

living planet symposium | BONN

23–27 May
2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



Operational detection of forest loss in Vietnam, Laos, Cambodia, Gabon, French Guiana, Suriname and Guyana Using Sentinel-1 Data

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Dr. Marie Ballère | CEREMA | France
Dr. Thuy Le Toan | CESBIO | France

Objectives: Provide **forest loss maps** with a **low latency** at **global scale**
>0.1 hectare **<2 weeks** **tropical forests**

Framework:

The TropiSCO project is part of the Space Climate Observatory (SCO) program



Examples of usage:

- Detection and identification of illegal activities , management of protected areas, monitoring the conservation agreements, enforcing the certification labels, ...
- Contribution to REDD+ Measurement Reporting and Verification, estimation the carbon source
- Contribution to the National Strategy against imported deforestation to improve the sustainability of goods

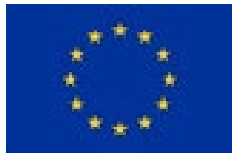


Data:

- SAR Sentinel-1 data (every 6 or 12 days) allows developing an operational system for forest loss alerts
 - Minimum Mapping Unit : 0.1 hectare (pixel size 10m)
- Ancillary data:
 - forest/non-forest masks, digital elevation model
 - provided by local users if available
 - Planet optical images: for validation and website background

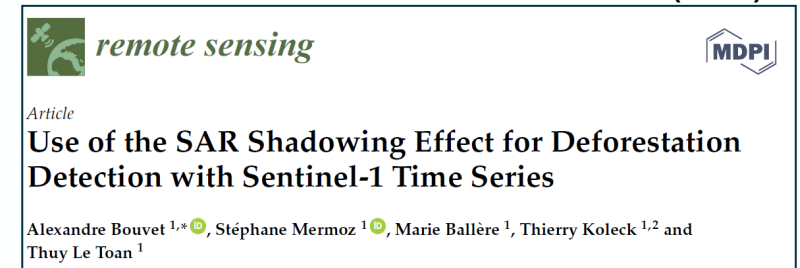
Method developed/validated by the team for many years

Thanks to



for supporting previous research works

Bouvet et al. (2018).



Ballère et al. (2021)



Mermoz et al. (2021)

TropiSCO project

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Phase 1:
Demonstration and
architecture studies

Phase 2:
Development and
production

oct. 2021

apr. 2022

2024



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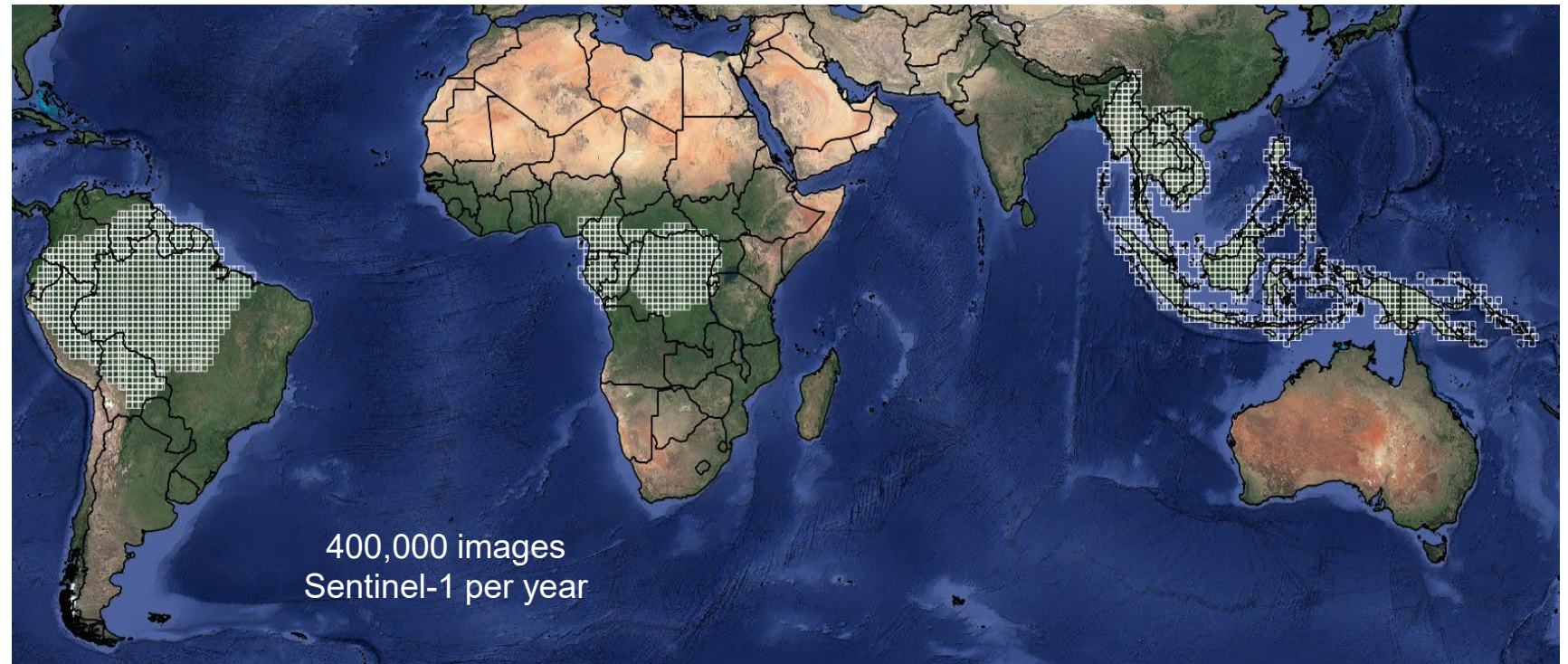
Phase 1:
Demonstration and
architecture studies

