTELYS - Sao Paulo
BanD-SOS - Amazon delta
Chove-Chuva - Mato Grosso
XtremQuality
WEST AFRICA
AirCrowd Africa - Benin, Ivory Coast
OSS Saint Louis - Senegal
SAFARI - Niger
StockWater - Burkina Faso
WACA-VAR - Ghana, Nigeria, Cameroon
GABON
TropiSCO AFRICA
RWANDA
GeoHaTACC
AFRICA
ECLAT - Lake Chad region
MYANMAR
ClimHealth - Yangon
THAILAND
SatLCZ - Bangkok
VIETNAM
Vimesco-Rice - Mekong delta
Viet-ARRO
SOUTH-EAST ASIA
TropiSCO - Cambodia-Laos-Vietnam
LA REUNION
Arbocarto-V2
BioEOS
MADAGASCAR
Cimcopolee
FloodDAM - Betsiboka river
Mangroves
AUSTRALIA
Monitoring the Gold Coast
NEW CALEDONIA
EO4DroughtMonitoring
EO4AgriWater
KERGUELEN - CROZET
Cartovege - France
ADAPTING OUR SOCIETIES TO THE IMPACTS OF CLIMATE CHANGE
SCO
SPACE FOR CLIMATE OBSERVATORY
71 projects
42 members
June 2023
Agriculture - Biodiversity - Carbon - Forest fires
Coastal areas - Education - Extreme meteo
Forests - Health - Land use - Natural disaster response
Rural - Urban areas - Water management areas

THE SCO DIGITAL TOOLBOX

[Tools | Space Climate Observatory]

BandSOS Platform

Forecasting cyclonic coastal flooding

Tested in the Bengal delta, the Band-SOS demonstrator is a pre-operational service for a coastal flood forecasting platform based on multispectral satellite images (Copernicus Sentinel-2). In operation since January 2023, the tool is used daily by the Bangladesh Flood Forecasting and Warning Center (FFWC).

Band-SOS provides **a real-time forecast of the risk of flooding** when a tropical cyclone strikes the coastline, **coupled with a map of the vulnerability of populations at risk**.

Free access

See the BandSOS platform → | See project →

Chove-Chuva

Monitoring territorial dynamics

Developed in the Mato-Grosso region (Brazilian Amazon), the Chove-Chuva demonstrator offers a map-based summary of the territorial dynamics observed in relation to the adaptation and mitigation strategies put in place.

Using multisource data, the tool can produce a **'dashboard' of the territorial situation for an area predefined by a user, based on synthetic indicators** covering 4 major themes: **climate** (rainfall), **forest cover**, **water** (hydrology) and **agriculture** (surface area and practices).

Free access

See the Chove-Chuva demonstrator → | See project →

BOSCO

Satellite surface soil moisture

Developed in Brittany, where geology makes water supply dependent on surface water, BOSCO lays the foundations for a spatial observatory of soil water content.

The interface displays three key pieces of information at **very high spatial resolution (plot) and temporal resolution (2-3 days)**, which are crucial for farmers and water managers: **surface moisture** (first 5 cm of soil), **root water content** (one metre deep) and **recharge** (or water flow) towards the water table.

Free access

See the BOSCO demonstrator → | See project →

SAGUI

Hydrometeorological monitoring and forecasting

Operational in French Guiana since June 2023, the SAGUI platform offers a hydrological forecasting service based on space altimetry data to **monitor river conditions in real time** and help with navigability.

In this interface, the fruit of the OpHySE project, the results are displayed on a global map with a coloured representation of the state of the rivers (flows and flow anomalies - i.e. deviations from normal), and several navigation tabs provide differentiated views of the **hydro-meteorological indicators flow, rain and air quality.**

Free access

See the SAGUI platform → | See project →

TropiSCO

Monitoring tropical deforestation

The Tropisco platform provides a near-real-time view of tropical deforestation from 2018 to the present day. Its **maps** of forest cover loss are **updated every 6 to 12 days** using radar images from the Copernicus Sentinel-1 satellite.

Aiming for global coverage, Tropisco currently monitors the forests of 7 countries (French Guiana, Suriname, Guyana, Gabon, Vietnam, Laos and Cambodia), which were used to develop the tool.

Free access

See the TropiSCO platform → | See project →

THE SCO INTERNATIONAL EVENTS

COP27 Sharm el Sheikh

COP27 : Mobilizing New space solutions for Climate actions

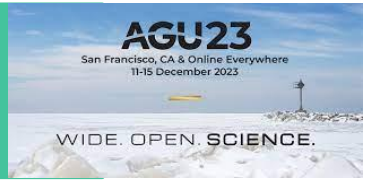
COP 28 : Operating early warning Earth-Observations based systems: from Methane emissions to natural disasters

IGARSS 2023 & 2024

IAC Paris 2022

High level Discussions France/USA

AGU 2023



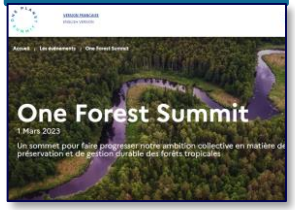
11th Stc IAF GLOC 2023

12th Stc SCO IAC 2023

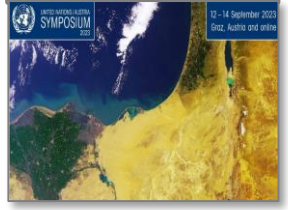
International call for Projects

UNEP High Level Expert Group Meeting – Towards a Big Data Revolution for the Planet

One Forest Summit 2023



UN/Austria Symposium



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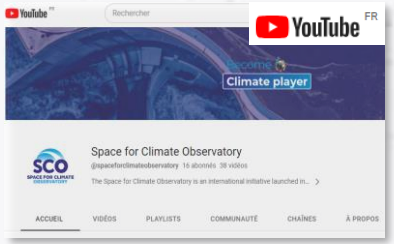
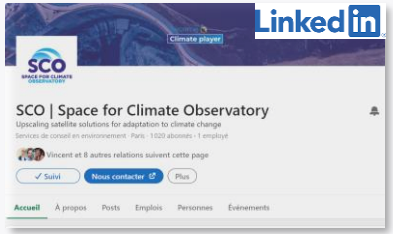




Monthly NEWSLETTER

An online mapping tool for natural risk management in Madagascar: **the Cimopolée project**

