

MONITORING SELECTIVE LOGGING IMPACTS IN TROPICAL FORESTS USING SENTINEL-1 SAR: A CASE STUDY IN THE JAMARI FOREST (ID: 139)

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**Tropical Forests**

Crucial for:

- Climate regulation
- Biodiversity conservation
- Carbon sequestration

**Sustainable Management**

- Selective logging is less harmful than clear-cutting
- Practices like Reduced Impact Logging (RIL) within Sustainable Forest Management (SFM) reduce damage

**Problem**

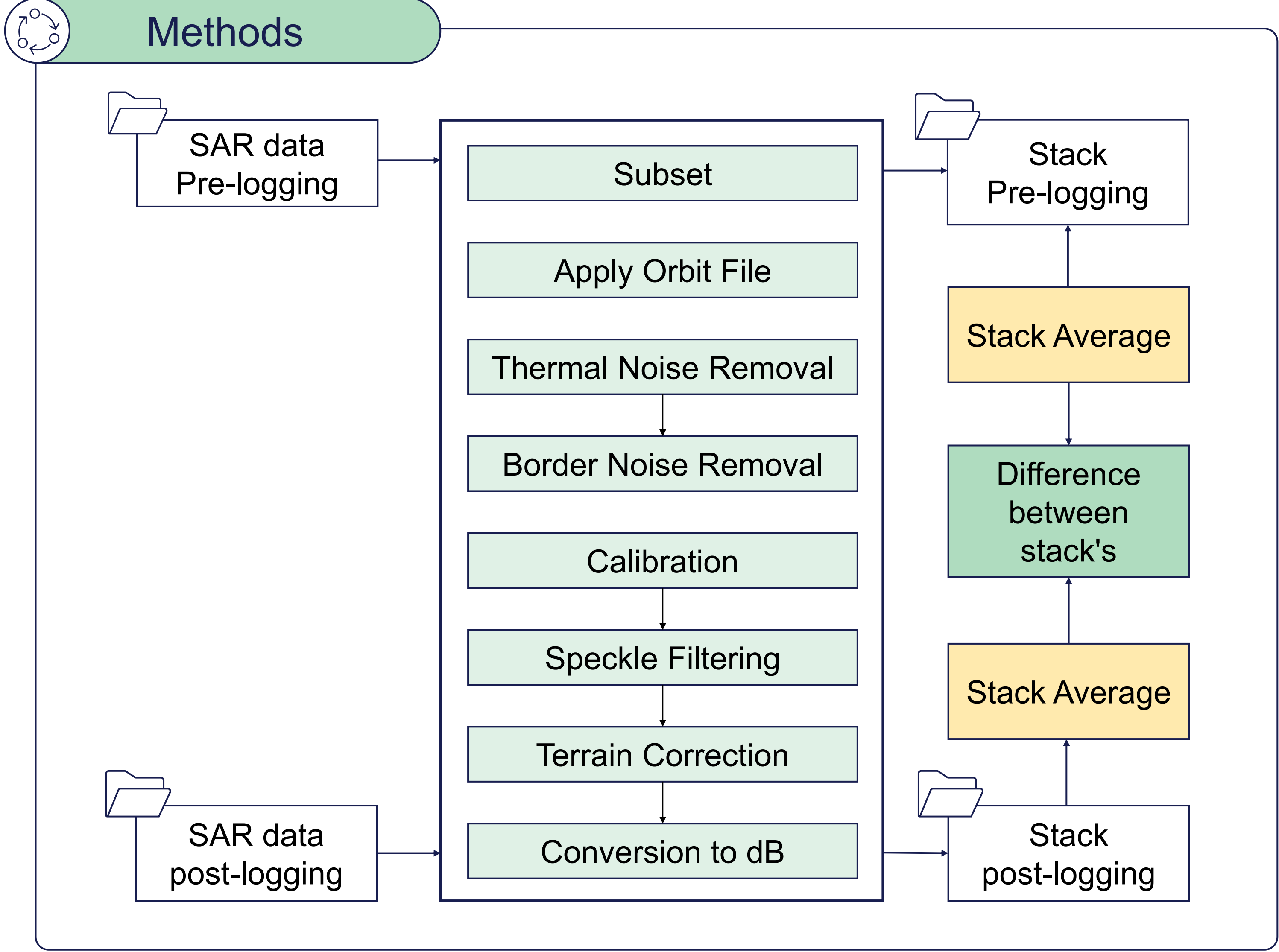
- Need for scalable, affordable tools
- LiDAR is accurate but expensive/logistically complex
- Monitoring remote areas is difficult

**Solution**

Sentinel-1 SAR is free, weather-independent, and ideal for monitoring large, remote regions such as the Amazon

**Objective**

To develop a methodology for quantifying the impacts of selective logging in tropical forests using multitemporal Sentinel-1 SAR data in Brazil's Jamari National Forest.



