BIOSPACE25 Biodiversity Insight from Space ESA-ESRIN, Frascati 10-14 Feb. 2025

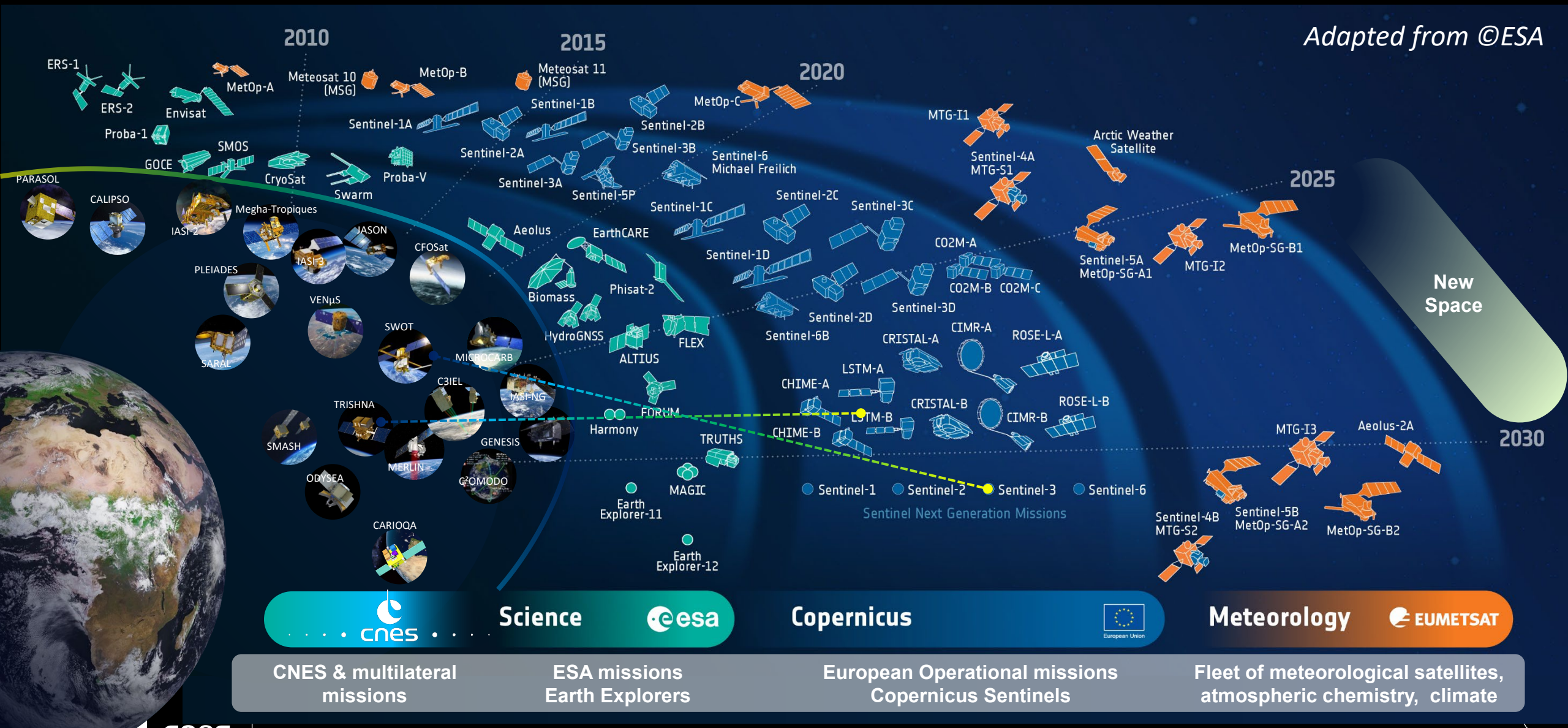
Philippe Maisongrande*, Delphine Leroux, Philippe Gamay, Laurent Lebègue, Bimal K. Bhattacharrya, Aurelien Carbonière, Jean-Louis Roujean, Sandra Luque, Xavier Briottet, Jean-Baptiste Féret , et al.