Phase 2:
Development and
production

oct. 2021

apr. 2022

2024





User requirements:
Questionnaire

Demonstration:
Maps production and webGIS development

Data Architecture:
Trade-off on technical solutions for operational processing

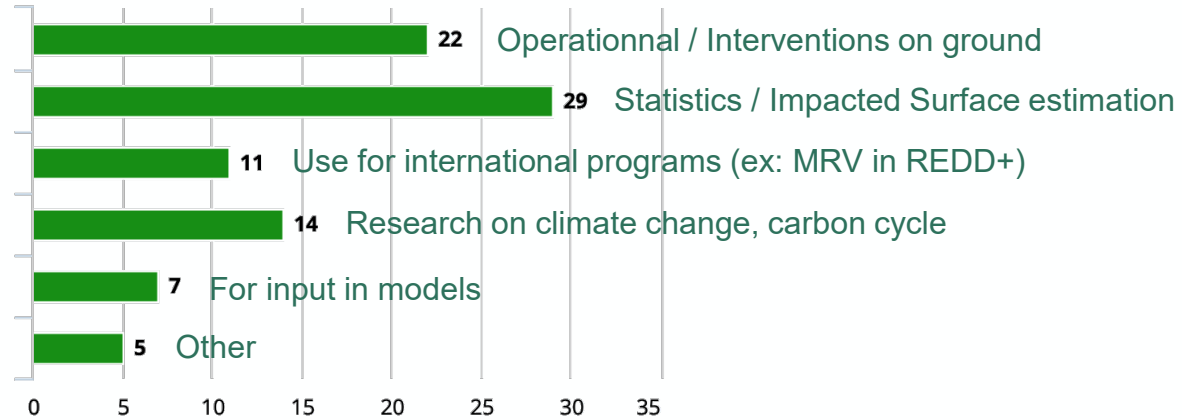
Last works

- Users requirements synthesis
- Production on 7 countries (Guiana shield, South-East Asia and Gabon) since 2018
- WebGIS development and validation
- Processing and cost estimation for phase 2

