

FROM GROUND TO ORBIT:

COMBINING IN-SITU AND SATELLITE MONITORING OF WATER AND FOREST
RESOURCES FOR ADAPTATION TO CLIMATE CHANGE”

*Space Agencies and Satellite Tools for Agricultural Monitoring:
Capabilities and Innovations*

12TH NOVEMBER 2025

ERIC BREL

Espace pour la Guyane
Centre Spatial Guyanais

CNES – Agence française de l'Espace / Expertise technique française

L'ÉCOSYSTÈME SPATIAL FRANÇAIS EN CHIFFRES

3 milliards €

Le budget spatial institutionnel français en 2024, ce qui représente :



45 €

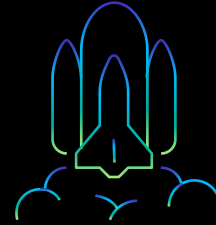
par an et par
habitant

5^e

pays, après USA,
Chine, Japon et la
Russie

1^{er}

budget national
en Europe



1 000

entreprises françaises dans la
filière spatiale, qui représentent

1 500 établissements

90 % de PME et ETI (entreprises
de taille intermédiaire)

Plus de

80

formations académiques
spécialisées dans le spatial



Plus de

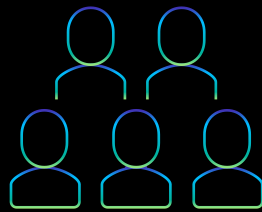
15

Centres Spatiaux Universitaires
collaborant avec le CNES

70 000

personnes

travaillent dans la filière spatiale en France, dans
l'industrie manufacturière et de services et le
secteur académique.



1^{er}



pays européen en terme
**d'investissements
privés** dans le spatial

OUR 4 STRATEGIC PRIORITIES



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Vidéo CSG/S Martin, 2023

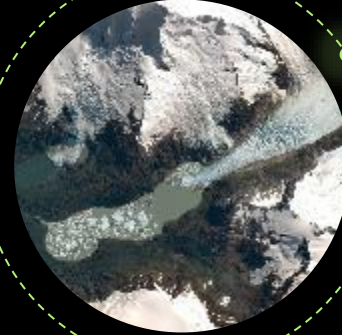
STRENGTHEN **SUPPORTING**

our strategic autonomy



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the competitiveness of
the space ecosystem



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2020

COMMIT

to a sustainable world



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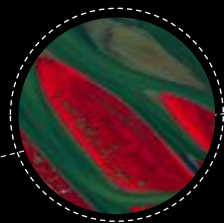
SHOWCASE