***Biosphere Program Manager**
@CNES Strategy Directorate

CNES Space Missions for the Monitoring and Study of Biodiversity

Adaptation and mitigation issues require **reliable metrics**
to understand and manage the **habitat** and its

THE FRENCH & EUROPEAN CONTEXT - OVERVIEW



BILATERAL PROGRAMS AND INNOVATION

Launch scheduled in 2026

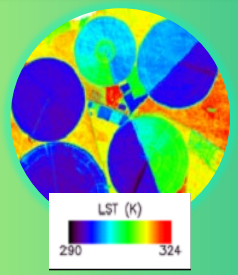
Launched Dec. 16, 2022

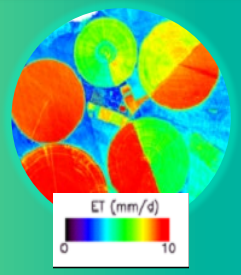
Bilateral programs devoted to water Quantity & Quality

Land, Coastal, Ocean Water

Satellite precursors LSTM, S3-NG TOPO Downstream Programs

Ground **surface temperature** and daily **evapotranspiration**





DATA TERRA

Theia

PNDB
Pôle National de Données de Biodiversité

First global survey of Earth's **surface waters**

SWOT RESULTS ON INLAND WATERS

SWOT works well on large lakes & rivers

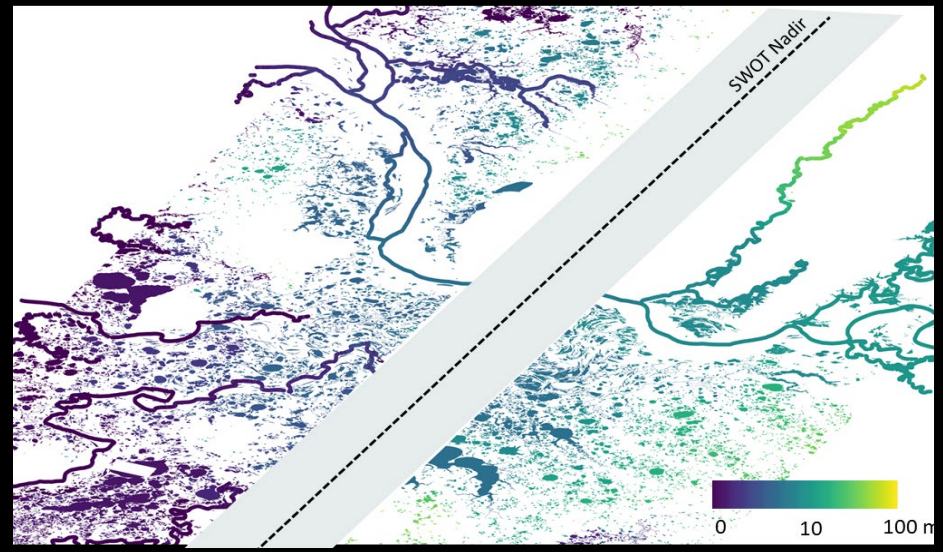
100 m rivers & (250m)² lakes
As per requirements
Global inventory of surface water