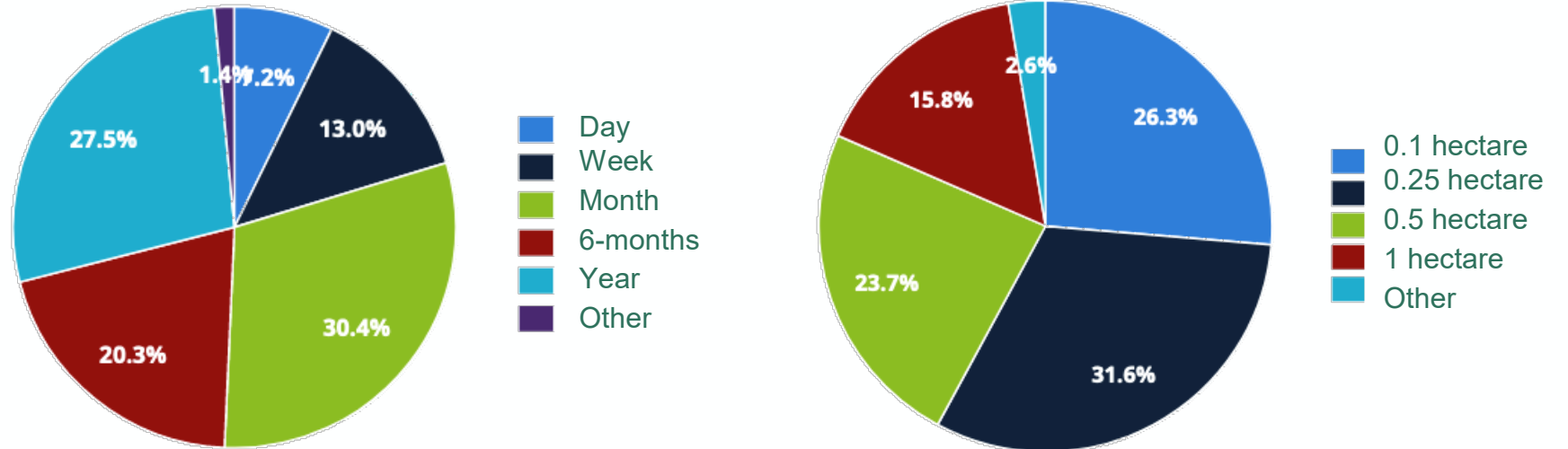
Users

Greenpeace France
 WWF
 NITIDAE ONG
 Association Kwata
 DGTM Guyane
 Parc amazonien de Guyane
 ONF International
 IGN, LaSTIG
 INRAE, UMR TETIS
 INRAE, UMR CEE-M
 CIRAD
 ŒIL, Nouvelle-Calédonie
 MAA
 IRD UMR Espace Dev
 IRD UMR AMAP
 IRD/GET/UR 234
 Alliance Forêts Bois
 CNPF-IDF
 AGEOS
 INPE
 Indépendants
 CNRS
 DYNAFOR
 AIRBUS DS GEO
 INSIGHT SAS

Why do you need forest loss maps ?



At which frequency do you need the forest loss data ?



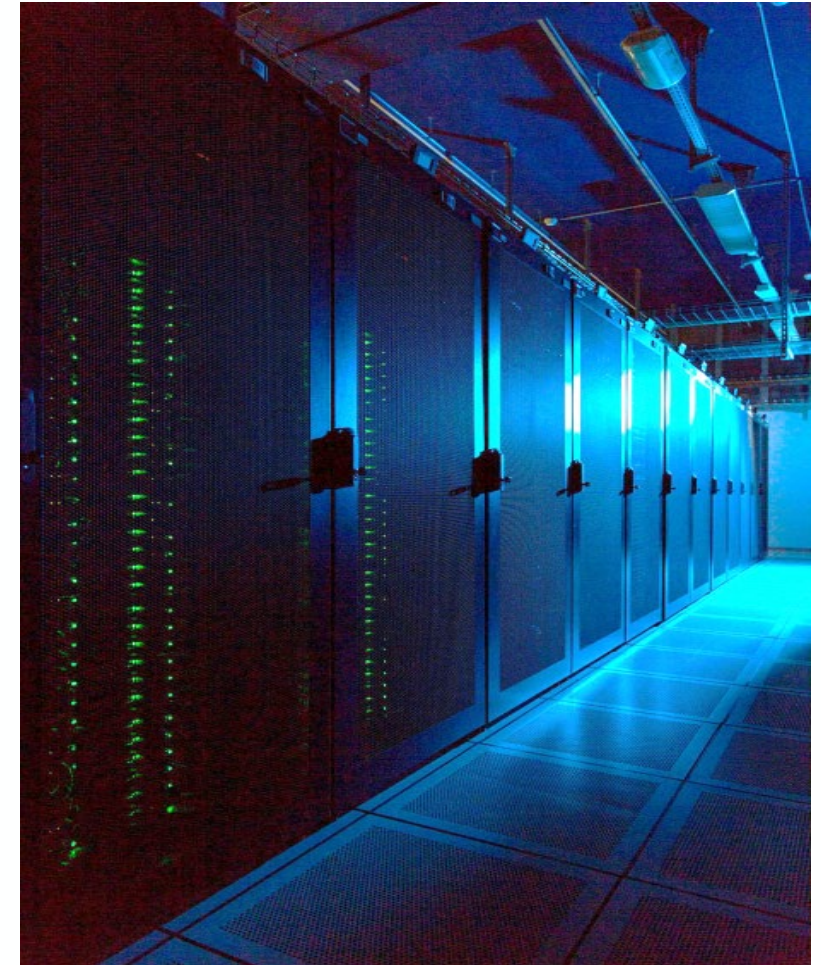
Continuous and automatic processing

Every day, the Tropisco processor :

- processes new Sentinel-1 images (on all countries)
- detects the forest losses
- updates the forest loss maps and statistics
- transfers products to webGIS

⇒ Fully automatic process, same algorithms for all countries

However, input data (masks, parameters, DEM) can be provided by the country users