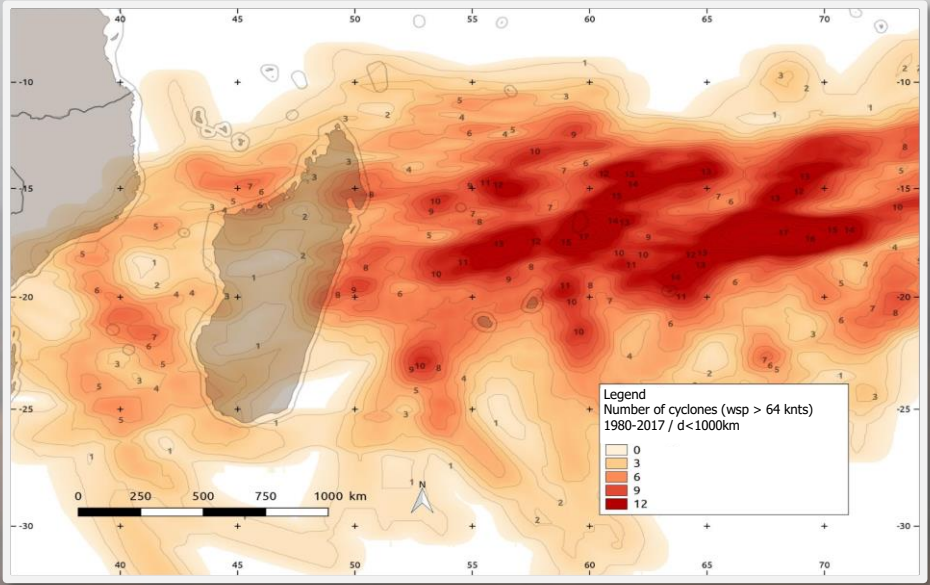
[1] **RAKOTOMANDRINDRA Pascal Fetra Nirina** (prakotomandrindra@gmail.com)

[2] **VEILLON Florent** (florent.veillon@ird.fr)

[1] **BNGRC** (Malagasy National Office for Disaster and Risks Management)
[2] **UMR EspaceDev - IRD** (French National Research Institute for Sustainable Development)

Madagascar and natural hazards

- Madagascar is located in the zone of cyclogenesis and the passage of cyclones
- Impacts : floods, destroyed houses, landslides… ⇒ population
- Activities impacted : food, agriculture, education, health…



Flood after the cyclone Freddy 2023, District of Vohipeno

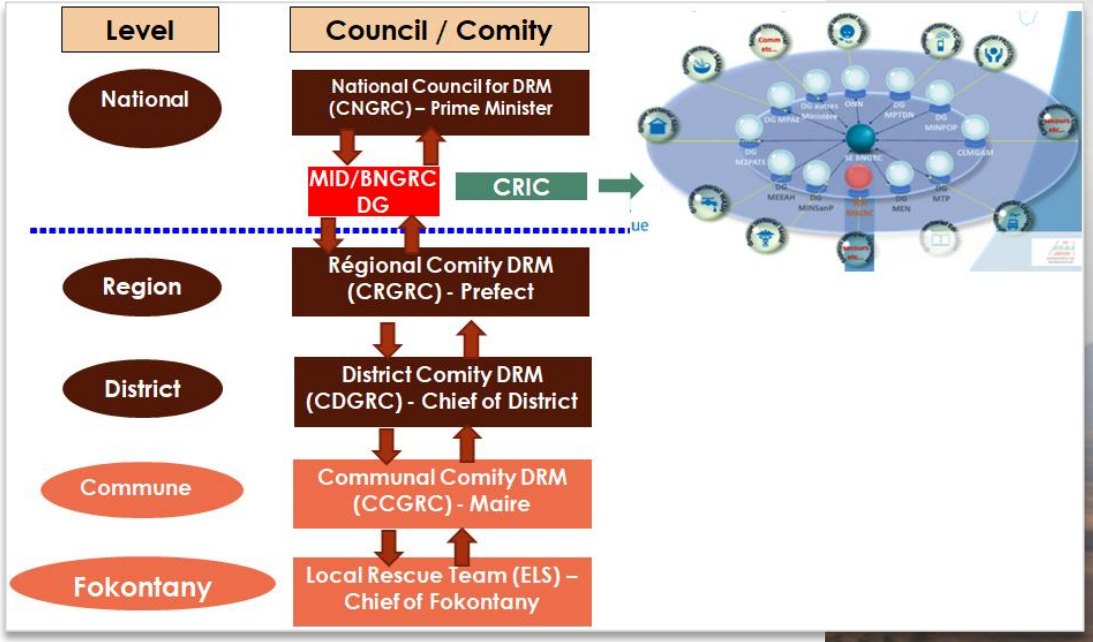
Destroyed houses after the cyclone Batsirai 2022
District of Mananjary

National Office for Disaster and Risks Management (BNGRC)

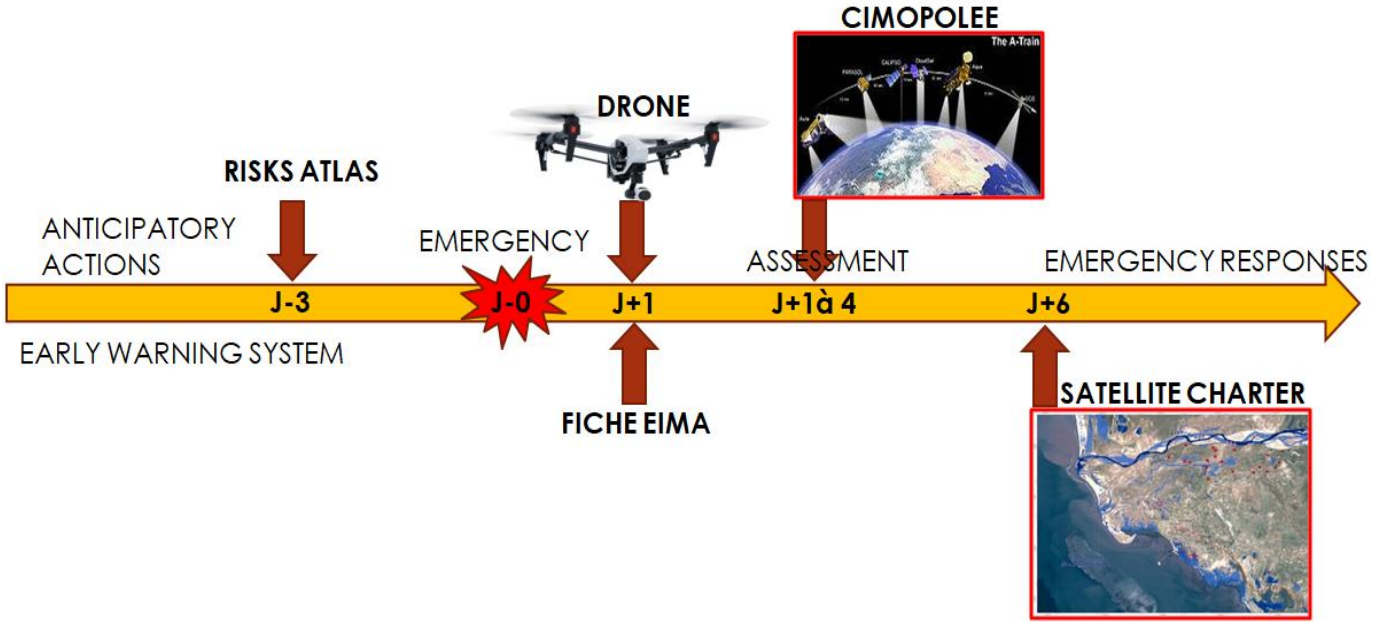
BNGRC: General Directorate of the Ministry of the Interior and Decentralization
Public institution mandated to coordinate all operational DRM and DRR activities in Madagascar