Outperforms its (optional) goals

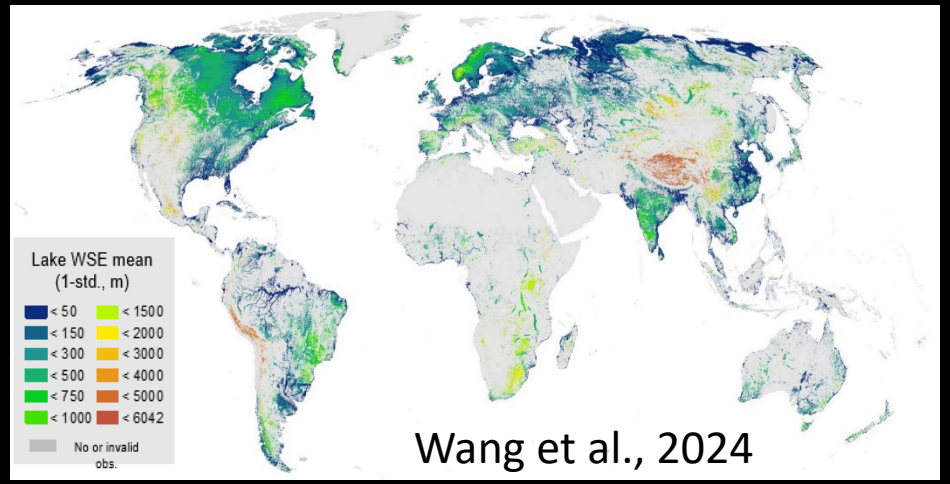
50 m rivers and (100m)² lakes
Better monitoring of Water Cycle
Thousands of Canadian/Russian lakes

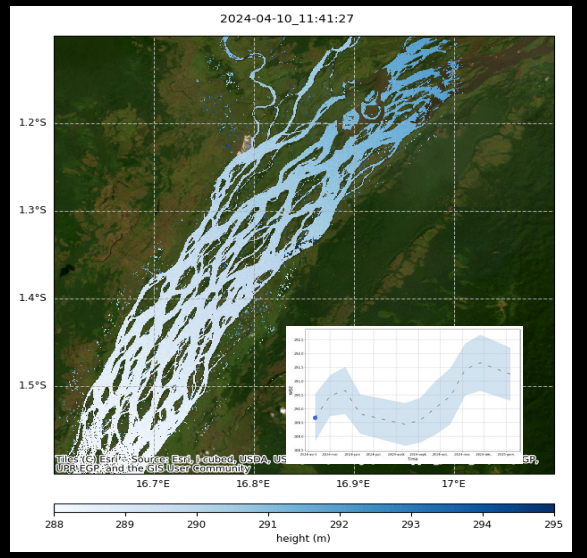
Delivers on frozen lakes & rivers

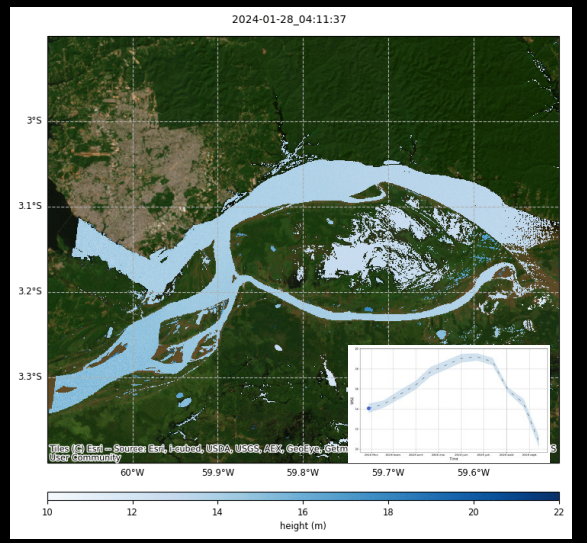
Ice is bright enough for heights,
Frozen/liquid state is in sigma0
1-day phase captured thaws



SWOT-measured **mean water surface elevation** on global lakes during January to May 2024





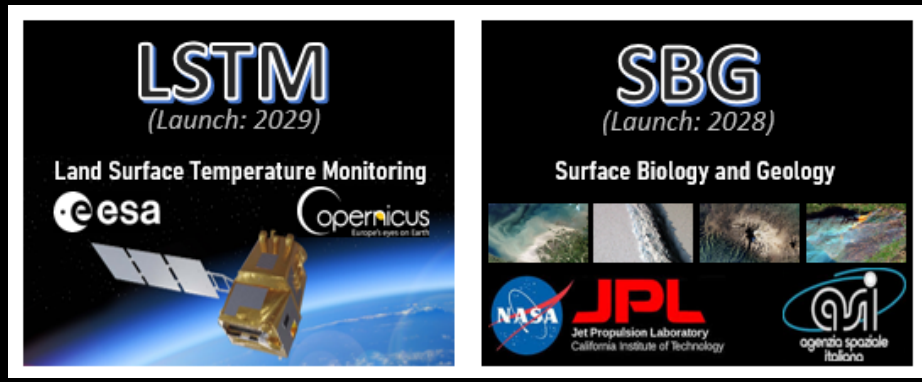


Congo River & Manaus
from April 2024 to January 2025
(21 day revisite)

