

Post-K&C – First Report

Integrating multisensor information as analysis-ready data for semiautomated monitoring of South American wetlands

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Post-KC Science Team meeting #1
Tokyo, Japan, January 20-24, 2020

UNIVERSITY of
STIRLING



Instituto de Desenvolvimento
Sustentável Mamirauá



Project outline and objectives

- 1) Develop cloud-based data acquisition and storage procedures for optical (Landsat, Sentinel-2) and SAR (PALSAR-1, Sentinel-1) data;
- 2) Develop a pre-processing workflow to derive temporal descriptors from optical and SAR data;
- 3) Integrate optical and SAR temporal descriptors into consistent grid-based tiles with minimal data-gaps;
- 4) Demonstrate how this method could be applied in the future for combining existing minimal (Landsat, Sentinel-2) and expected (ALOS-3) optical data with existing (Sentinel-1, ALOS-2) and expected (ALOS-4) L-band SAR data;
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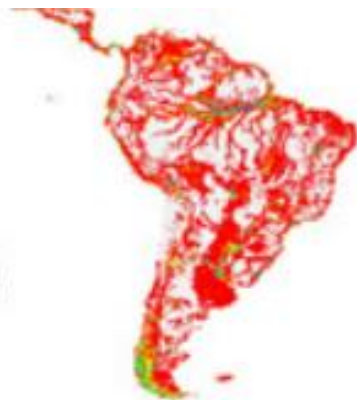
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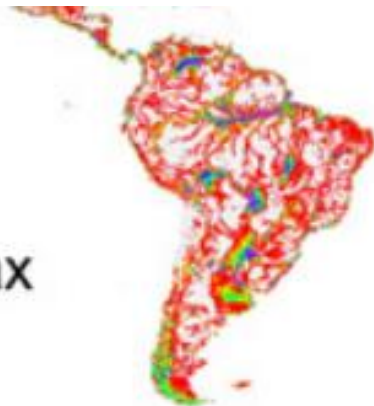
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Project outline and objectives