our scientific excellence

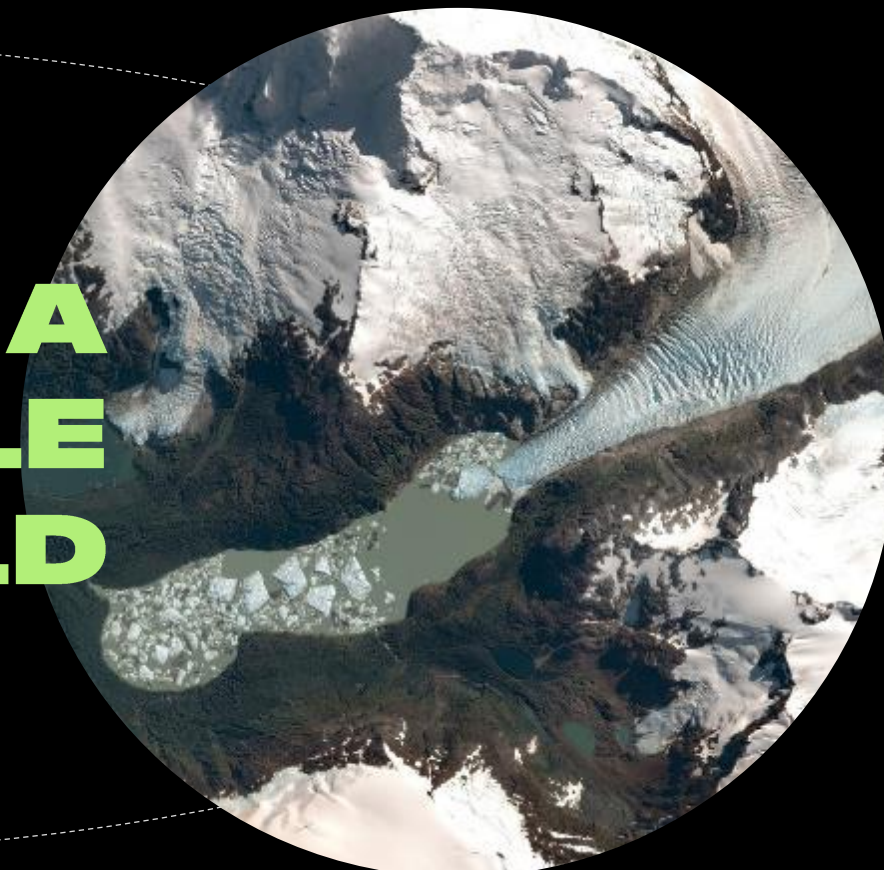
CONTRIBUTE TO
TERRITORIES
RESILIENCE

IMPLEMENTING
AN AMBITIOUS
CSR POLICY

BEST UNDERSTAND OF
CLIMATE CHANGE



COMMIT TO A SUSTAINABLE WORLD



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PROMOTE
A **SUSTAINABLE**
USE OF SPACE

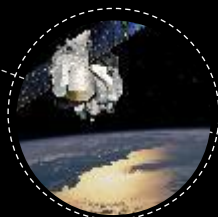


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DECARBONER
THE SPACE SECTOR



© CNES/DUCROS David, 2016

SERVICES FOR EVERYONE

Lunar economy

Space logistics

Constellations

In orbit services

EXPERTISE, TECHNICAL RESOURCES,

Meet our experts for personalized support, get in touch with our laboratories, their technical resources and space data, our industrial patents

FOR PRIORITY SECTORS

Télécom.