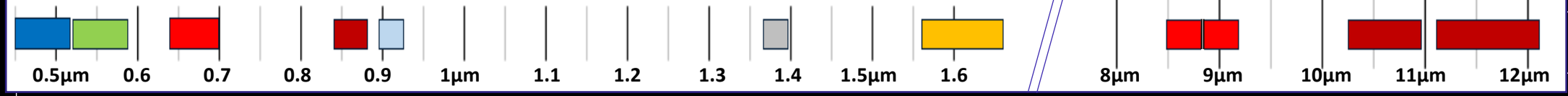
TRISHNA

Thermal infraRed Imaging Satellite for High-resolution Natural resource Assessment

- NeDT 0.2K at instrument output, AKA 0.5K
- Free & open data policy
- Level 2: ground and water reflectances, Land and Sea Surface temperature, Land Surface emissivities, vegetation variables, daily evapotranspiration
- International collaboration (products, ATBDs, orbits, cal/val, campaigns)



Spectral bands



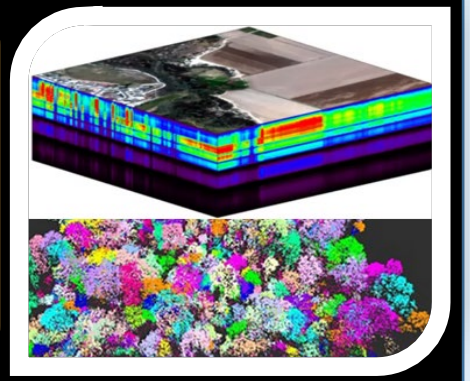
Theme 4: Socio-ecosystems and biodiversity

Monitoring EBVs and characterization of marine coastal & land environments

Two recommanded Missions

Biodiversity

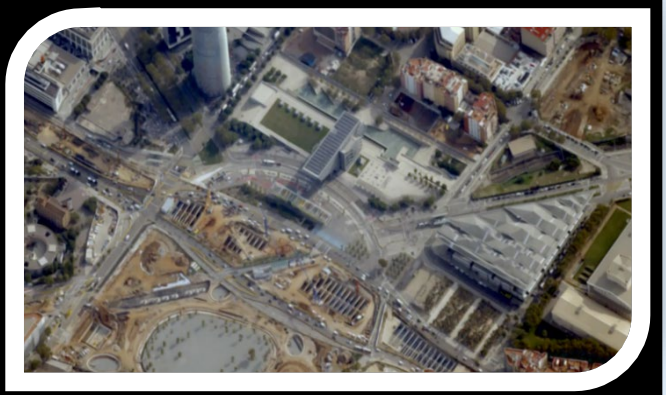
- Hyperspectral Sensor [*0.4-2.5 µm]*
- *Study of heterogeneous land and coastal ecosystems + pollutions sources*
- *10nm / 10m res. / 5day (30m for other missions, CHIME, Enmap, SBG)*



J.-B. Féret Today 12:20-12-30 Big Hall

4D-Earth

- 3D High Resolution (2m) VIS-NIR imager
- Monthly global revisiting capacity.
- 2 DEM and DSM/year
- 3D description of Ecosystems



But another 3D mission is expected first : CO3D

In synthesis, CO3D

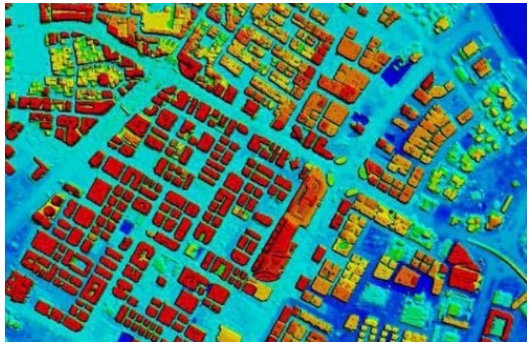
A WORLDWIDE ONE-METER ACCURACY launched July 2025