**Data**

Two multitemporal Sentinel-1 datasets were created to match the logging periods of each study area.

SAR data Pre-logging

13 images

Study Area 1 and 3

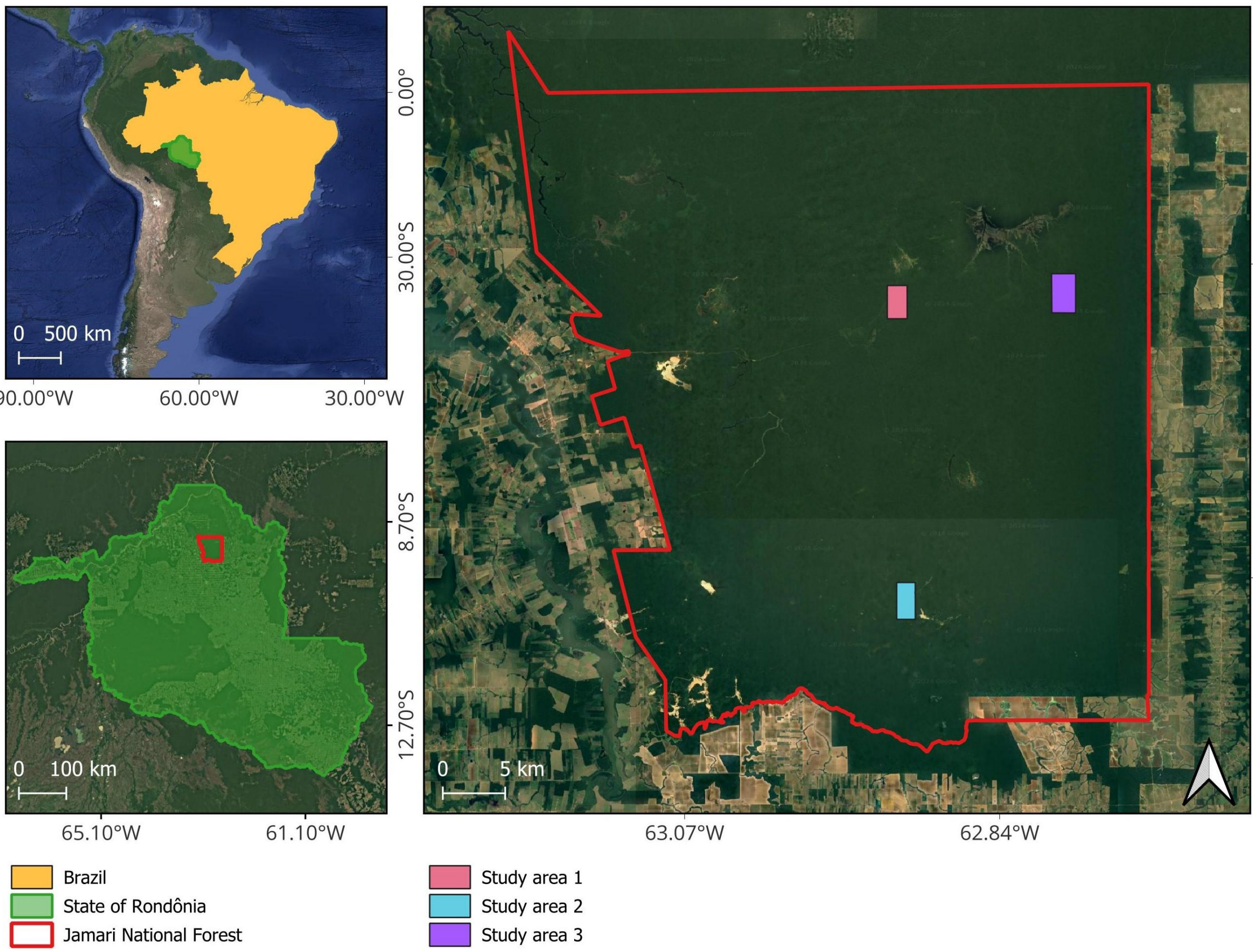