Mobility

Health

Insurances

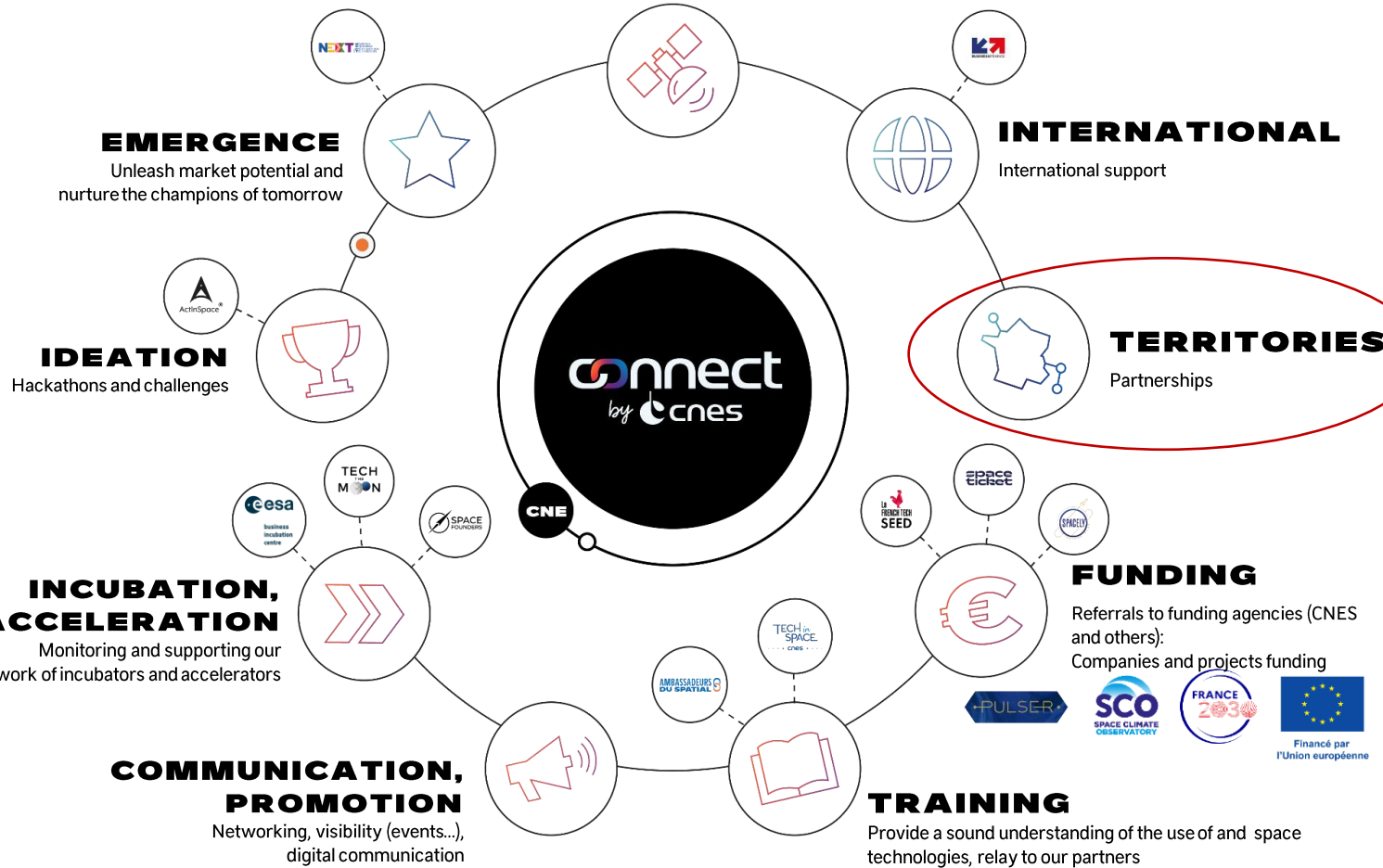
Forests

Agriculture

Energy

Territories management

Maritime





02

**APPLICATIONS
IN ALL
SOCIO-ECONOMIC FIELDS**

rayon de 2500 km autour de sa position





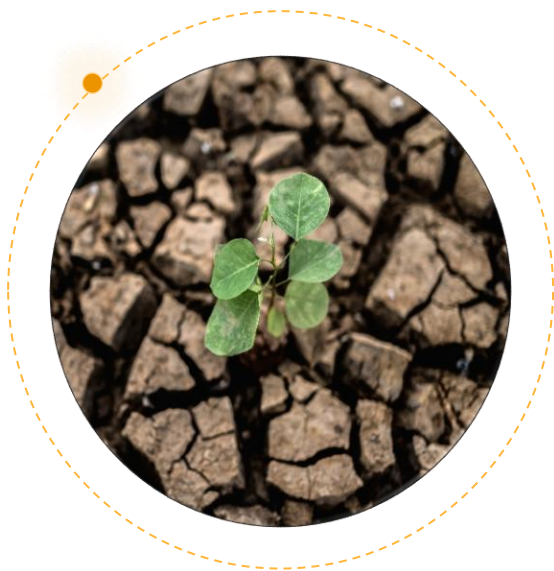
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FEEDING
a growing global population



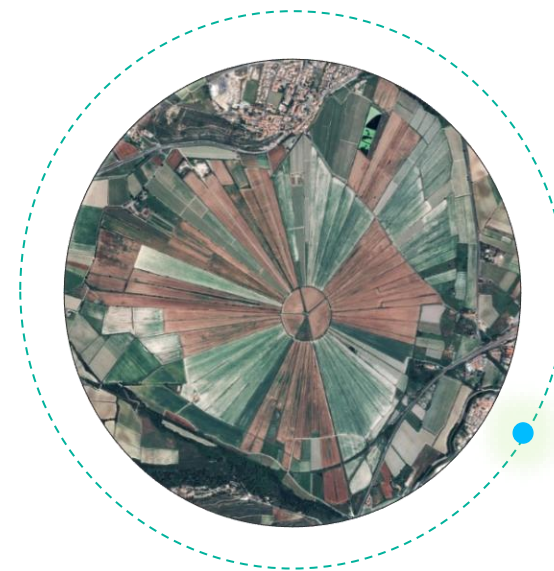
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CONTROLLING
Its environmental impact