4
Satellites
AIRBUS

502 km
SSO orbit

Launch
July2025

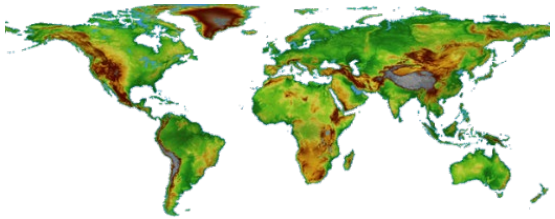
1 m
Relative 3D accuracy DEM



DATATERRA DINAMIS

50 cm
RGB & NIR imagery

123 Mkm²
Worldwide coverage



4 yrs
Processing

6000 TB
Data volume

2026 **2027**

IGN

18 months
demonstration phase

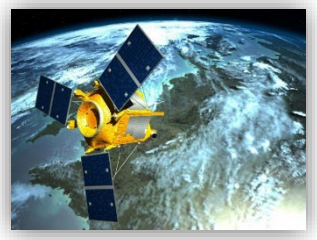
27 Mkm²

Commercial
phase

AIRBUS

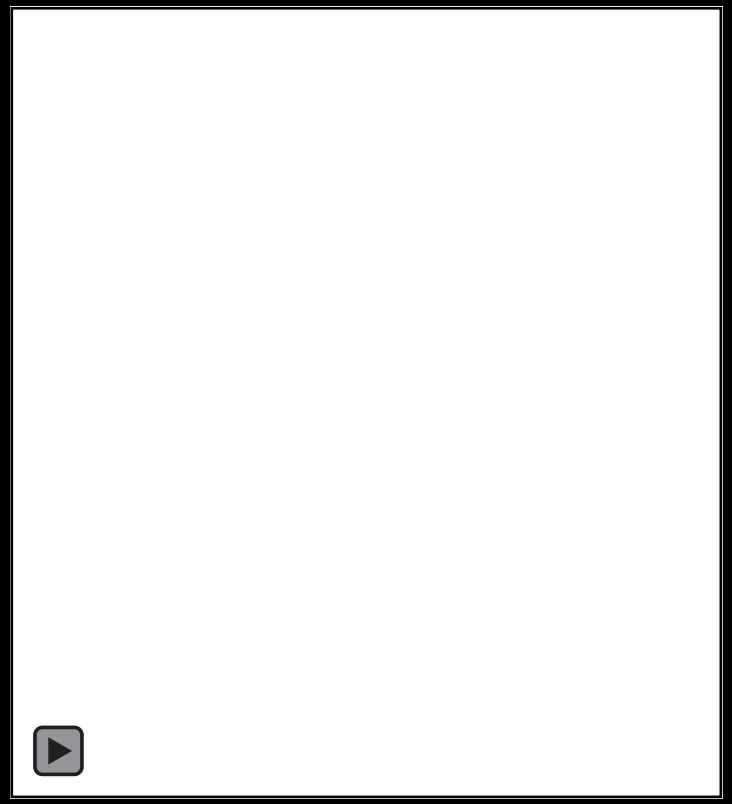
Successor of

- Pleiades 1A/1B - 70 cm [2011-2025]
- Pleaides Neo -30cm [2021 -]
  (SPOT6—7 : 1.5m 2D only)