Food distribution after the CYCLONE FREDDY 2023, District of VOHIPENO

Institutional Mechanism

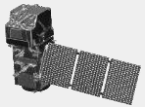


Activities around the emergnecy



Developed tools

Sentinel-2

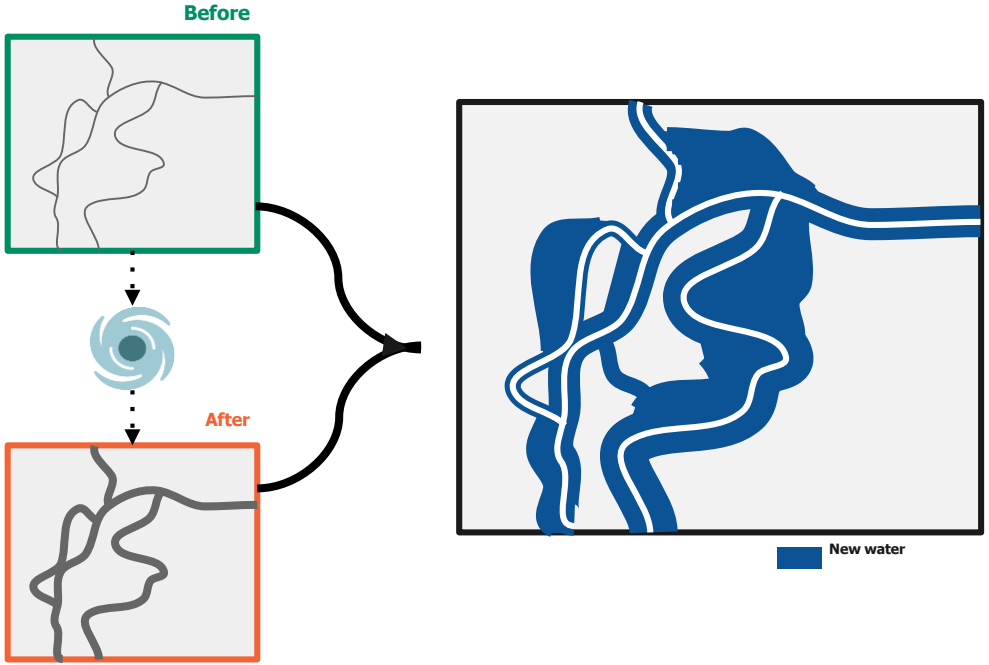


Sen2Chain [1]
Sen2Change [1]

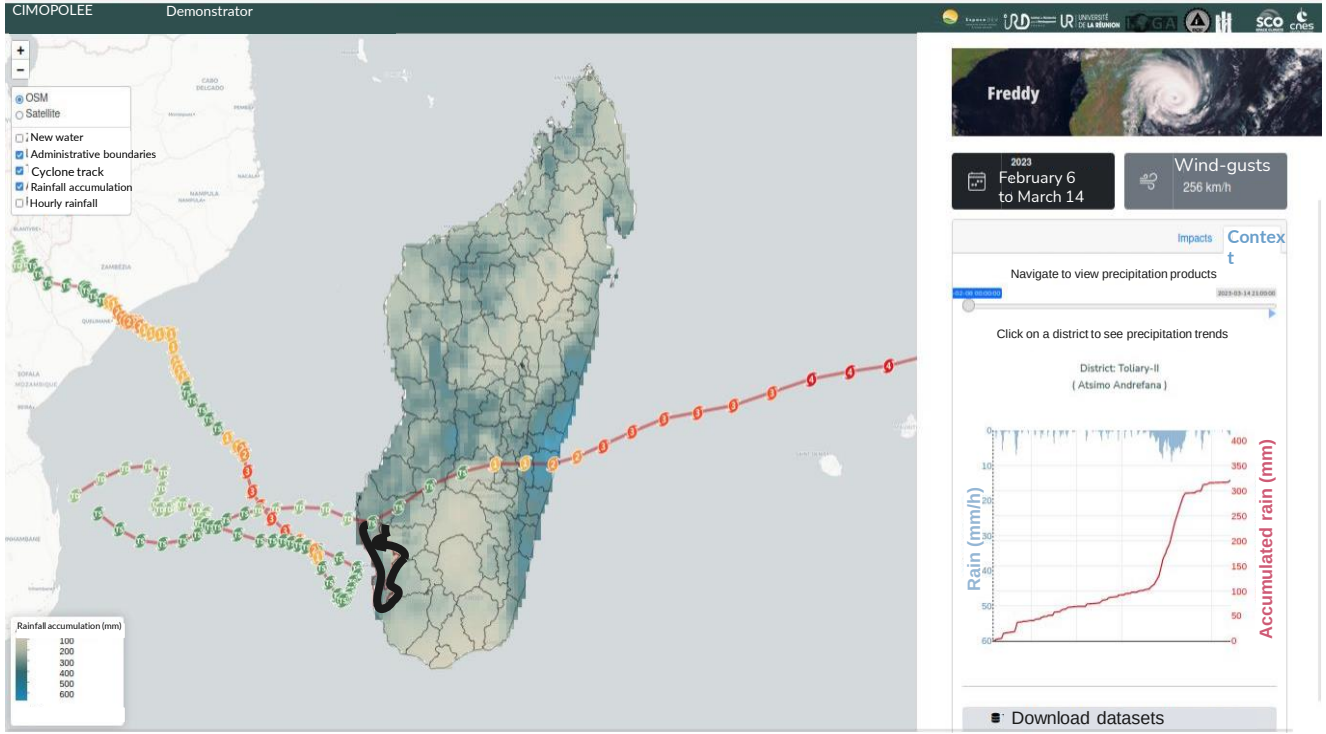
Sentinel-1

S1Chain [2]

1 - Mouquet, P and al ., 2020
2 - Alexandre, C and al ., 2020



Results/Deliverables (in development)