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ADAPT
to climate change



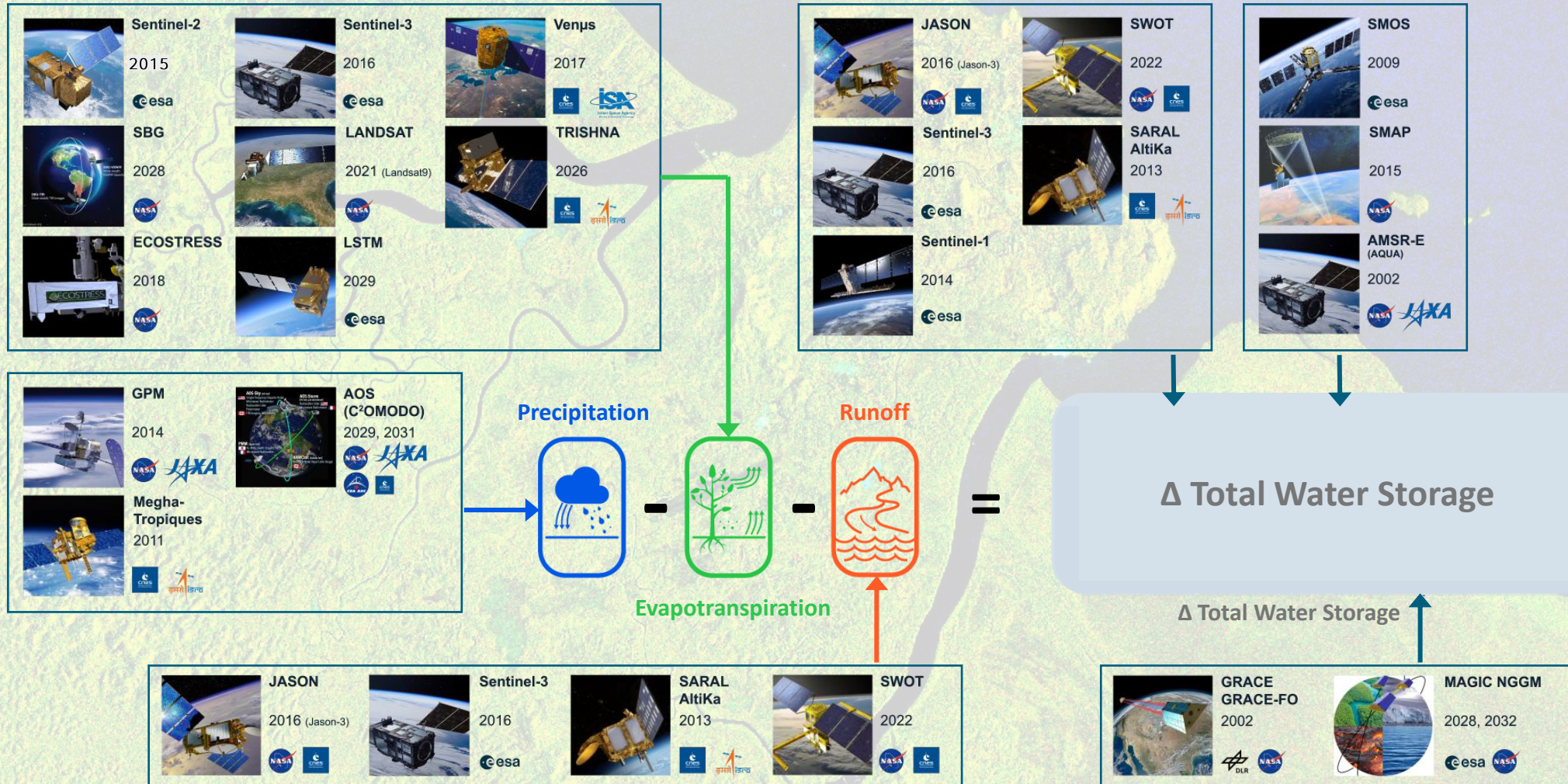
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SUPPORTING
Agricultural stakeholders