CO3D VIDEO ACQUISITION CAPACITIES

BURST mode : RGB video, up to 5 fps during 60 s. Example over Barcelona

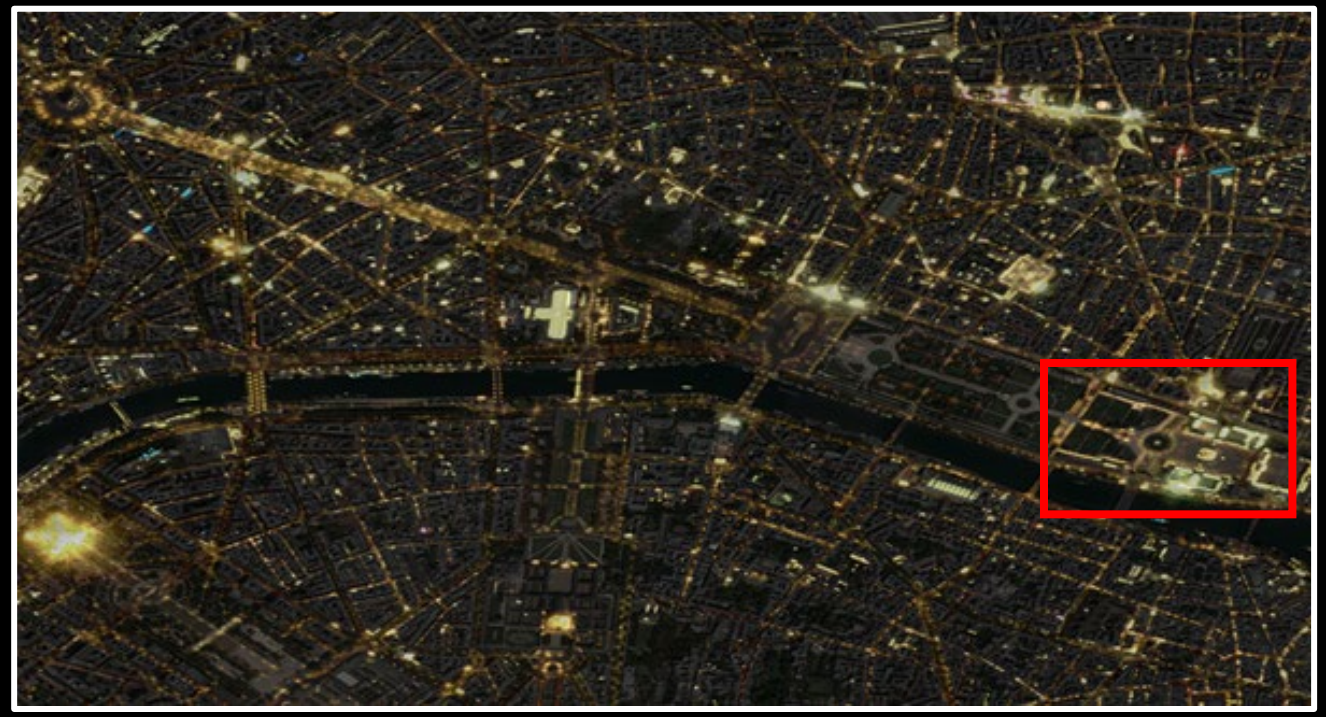


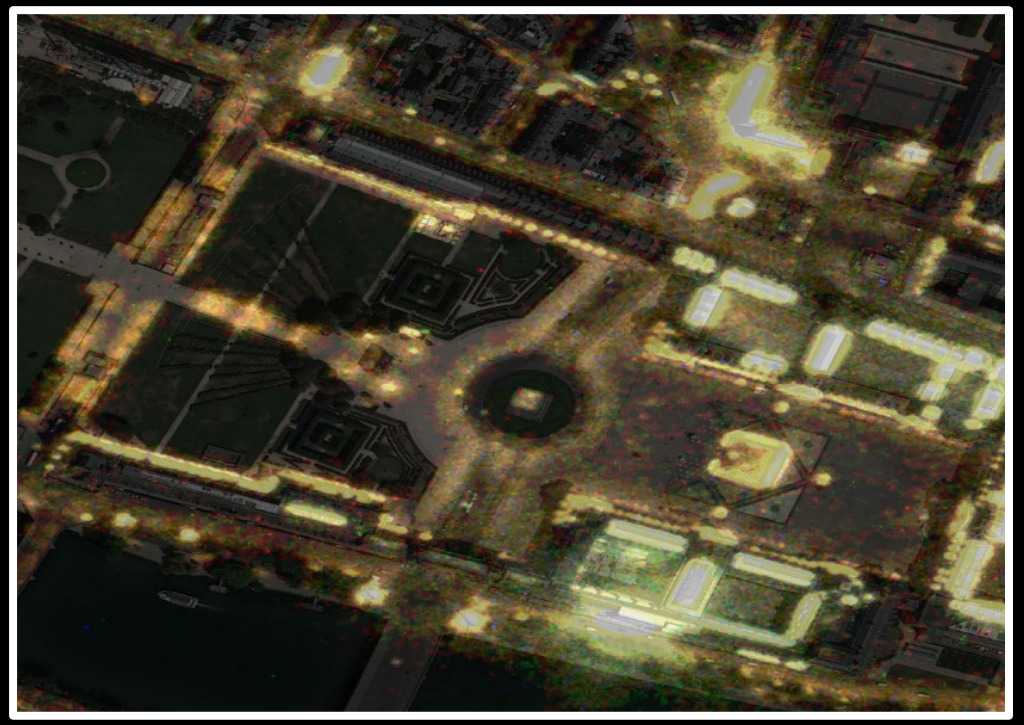
CO3D will be launched July 2025

CO3D NIGHT VISION CAPACITIES

Low signal enhanced thanks to dedicated night-vision integration time or video frame stacking

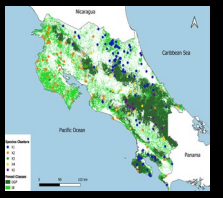
Paris, Le Louvre