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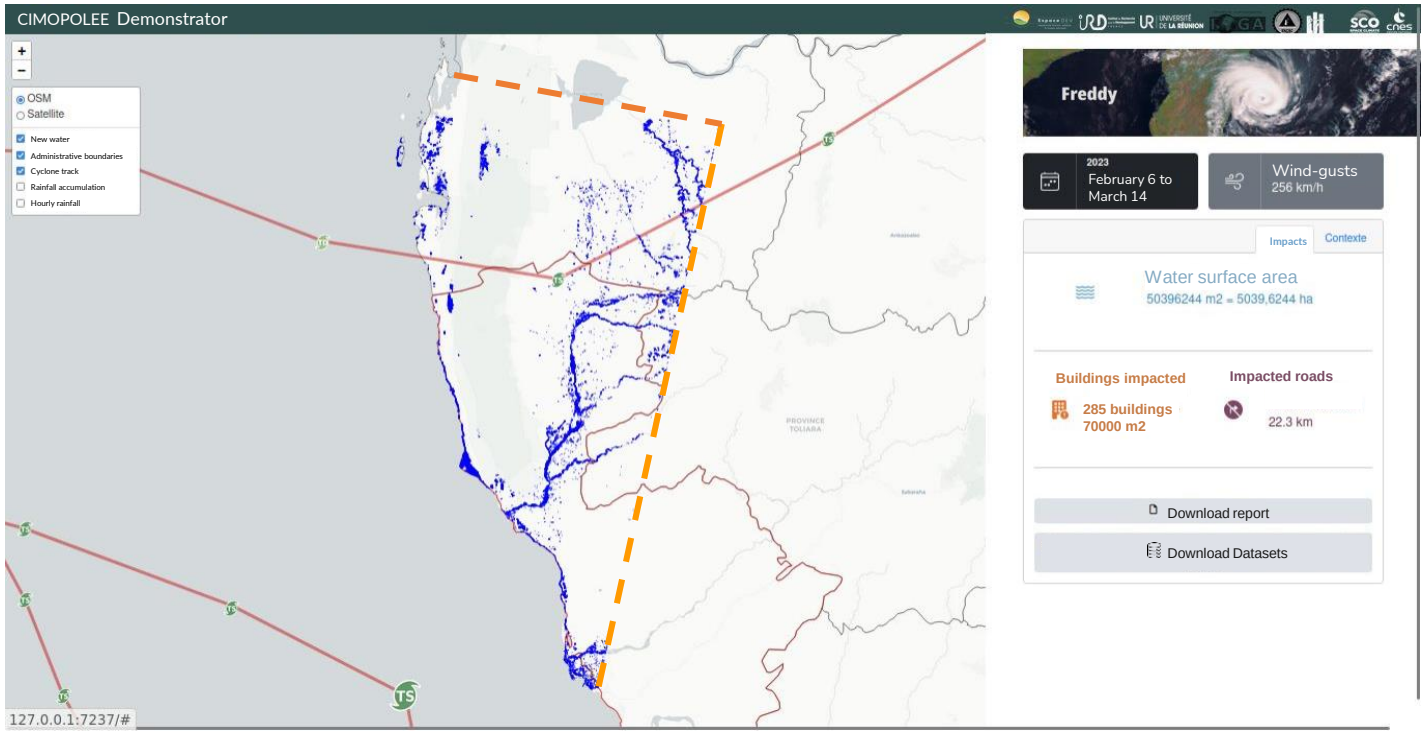


Links with local partners

- Historical links between partners
- 2 Worskshops since the end of 2022 (Reunion island and Madagascar)
- Collect the needs of future users (BNGRC)
- **Final workshop in 2024 march/april**

Project members

Révillion Christophe (Engineer - University of Reunion Island - UMR EspaceDev)

Pennober Gwenaëlle (Lecturer and researcher - University of Reunion Island - UMR EspaceDev)
Catry Thibault (Research engineer - IRD - UMR EspaceDev)
Mouquet Pascal (Engineer - IRD - UMR EspaceDev)
*Veillon Florent (Engineer - IRD - UMR EspaceDev)

*Rakotomandrindra Pascal Fetra Nirina (Head of Information Systems and Data Management Department)
Lieutenant Colonel FALY Aritiana Fabien (General Project Coordinator)

Randriaharihaja Bruno (Engineer)
Hasinjatovo Nahdi (Geomatician)

Rakotondraompiana Solofo (Lecturer and researcher)
Rosa Johary (PhD student)

Rasolomamonjy Jaotiana (Lecturer and researcher)

*speackers

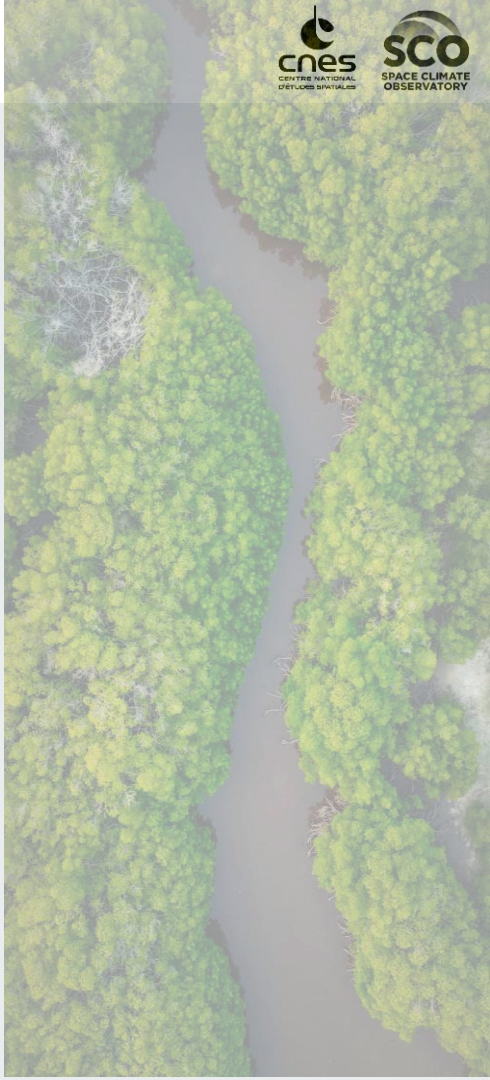
Strengthening the resilience of territories using operational tools: the example of **Mangroves** and **Ophyse** SCO projects

Presented by Célie LOSADA (celie.losada@cnes.fr)

Elodie Blanchard - IRD / UMR Espace-dev, La TeleScop

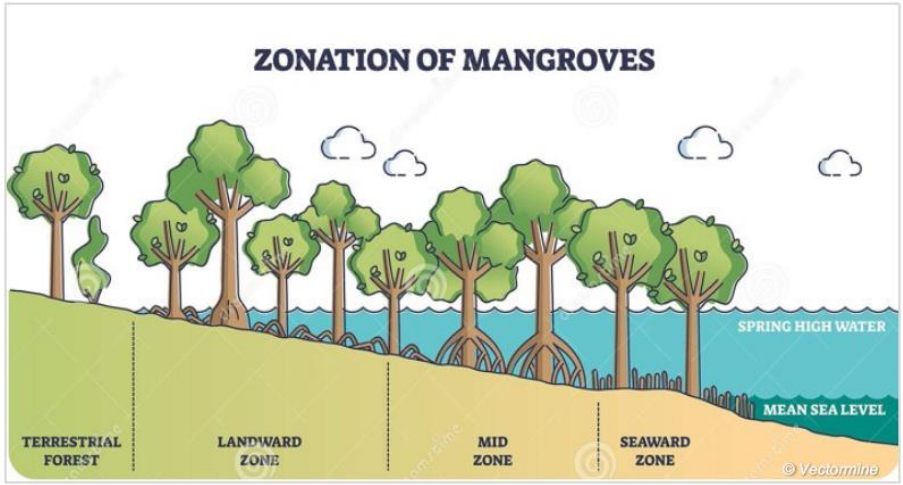
Jean-François Faure - IRD / UMR Espace-dev