SAR data post-logging

13 images

10 images

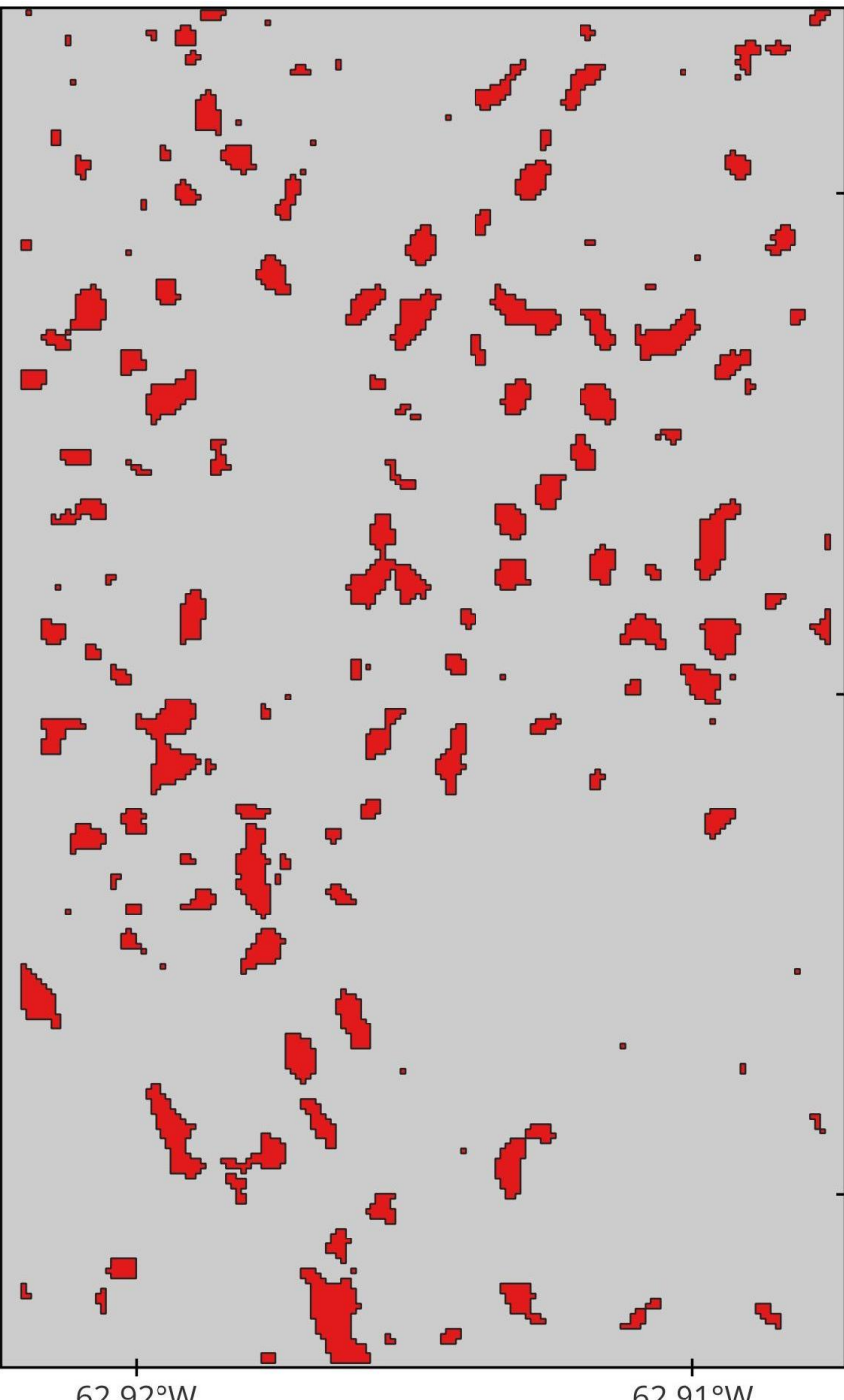
Study Area 2

10 images