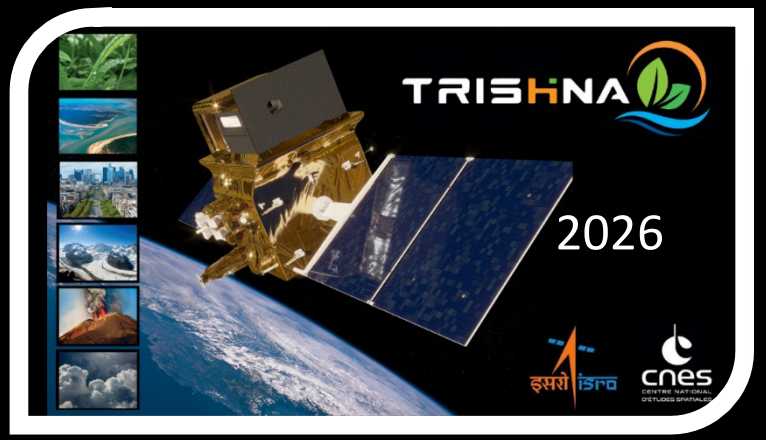


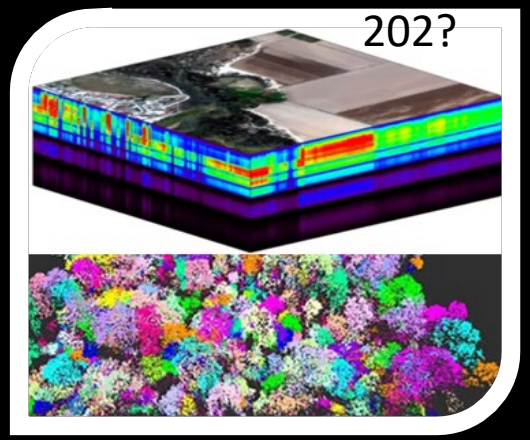


CO3D will be launched July 2025

SUMMARY OF PRINCIPAL CNES EFFORTS FOR BIODIVERSITY







- CNES involved in EE missions,SMOS, BIOMASS (April 2025), FLEX…
- CNES and INRAE involved in the CEOS Ecosystem Extent Task Team
- Additional CNES efforts in Data Terra thematic Platforms

(about translation of data into usable information)