a) MA_{Min}

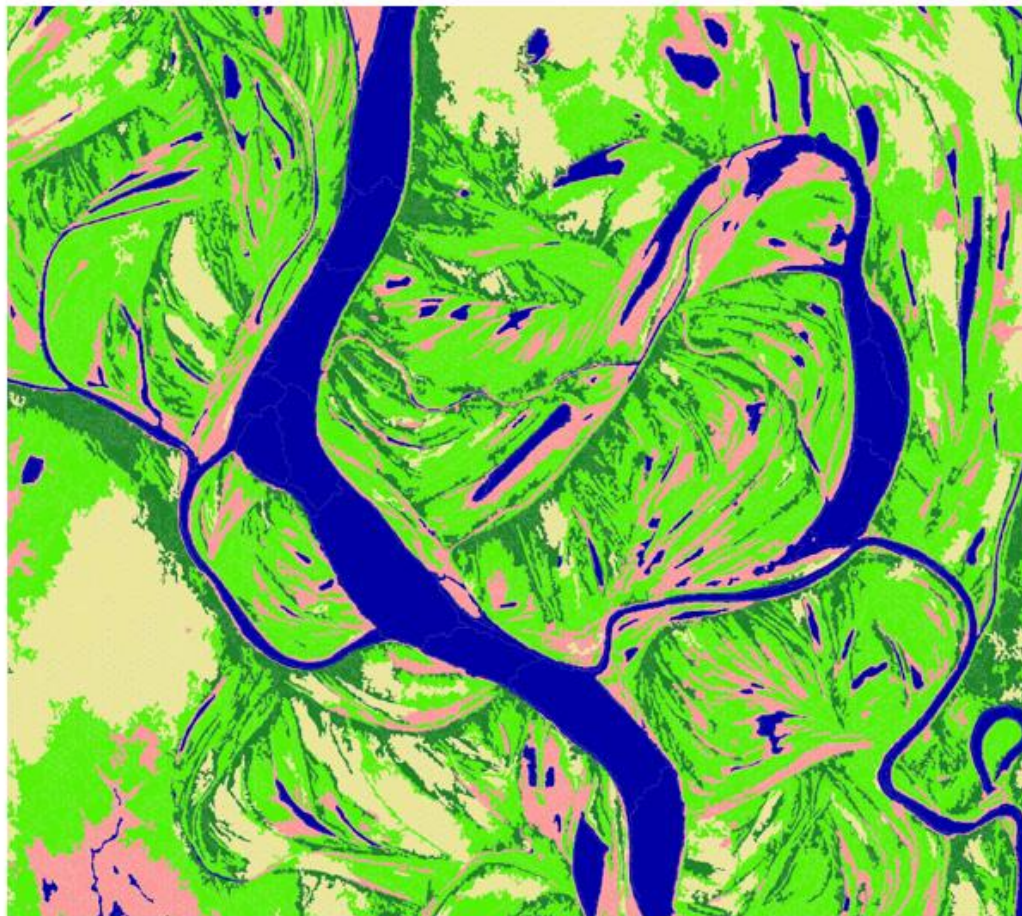


b) MA_{Max}



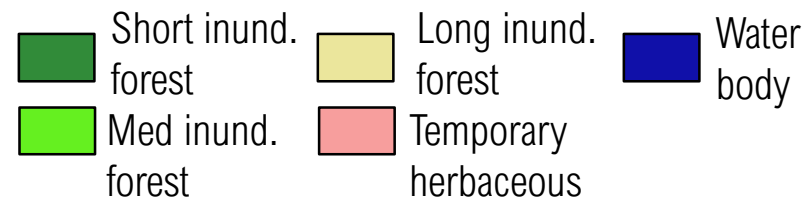
- Real extent of freshwater wetlands in South America not precisely known - may be up to 20% (~3.5 million km²) of its area (Junk, 2013).
- Lack of accurate assessment of distribution and extent of South American wetlands hinders monitoring and protection efforts
- Existing continental assessments are mostly based on lower resolution datasets (> 500m² per cell), or concentrated towards a few large systems, such as the Amazon and the Pantanal

Project outline and objectives



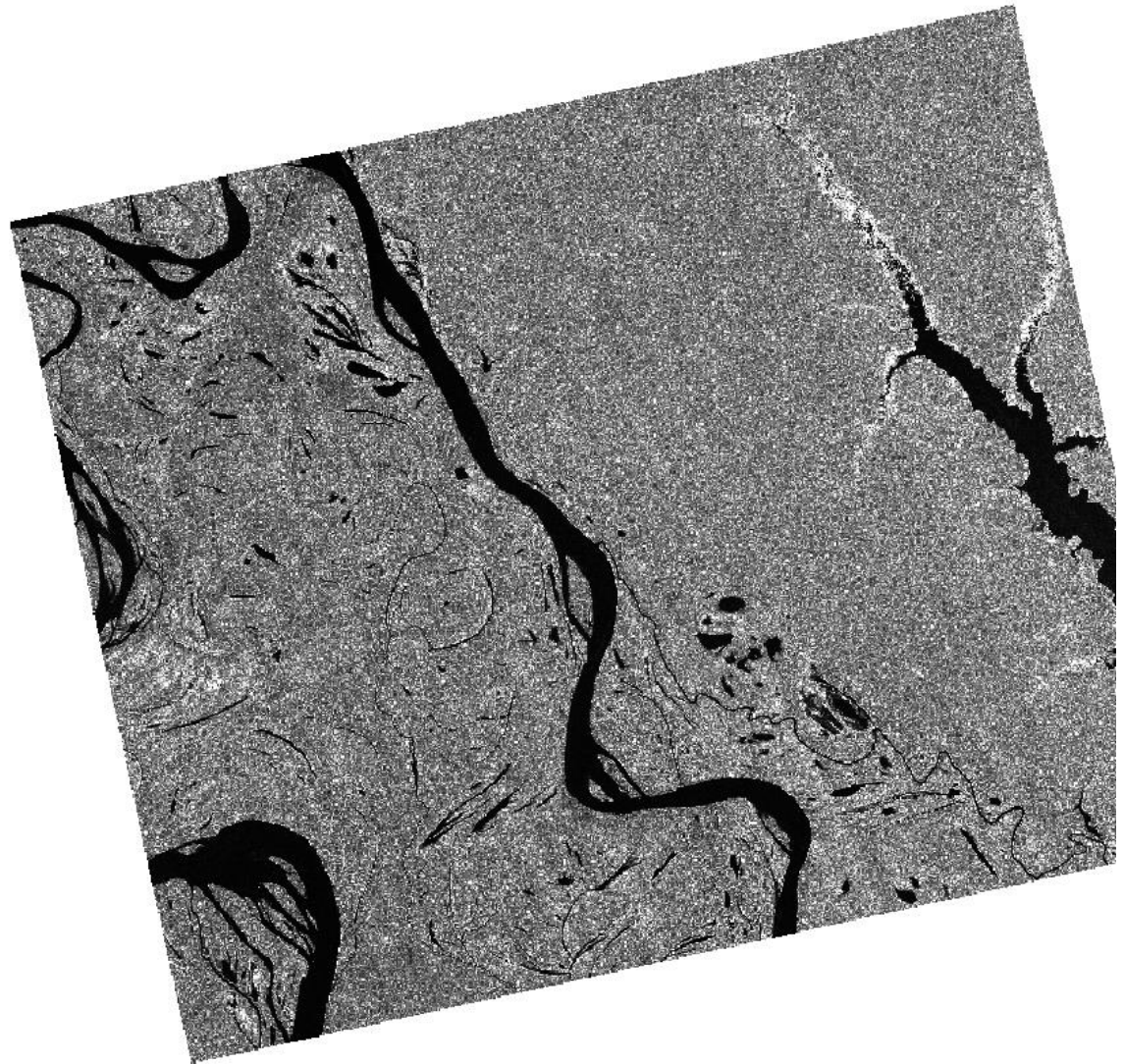
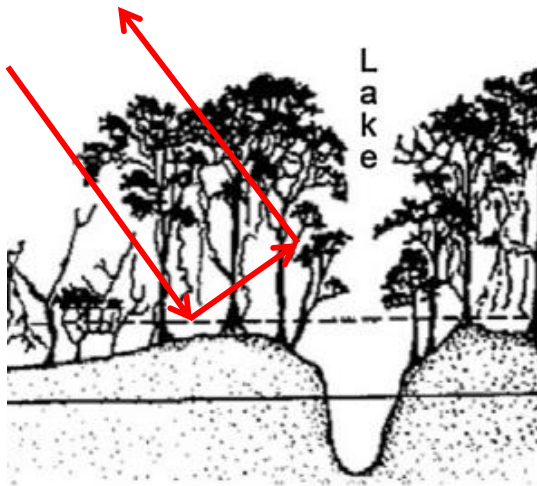
2km