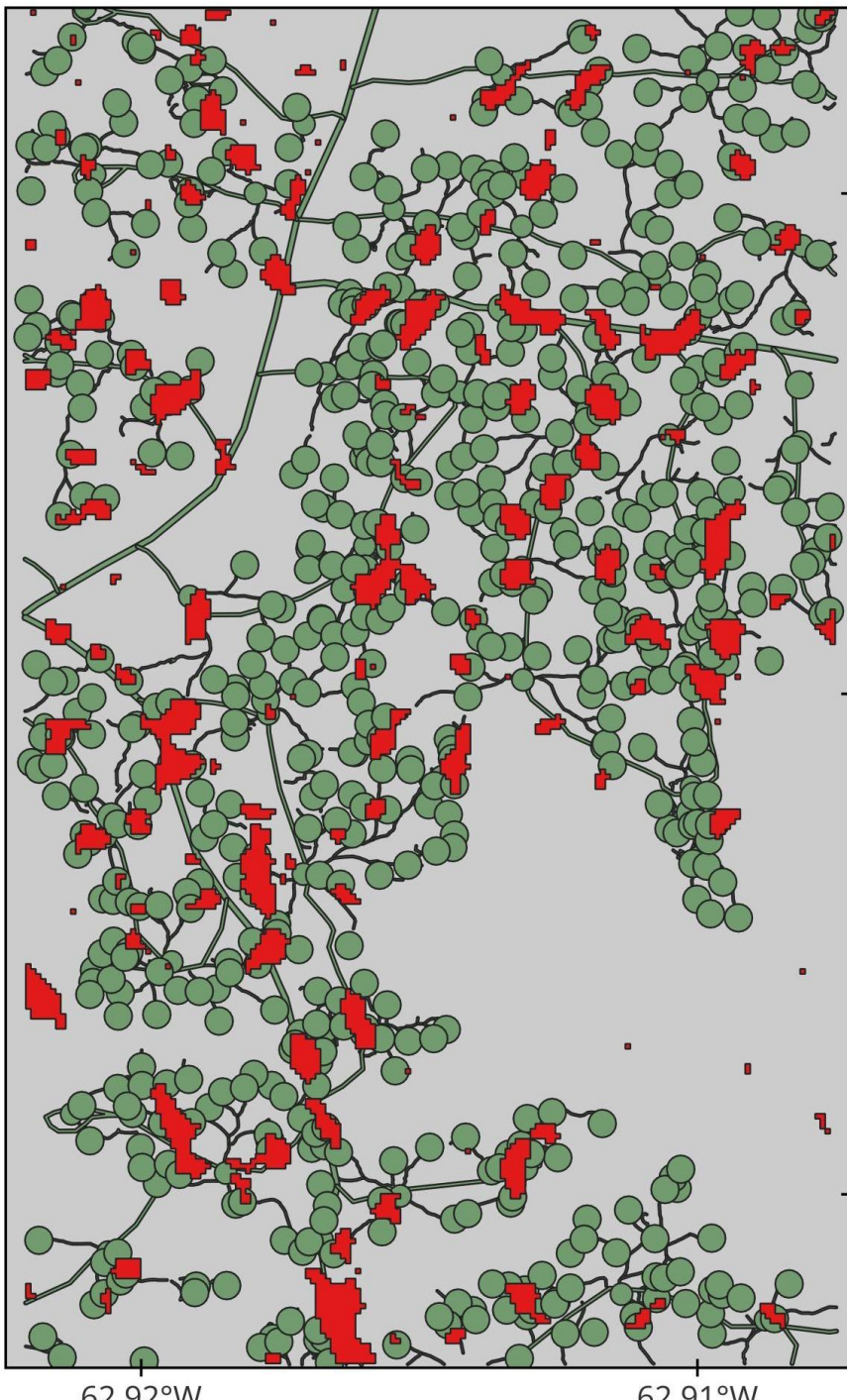


**Results**

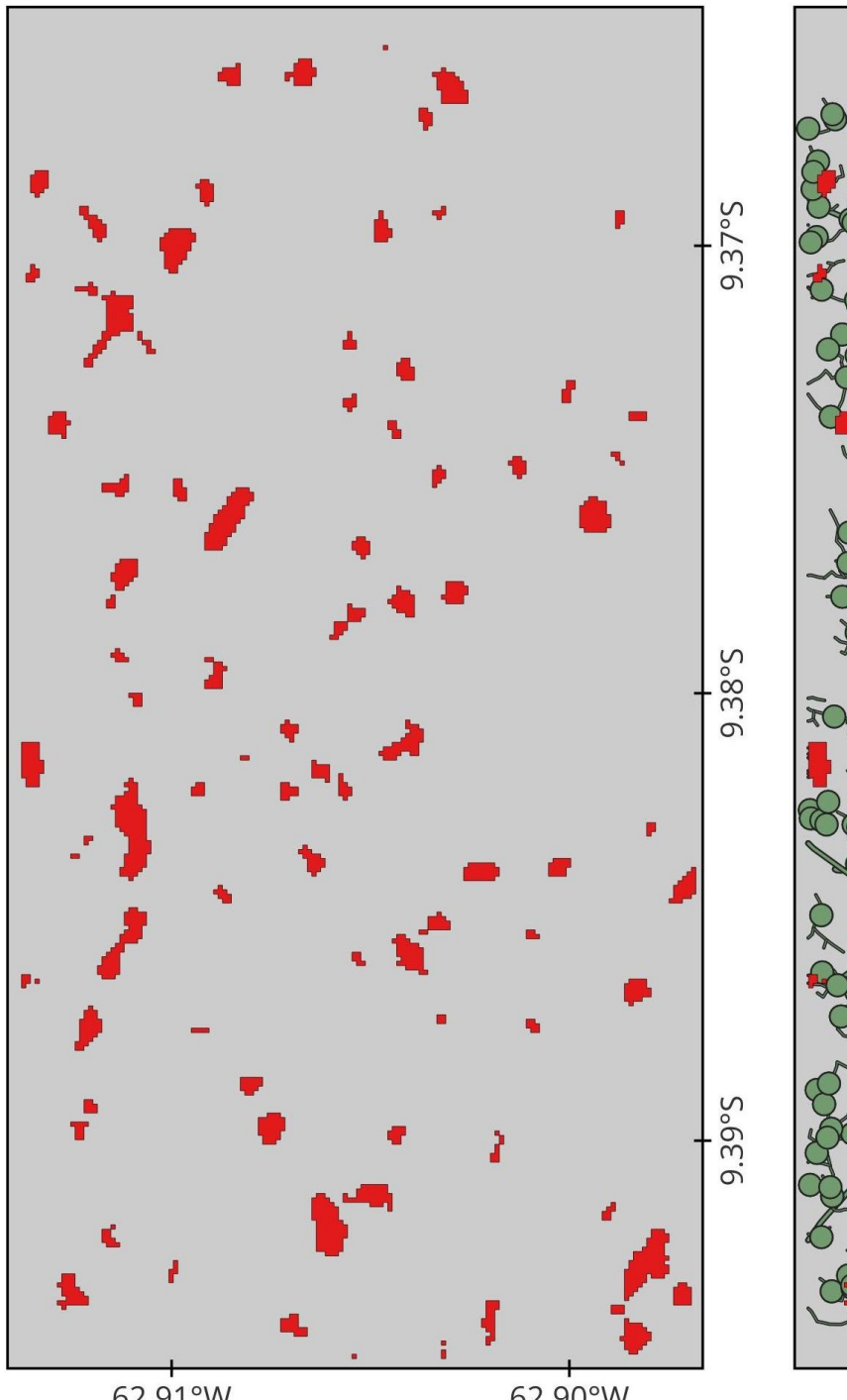
(a)