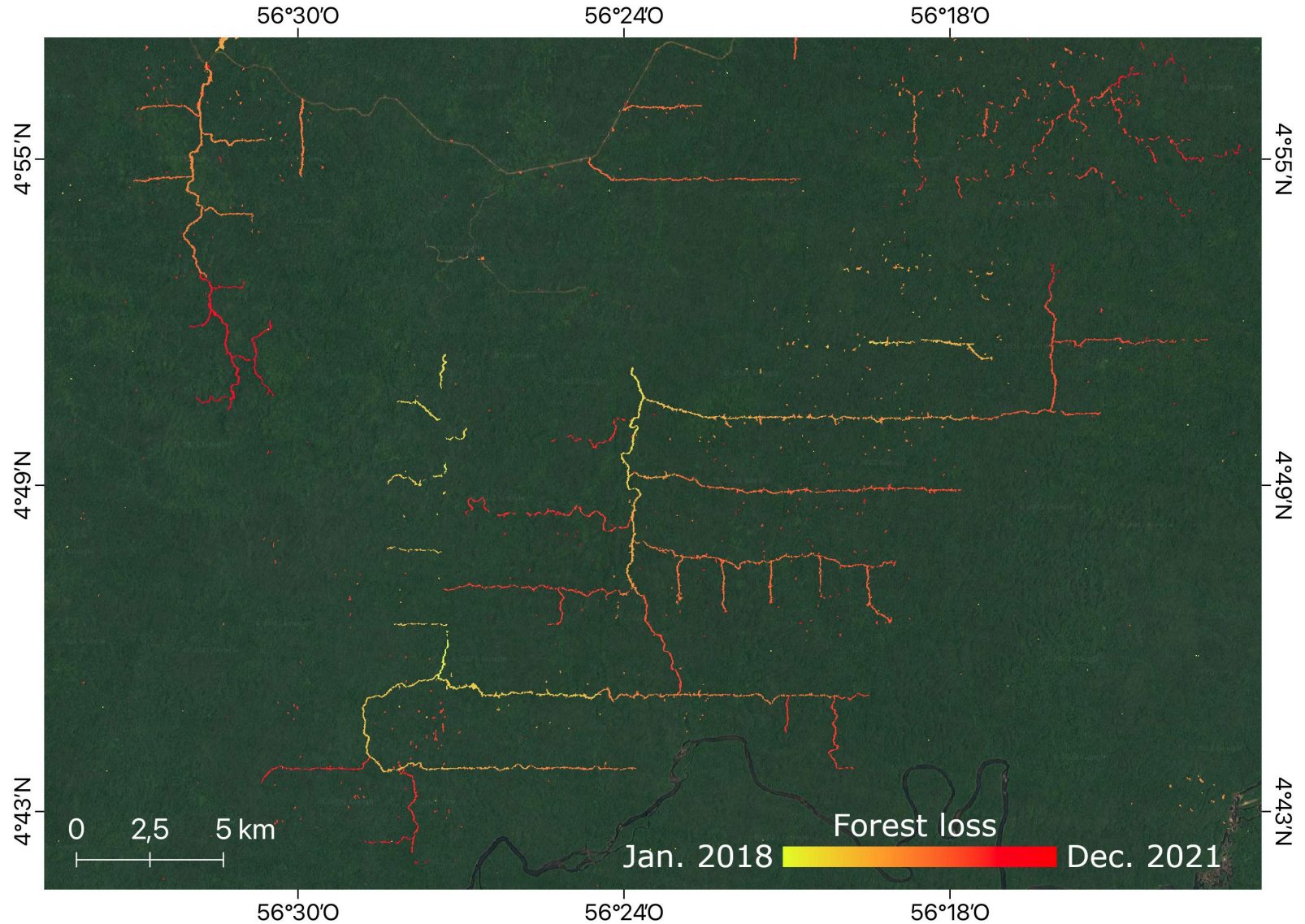


CNES HPC facility

Selective logging in Suriname

Forestry is a major economic activity in Suriname

The selective logging is a degradation responsible for the 2nd carbon source, after gold mining (Suriname Gouvernement, 2018)



TropiSCO webGIS



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Search a country/city

GB



www.tropisco.org
Opening in June !