CEOS Committee on Earth Observation Satellites

DATA TERRA

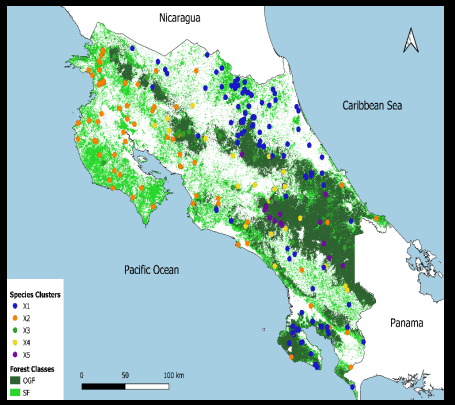
PNDB Pôle National de Données de Biodiversité

Theia

=>GEOBON, Living Planet,…GBios

FOR MORE DETAILS

12:20pm - 12:30pm
ID: 318 / 2.02.1a: 3
An EO-based framework for monitoring tropical forests ecosystems in Costa Rica: extent, condition and composition
Jean-Baptiste Féret, Florian de Boissieu, Rémi Cresson, Mona Bonnier, Mairi Souza Oliveira, Samuel Alleaume, Sandra Luque



EO conceptual approaches to improve biodiversity monitoring

Time: 11/Feb/2025: 12:00pm-1:30pm · Location: Big Hall

10:10am - 10:20am
ID: 454 / 2.03.1a: 2
Increasing engagement of the Committee on Earth Observation Satellites (CEOS) with biodiversity

Hall

Gary Geller[1], Shaun Levick[2], Sandra Luque[3], Roger Sayre[4]

Session Details:

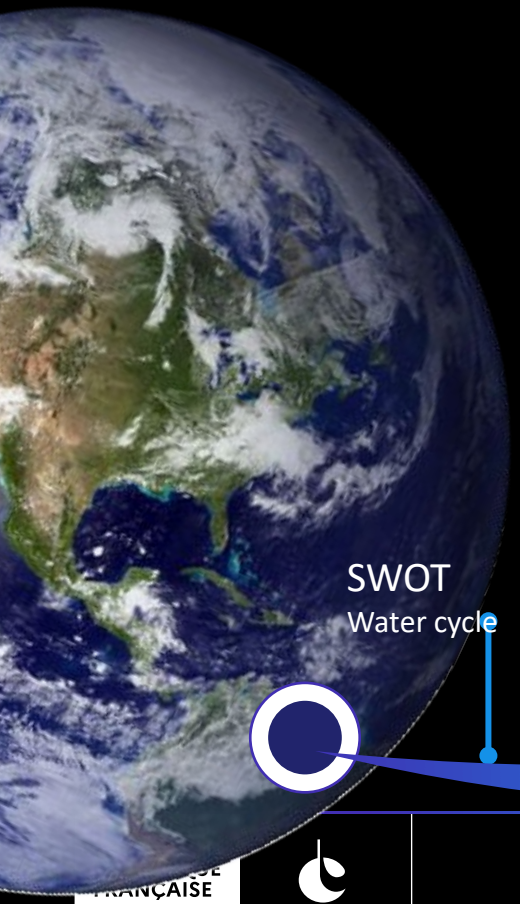
Ecosystem Extent

Time: 11/Feb/2025: 10:00am-11:30am · Location: Big

OUR FUTURE MISSIONS IN THE NEXT DECADE

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

SPS 2024 priorities



SWOT
Water cycle

MICROCARB
Carbon from space

CO3D
3D VHR imagery

IASI-NG
Atmosphere composition

TRISHNA
Surface temperature & Soil moisture

C3IEL
Convective clouds & lightning

SMASH
High-revisit hydrology

GENESIS
Geodetic references

ODYSEA
Ocean currents & winds

MERLIN
Monitoring methane e

S3-NG-Topo
Wide-swath altimetry
for ocean & hydrology

CARIOQA
Quantum gravimetry

C²OMODO/AOS
Convection, aerosols & climate

MAGIC/NGGM
Earth's gravity field

BIODIVERSITY
Hyperspectral Imagery

2025

2030

2035