Adrien PARIS - Hydromatters



Mangrove ecosystems

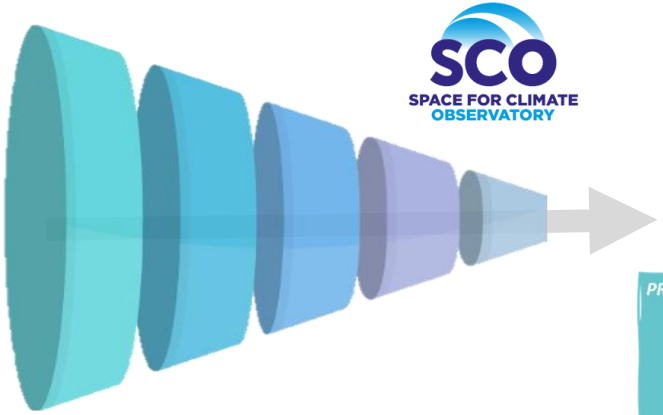
- **¾ of all coastal intertropical areas** (150 / 200 km² over 123 countries)
- **Intertidal forest ecotone adapted** to salinity, exposed to tidal balancing, home to a great biodiversity
- Naturally fragmented forests with **Carbon capture potential 3 to 5 times higher** than land forests
- **Protection against the effects** of natural and extreme hazards



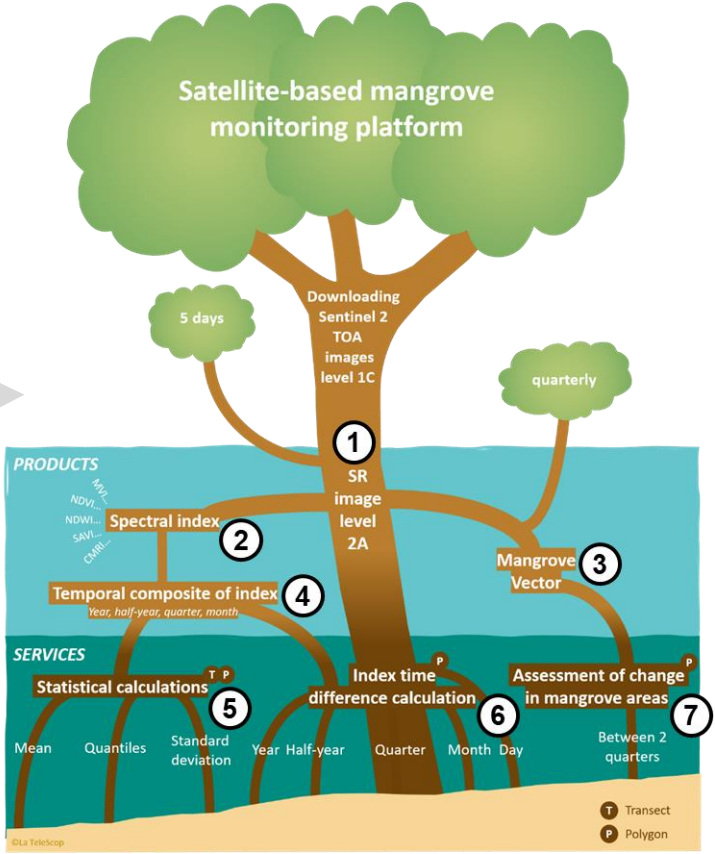
MangMag, The processing chain of the MangMap platform, from Sentinel 2 images to products and services

Satellite data (Sentinel 2) THEIA / Peps

- S2 niv. 2A time-series (Sen2Chain opensource) (10 m)
- SWIR dynamic thresholds
- 11 spectral indexes* defining mangrove environments



SCO SPACE FOR CLIMATE OBSERVATORY



TOA: Top Of Atmosphere, SR: Surface Reflectance

MangMap Mangrove Mapping & Monitoring

IRD Institut de Recherche pour le Développement FRANCE

Espace DEV OBSERVATION SPATIALE, MODÈLES & SCIENCE IMPLIQUÉE

Université de Montpellier

La TeleScop

magellium

Animation Régionale PAYS DU SUD Theia GEODEV

cnes

MangMap an online monitoring platform that produces and distributes environmental information on mangrove forests

Products made available regularly

Sentinel 2 / every 5 days / VHR
11 spectral indexes
Mangrove extent
Temporal composites for all indexes

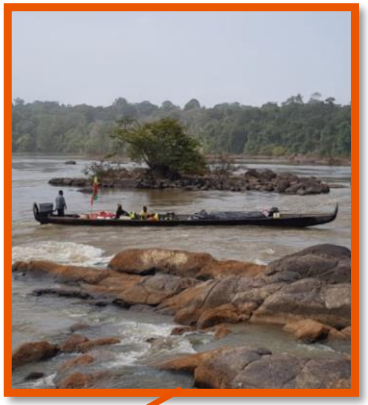
On-demand Services

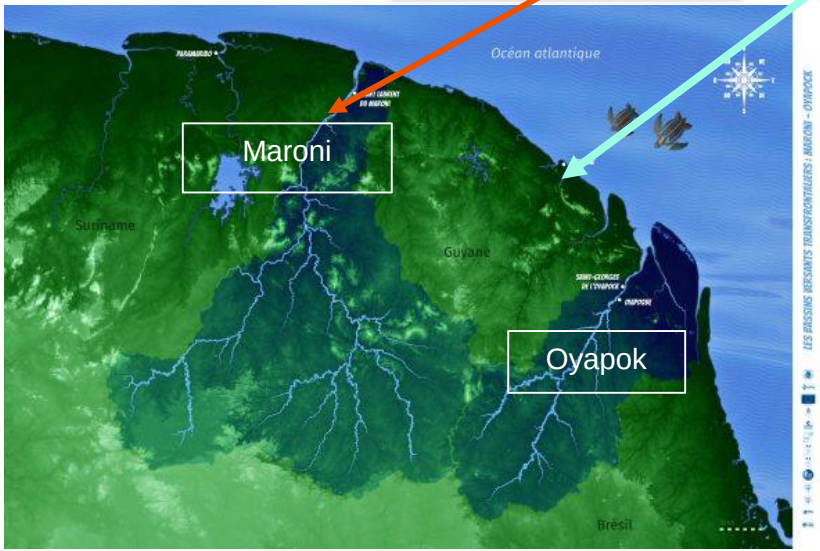
Statistics: evolutions in temporal composites values (polygons, transect, plot)
Date to date raster differences in temporal composites values
Estimation of mangrove spatial evolution
16 pilot sites spread over South America, Africa, Asia and Oceania regions