- Interactive mapping, from global view to pixel level
- Interactive information : detection date, statistics
- Direct download of products
- WMS for direct integration to GIS tools

Start date
01/01/2018

01/01/2018
2018

2019

2020

2021

2022

22/05/2022

End date
22/05/2022

Confidence index
High

10



Gold mining in French Guiana



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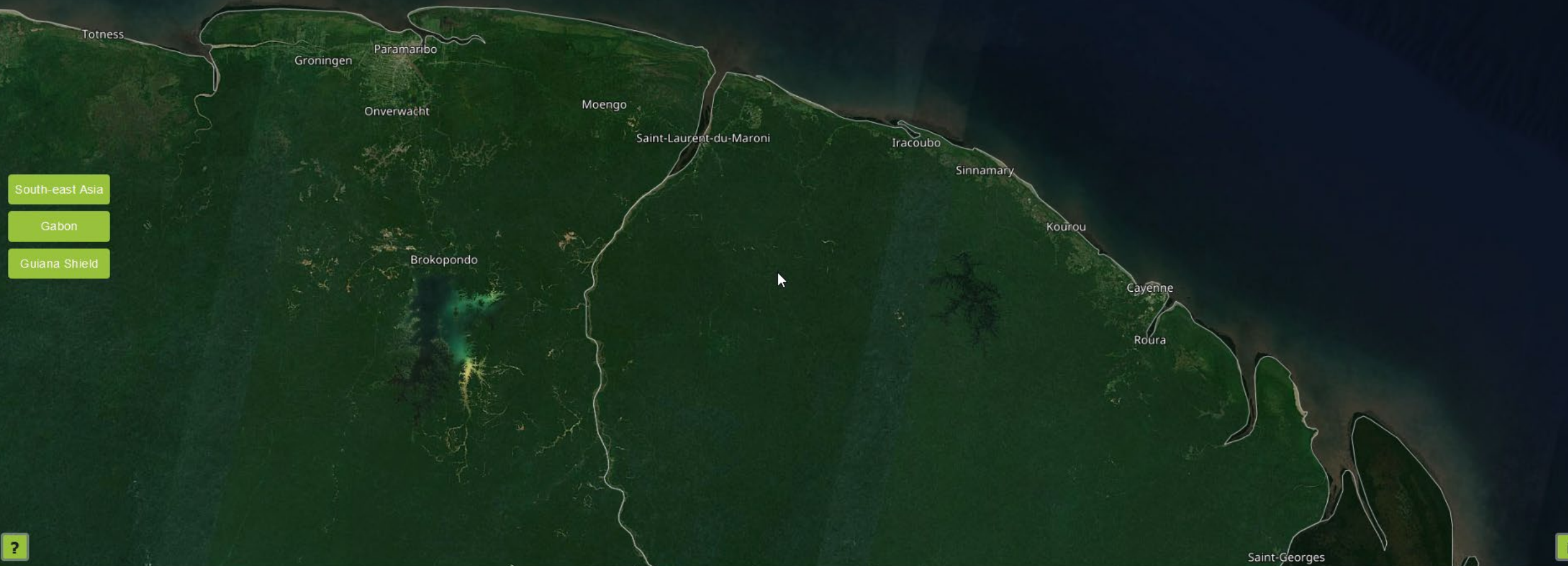
Explore