03

SPACE MISSIONS



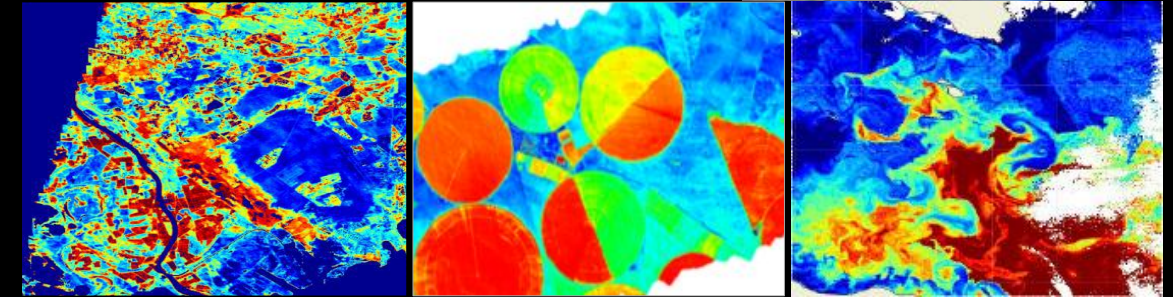
MEASURE THE SURFACE TEMPERATURE

The Franco-Indian TRISHNA mission and its frequent high-resolution measurements address major scientific, economic, and societal challenges through the five main themes which the mission addresses from research perspective and application development. These five main themes are:

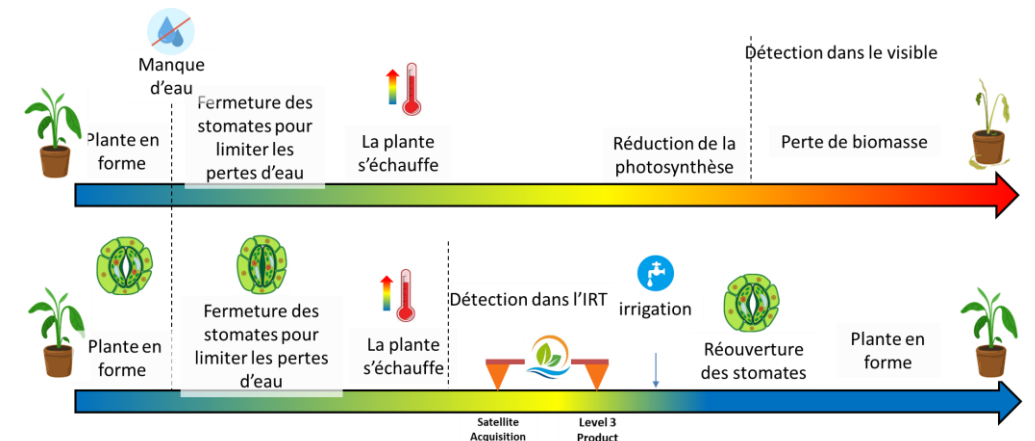
- ECOSYSTEM MANAGEMENT AND WATER STRESS DETECTION (ADJUSTING IRRIGATION NEEDS AS BEST AND AS EARLY AS POSSIBLE)
- MONITORING OF COASTAL AND INLANDS WATERS
- URBANIZATION AND URBAN HEAT ISLANDS
- ATMOSPHERE (AEROSOLS, WATER VAPOR, CLOUDS)
- CRYOSPHERE (SNOWMELT RUNOFF)

Mission characteristics:

- Lifetime 5 years
- Global land and coastal coverage
- 3-day revisit, 60 m resolution
- Equator crossing: 12:30 PM & AM
- Variable viewing angles up to 38 degrees
- VNIR-SWIR (7 bands) – TIR (4 bands)
- NeDT 0.2K instrument output, 0.5°K at 1C level
- Linked with ESA mission: LSTM to be launch in 2029 – A and 2030 – B
- Free and open data:
 - Level 2: surface reflectance, **surface temperature**, emissivity, plant-related variables, evapotranspiration flux
 - Level 3: **'Daily evapotranspiration product by interpolation**



Focus on the contributions of TRISHNA in agriculture



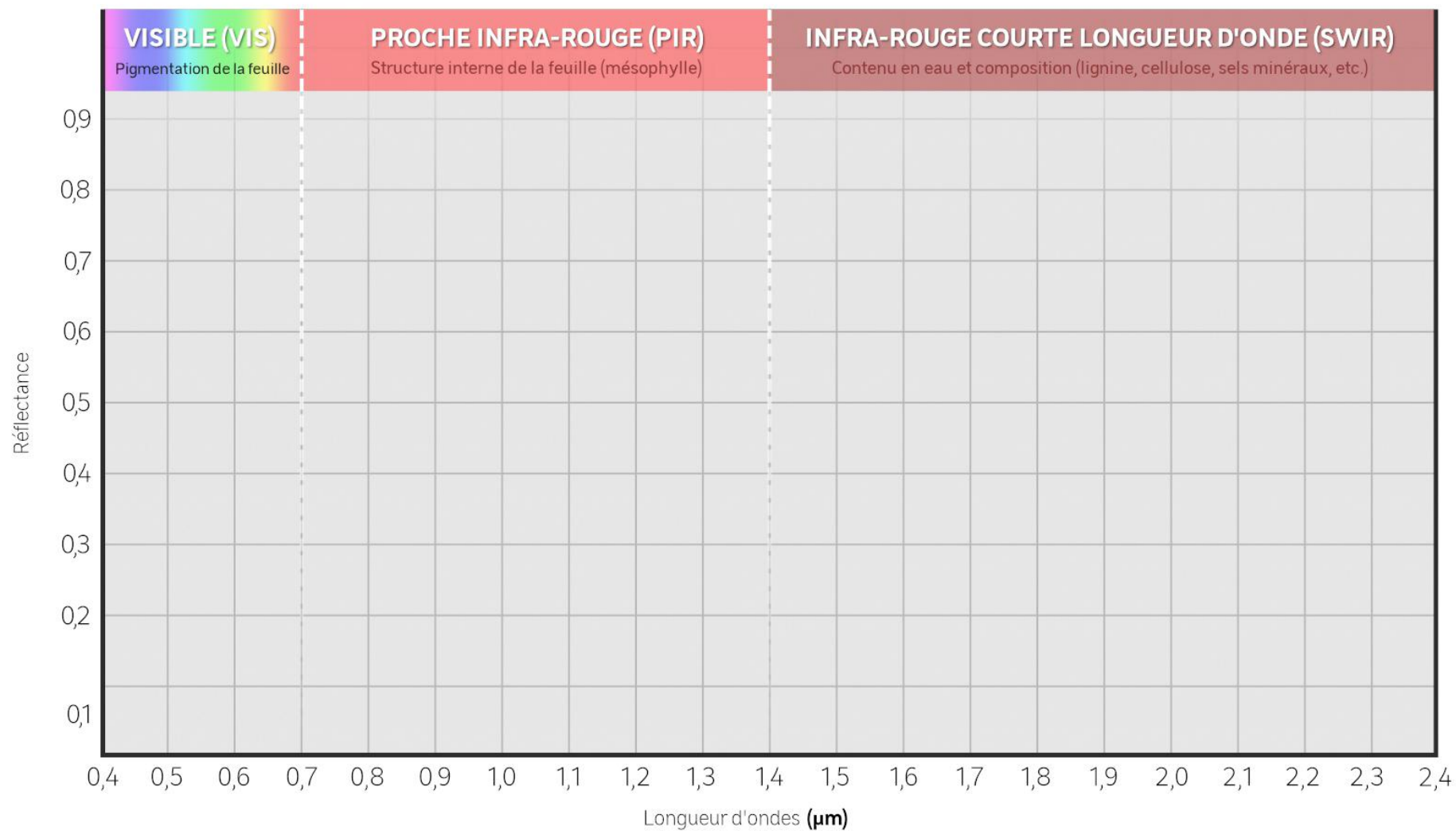
(Philippe Gamet, CESBIO/CNES)