Track mangrove gain or loss with the NDVI indicator

Scientific content on free access for private and public stakeholders

Guyanese rivers and streams, traditional communication channel





Rivers and streams of French Guiana

- economic vector (freight transport, tourism)
- social vector (access to remote villages
- recreational vector (water activities, sports…)

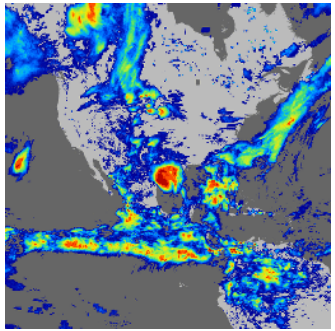
OpHyse, A complex forecast system made easily usefull

Satellite data (Sentinel 3 & 6)
Jason 3

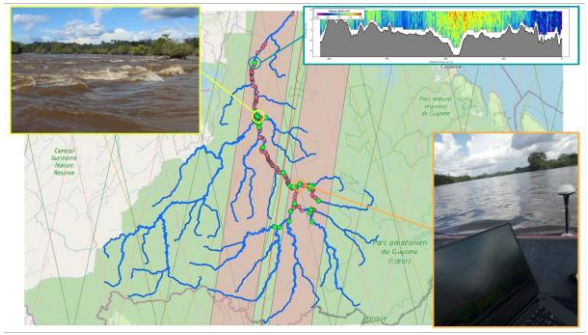
Long term Virtual Monitoring Stations of river altimetry (HydrowebNext)

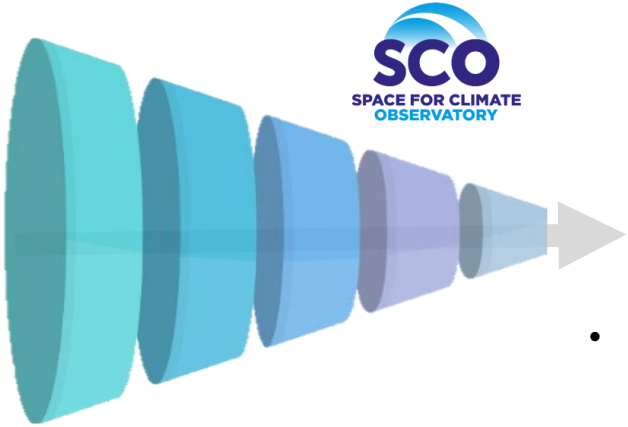
Water flow rate

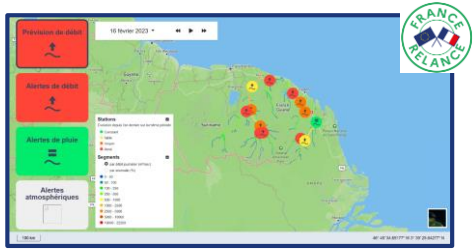
JAXA Global Rain Watch



Hydrological Model for Large Bassins (MGB)







https://sagui.hydro-matters.fr/

- **Real-time information on the hydrological status** of French Guiana's catchment areas
- **Long term evolution** under climate change conditions

SCO OpHySE

Operational Hydrology from Space and modEls

Hydromatters

cnes

Office International de l'Eau

Office de l'eau de la Guyane

OpHyse, A real contribution for understanding and modeling Guiana's watersheds from Space

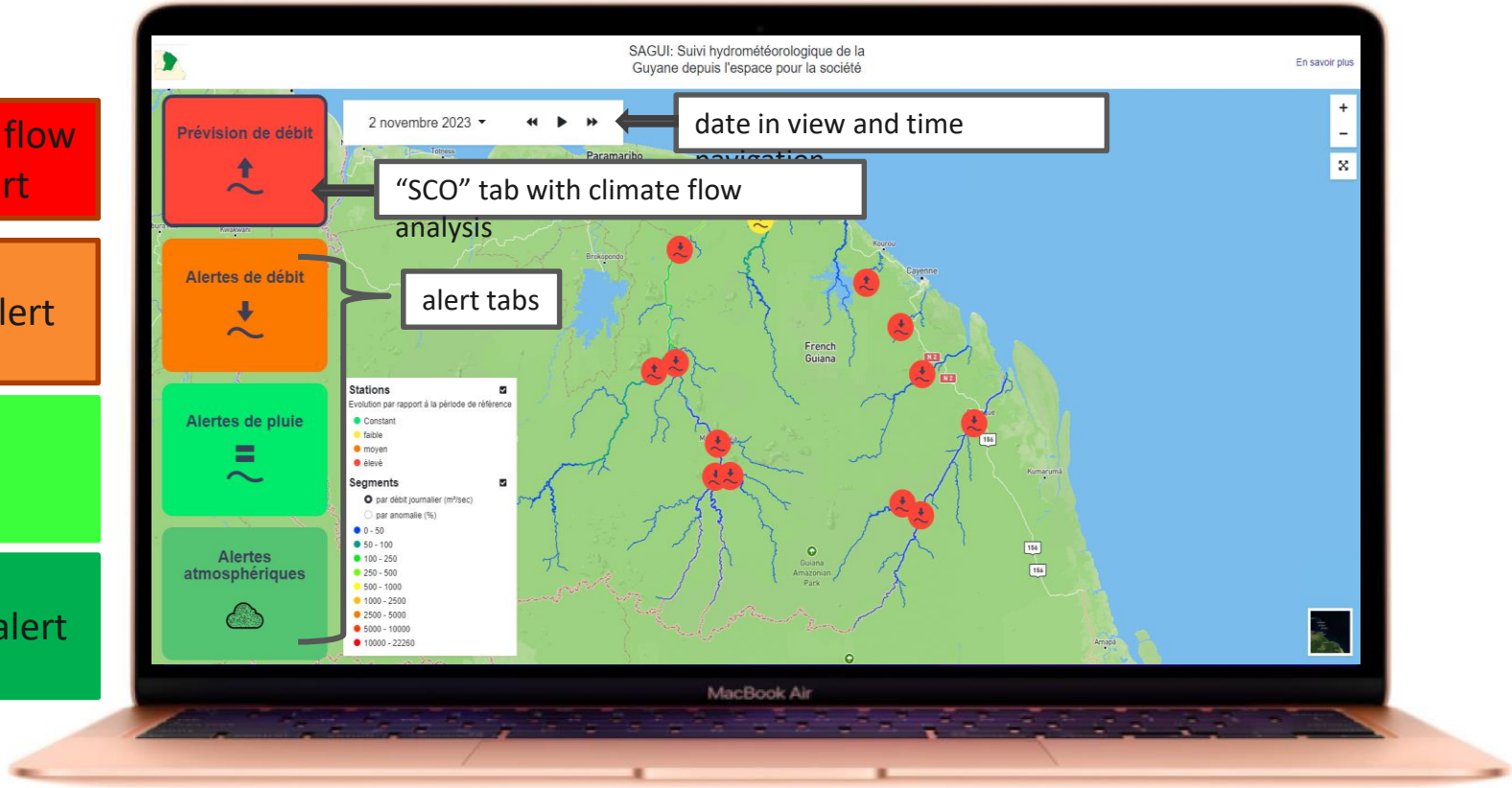
- a transparent calculation core for the user but configurable (alerts, reference periods, assimilated data, stations of interest, etc.)
- a generic method applicable to other basins
- results despite -normal- differences with the observed