06/2017

04/2022

50 km



- South-east Asia
- Gabon
- Guiana Shield



Start date
01/01/2018

01/01/2018



End date
22/05/2022

Confidence index
Medium

Mining impacts in Gabon



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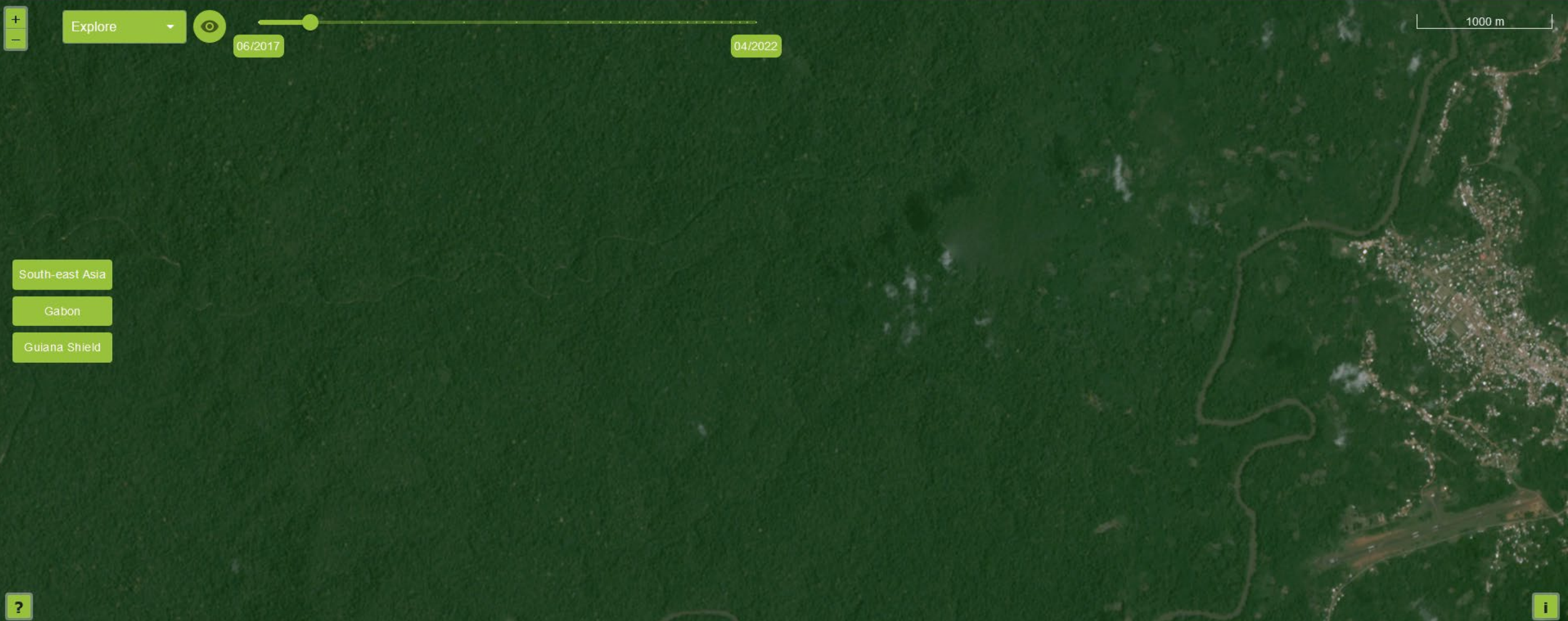
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Start date
01/01/2018

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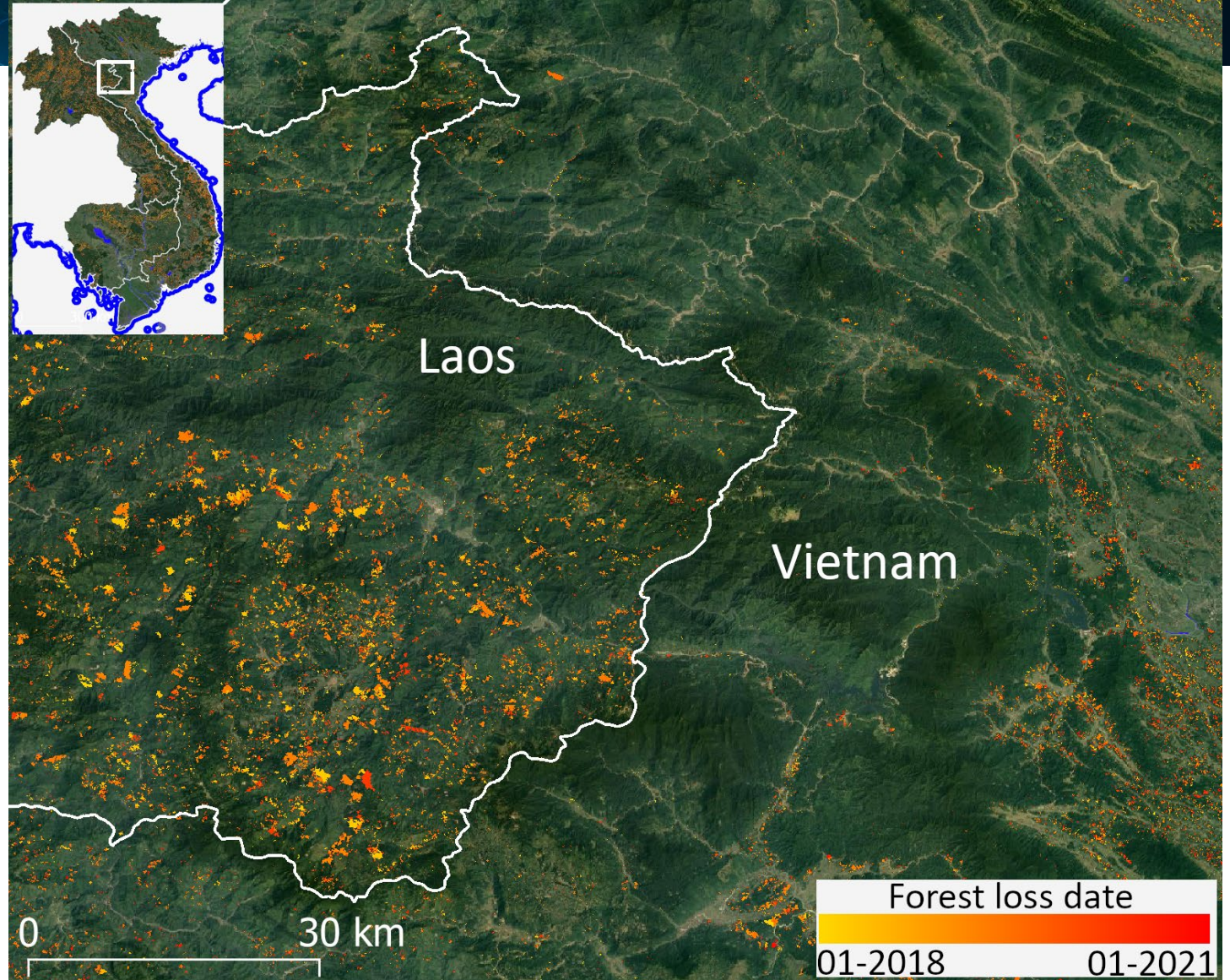
2022