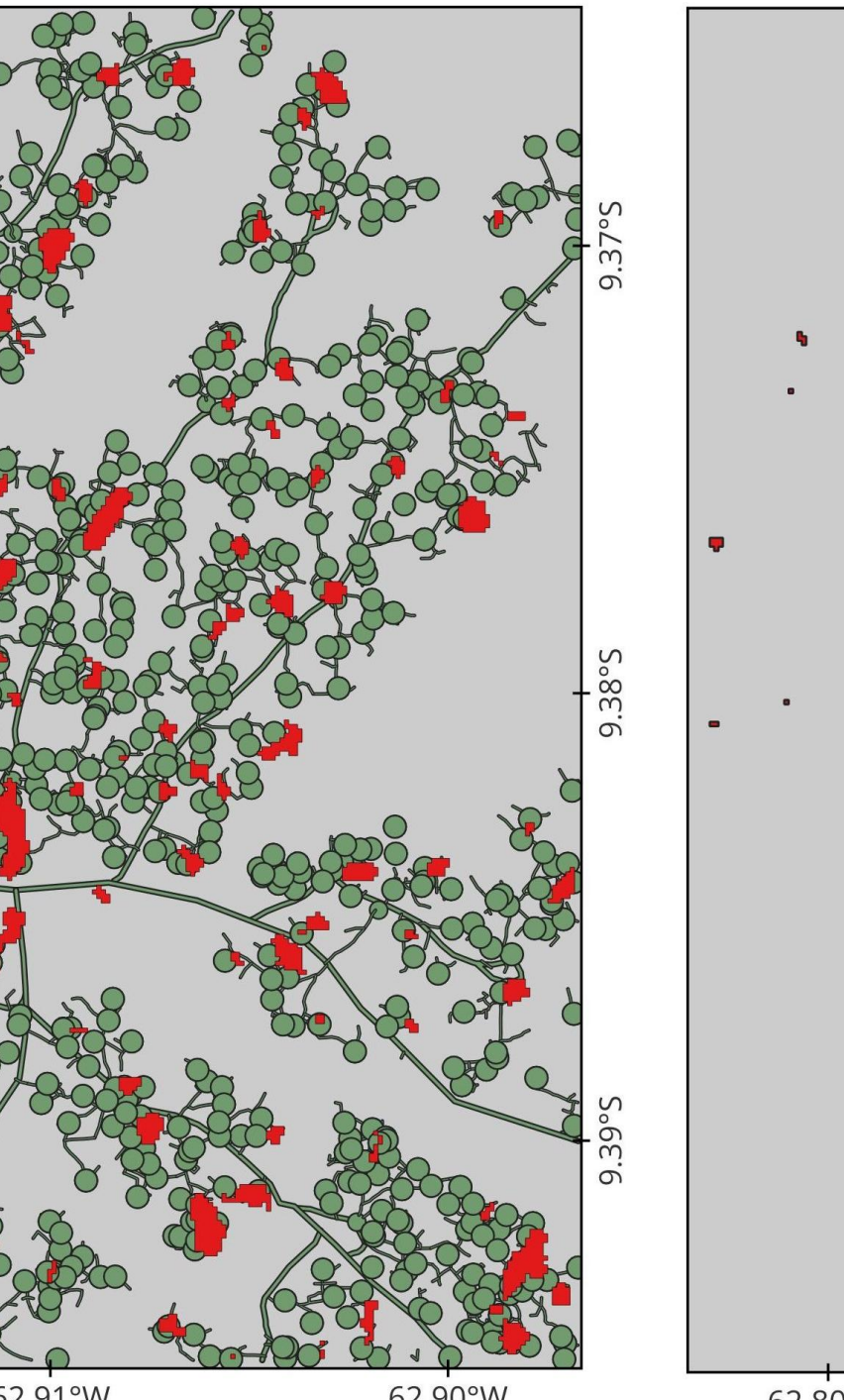
(b)