04

SOME APPLICATIONS

FREQUENCY CHOISE



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OTHER APPLICATIONS

Meteorology: Temperature and rainfall forecasts...

Reliable and accurate weather forecasting for sensitive plots even in the middle of savanna or forest



Precise location: Guiding machinery for sowing, harvesting, and weeding

But, also geolocate livestock

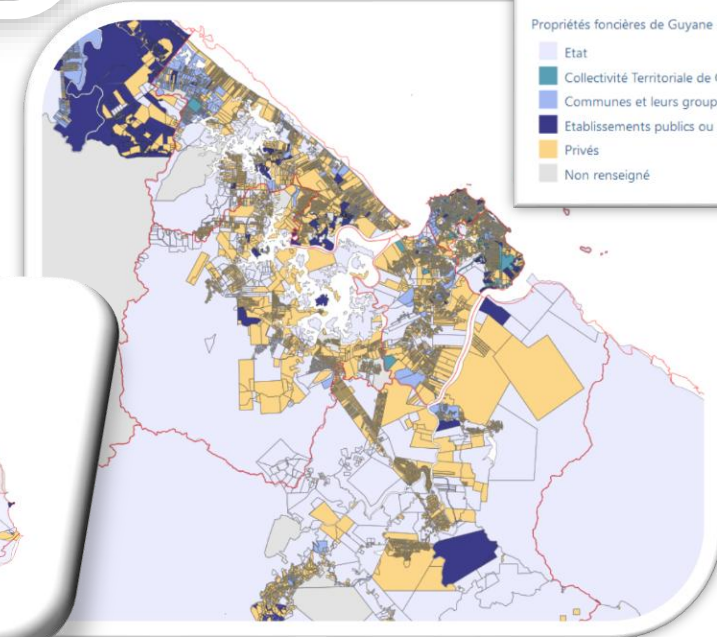
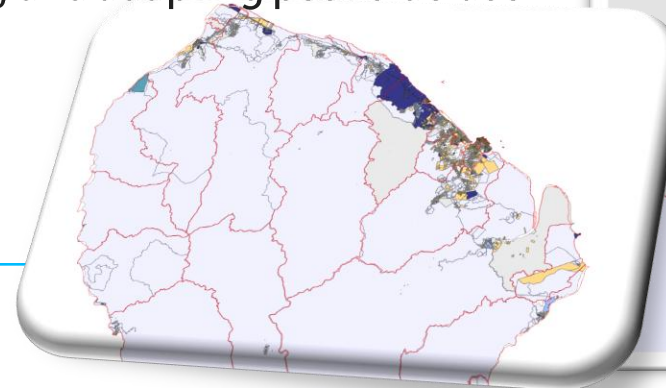
- Locate any precise animal on the planet, in a field
- In time precisely identify the elements of a herd
- Accompany the herd leader to the best watering hole or to the field with the best grass



Point de mesure	1°C au sol	22°C	22°C	22°C	22°C	23°C
Point de mesure (°C)	24°C	24°C	24°C	24°C	24°C	24°C
ETP (mm)	4.5mm	5.3mm	3.8mm	5.4mm	2.3mm	
État du ciel	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux
Précipitation (mm)	4.5	5.3	3.8	5.4	2.3	
État du ciel	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux	Partiellement nuageux
Précipitation (mm)	4.5	5.3	3.8	5.4	2.3	

high-resolution mapping and soil characteristics;

- accurately surveying and monitoring plot development
- adjusting fertilization, optimizing irrigation, and adapting pesticide use





THANKS!