10 days water flow forecast alert

Water flow alert

Rain Alert

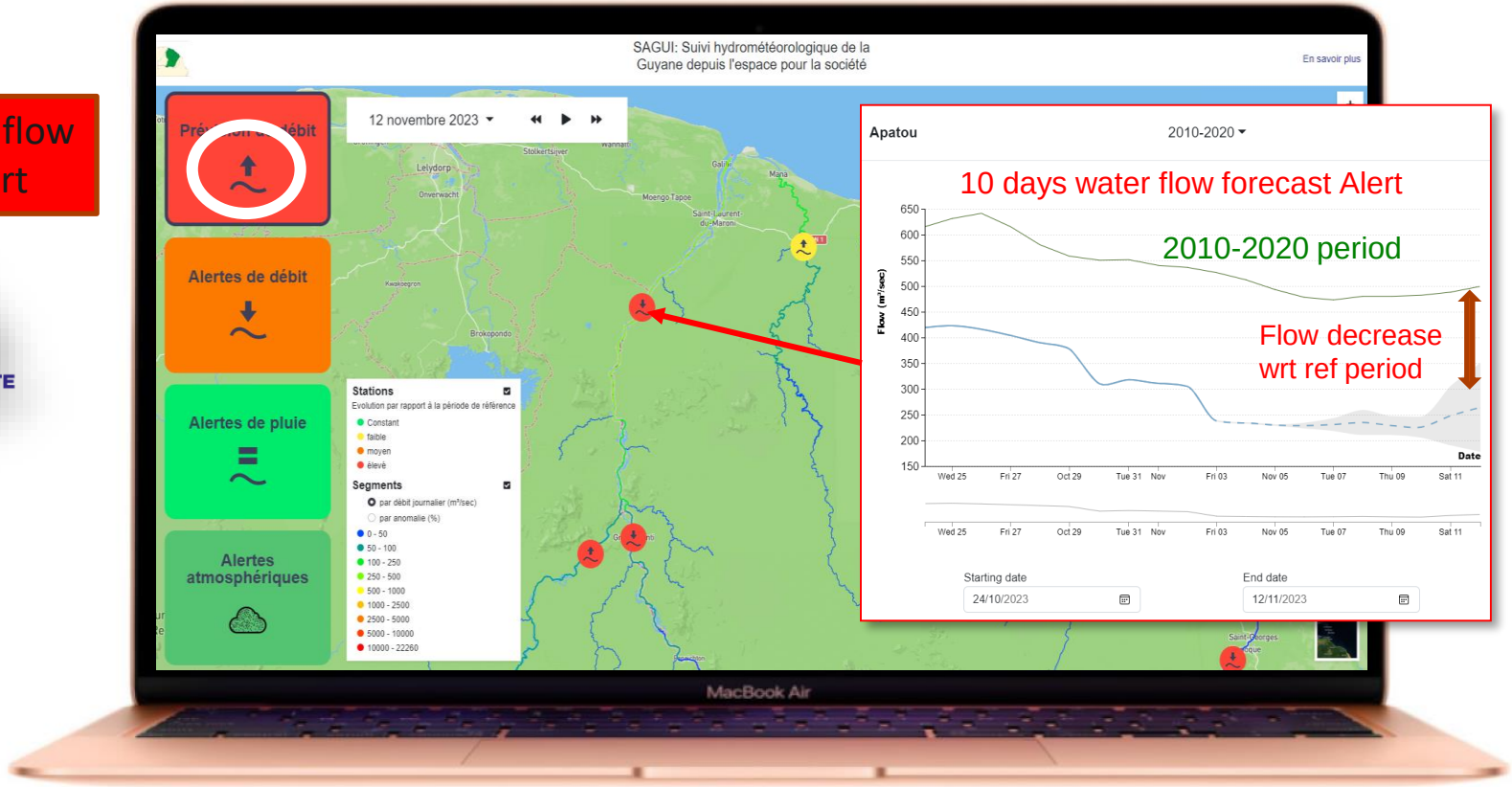
Atmospheric alert



OpHyse, A real contribution for understanding and modeling Guiana's watersheds from Space

"SCO" product integrated with the SAGUI platform
Daily update with Climate Change indicator and alert
Quality of estimates / complementarity of "SCO" and alert indicators