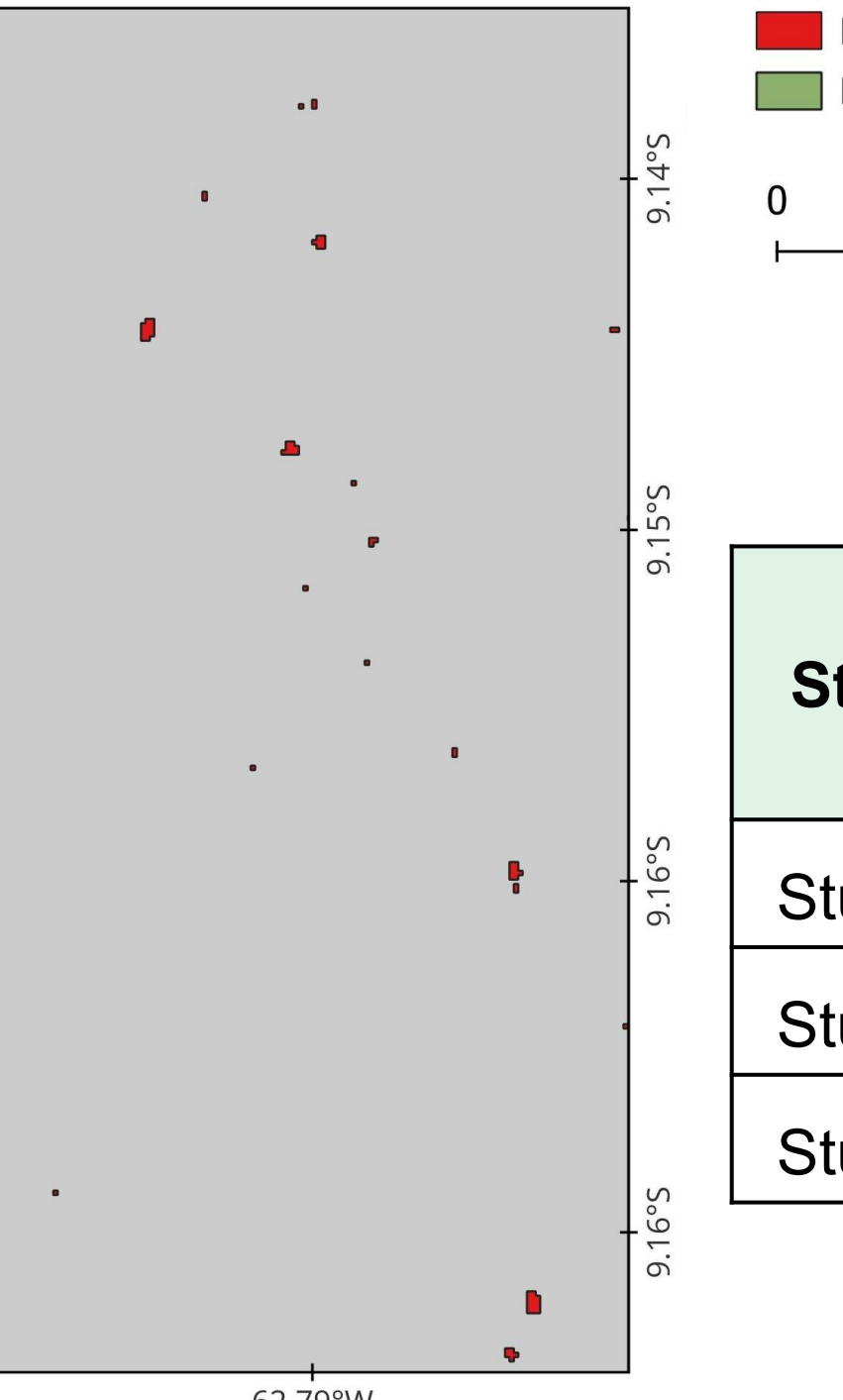


(c)



(d)





Results for Study Area 1: (a) SAR-derived impact areas; (b) overlay of SAR-derived impact areas with the logging infrastructure.

Results for Study Area 2: (c) SAR-derived impact areas; (d) overlay of SAR-derived impact areas with the logging infrastructure.

Results of the methodology applied to the Study Area 3.

The SAR-derived impact maps highlight canopy disturbances, and overlays with logging infrastructure (Figures b and d) validate the detected changes. These findings are consistent with previous studies showing that selective logging increases the number and size of canopy gaps.

The undisturbed area showed a negligible impact of 0.16%, with no overlap with logging infrastructure, suggesting only natural canopy gaps.

Forest impact obtained with SAR

Forest infrastructure

0 300 600 m

Impact metrics for each study area

Study Area	Impact (%)	Intersection rate (%)
Study area 1	6.90	60.94
Study area 2	4.11	51.65
Study area 3	0.16	-

**Conclusions**

This study shows that a SAR-based approach is effective for detecting and measuring the impacts of selective logging in tropical forests. By using freely available Sentinel-1 data, we were able to detect canopy changes in the selectively logged areas of the Jamari National Forest.

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