End date
22/05/2022

Confidence index
Medium

Strong contrast between Laos and Vietnam on the borders

High pressure on Vietnam forests moved to Laos and Cambodia (Ingalls et al., 2018)



Forest loss in Laos



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Start date
01/01/2018

01/01/2018

2018

2019

2020

2021

2022

22/05/2022

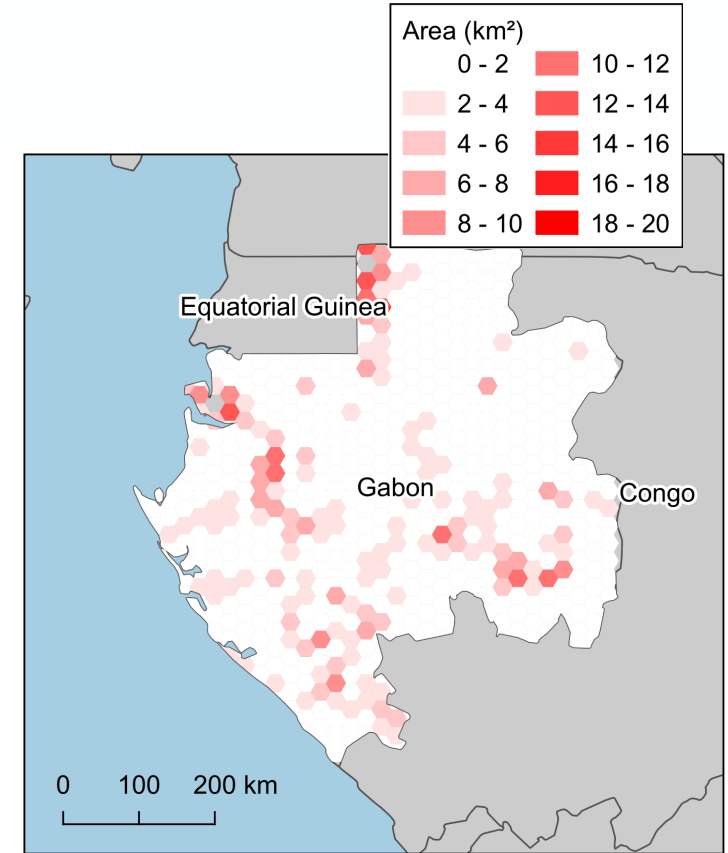
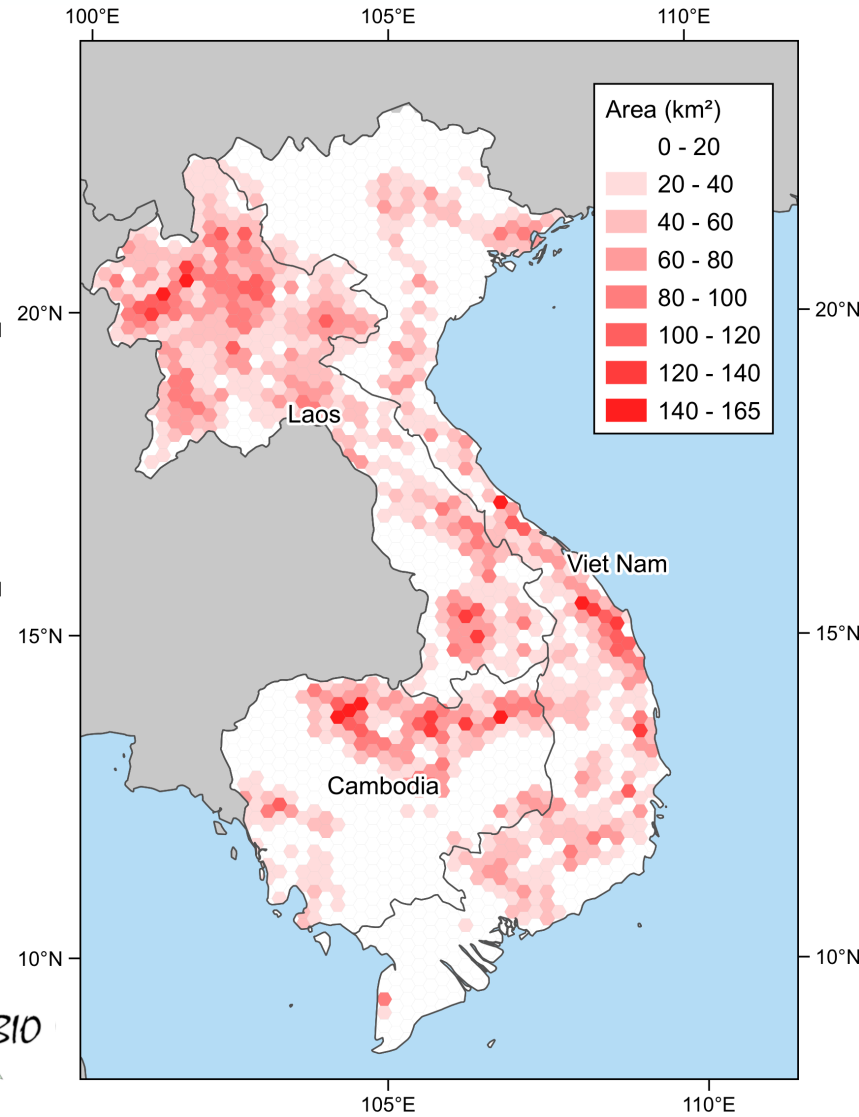
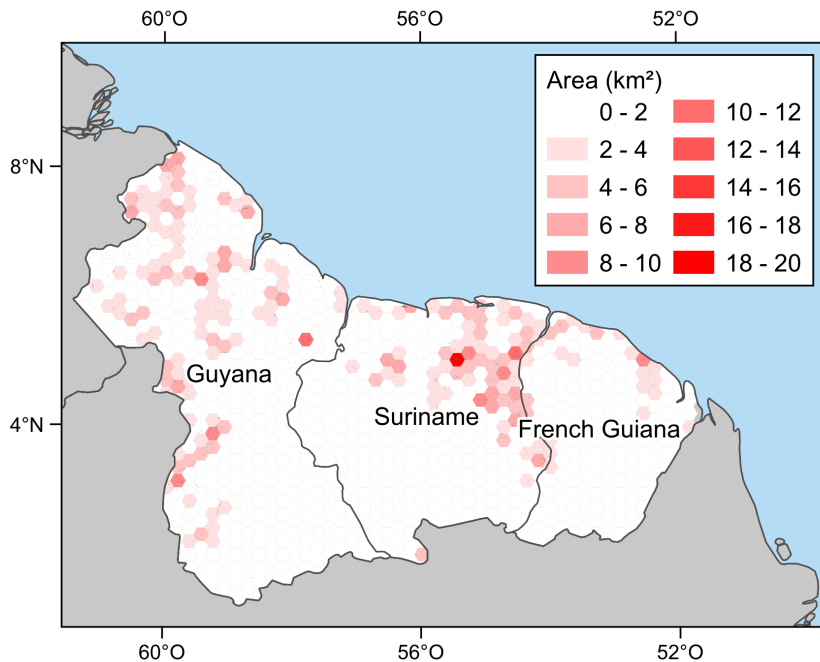
End date
22/05/2022

Confidence index
Medium

Forest loss synthesis

Forest loss (2018-2021)

One hexagon = 460 km²



Thanks to Simon Gascoïn and Maylis Duffau (CESBIO) for infographic



TropiSCO website
(opening in June)

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Mermoz et al. (2021). Continuous Detection of Forest Loss in Vietnam, Laos, and Cambodia Using Sentinel-1 Data. Remote Sensing, 13(23), 4877. <https://doi.org/10.3390/rs13234877>

Ballère et al. (2021). SAR data for tropical forest disturbance alerts in French Guiana: benefit over optical imagery. Remote Sensing of Environment, 252, 112159. <https://doi.org/10.1016/j.rse.2020.112159>

Bouvet et al. (2018). Use of the SAR shadowing effect for deforestation detection with Sentinel-1 time series. Remote Sensing, 10(8), 1250. <https://doi.org/10.3390/rs10081250>