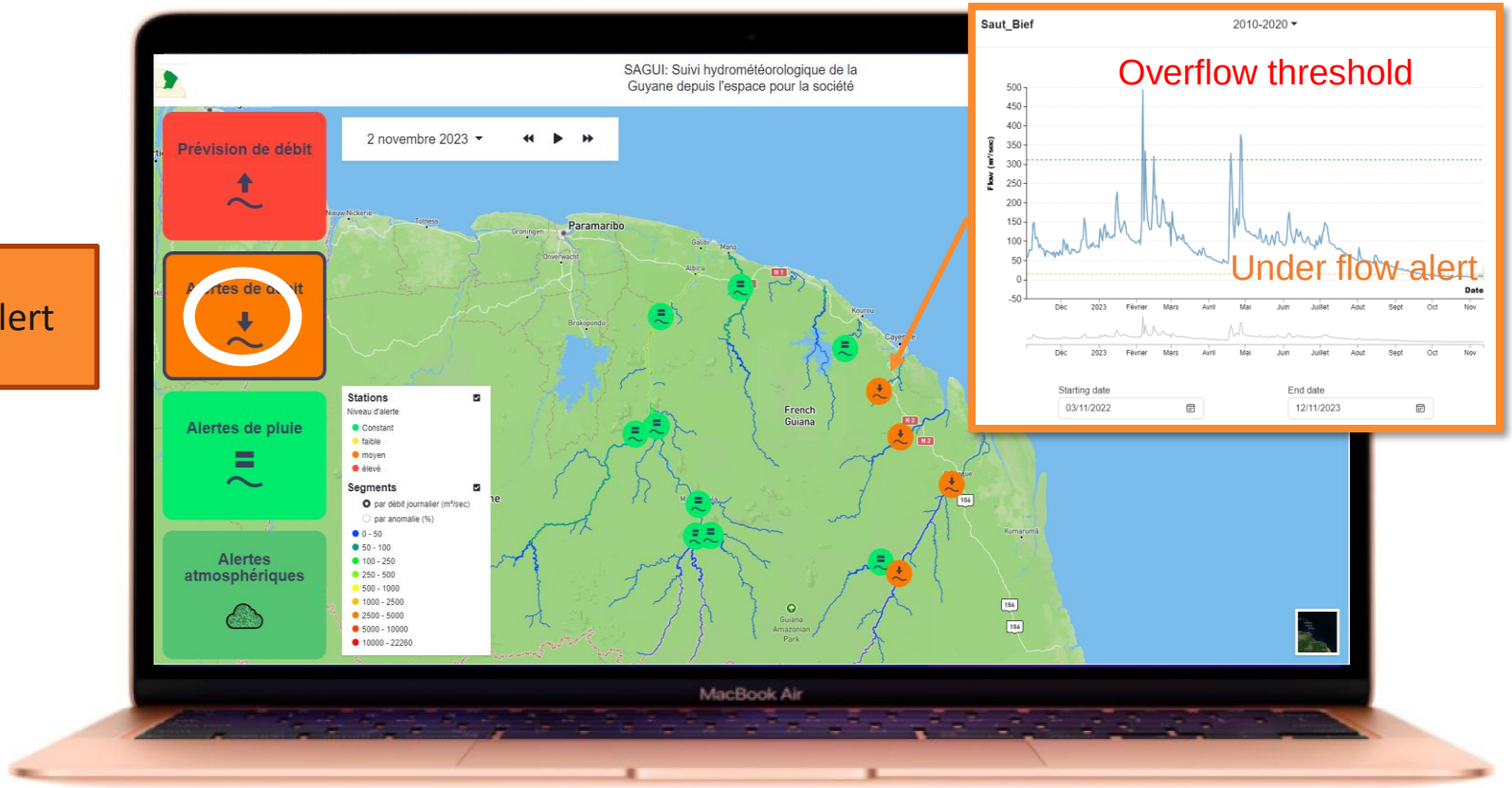
10 days water flow forecast alert



OpHyse, A real contribution for understanding and modeling Guiana's watersheds from Space

Calibration curves and conversion of heights to flow
Quality analysis of series available in Hydroweb/Theia
Study of the observability potential of new rivers / Highlighting of certain series suspicious and good surprises

Water flow alert



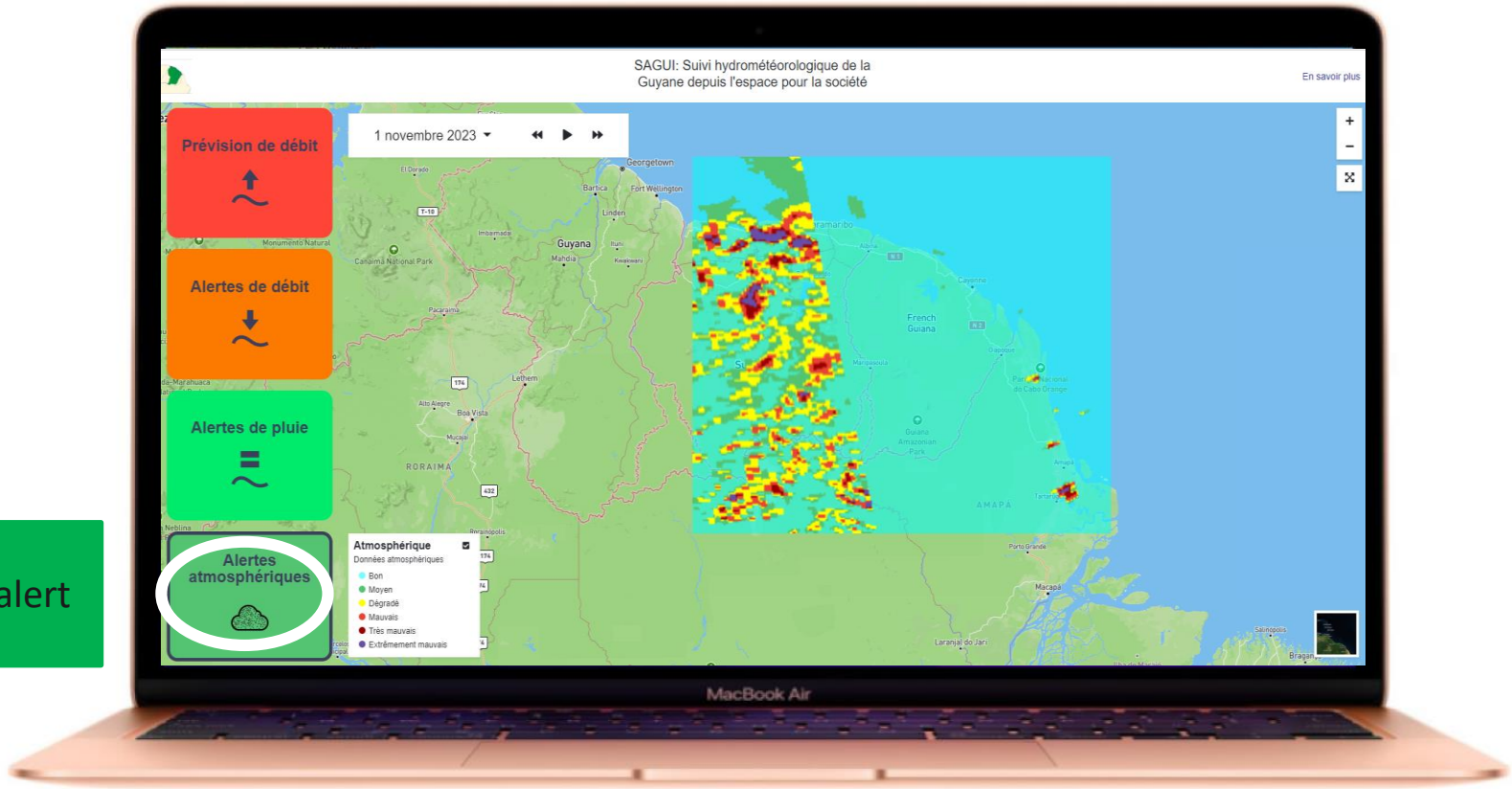
OpHyse, A real contribution for understanding and modeling Guiana's watersheds from Space

Hydrodynamic modelling

Capacity of the model/ precipitation couple to represent the long spatio-temporal wavelengths but also the small ones (cases of small watersheds)

Critical analysis of

Atmospheric alert



Thank you for your attention

Find the detailed project description on our website

MANGROVES | Space Climate Observatory

OpHySE | Space Climate Observatory

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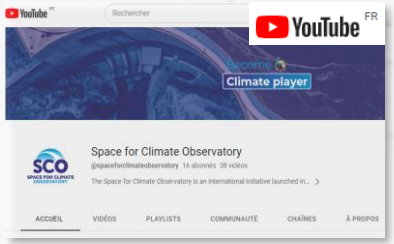

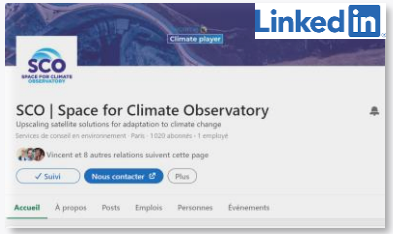

Monthly NEWSLETTER