- Wetlands are among the most spatially and temporally heterogeneous habitats
- Local scale processes determine ecological and biogeochemical processes
- Small wetlands, when aggregated, have significant importance for providing ecosystem services



Project Rationale

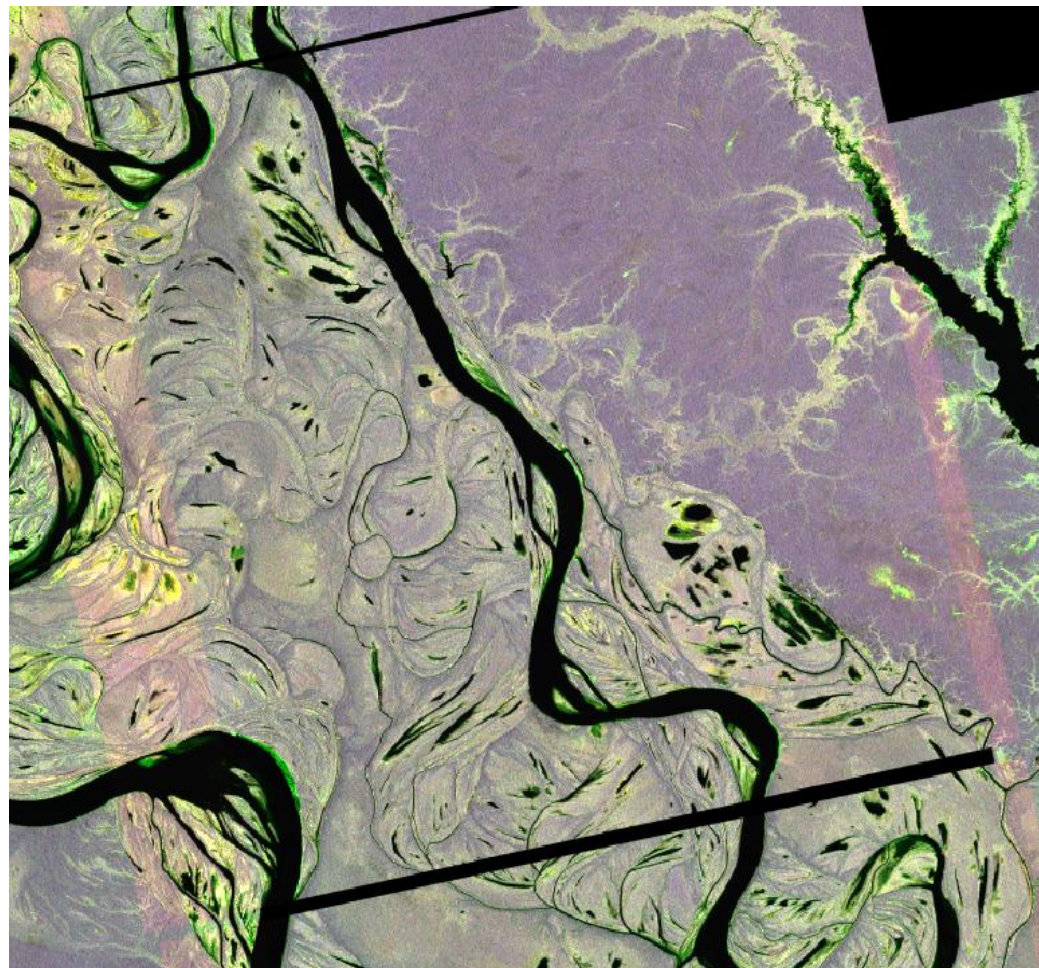
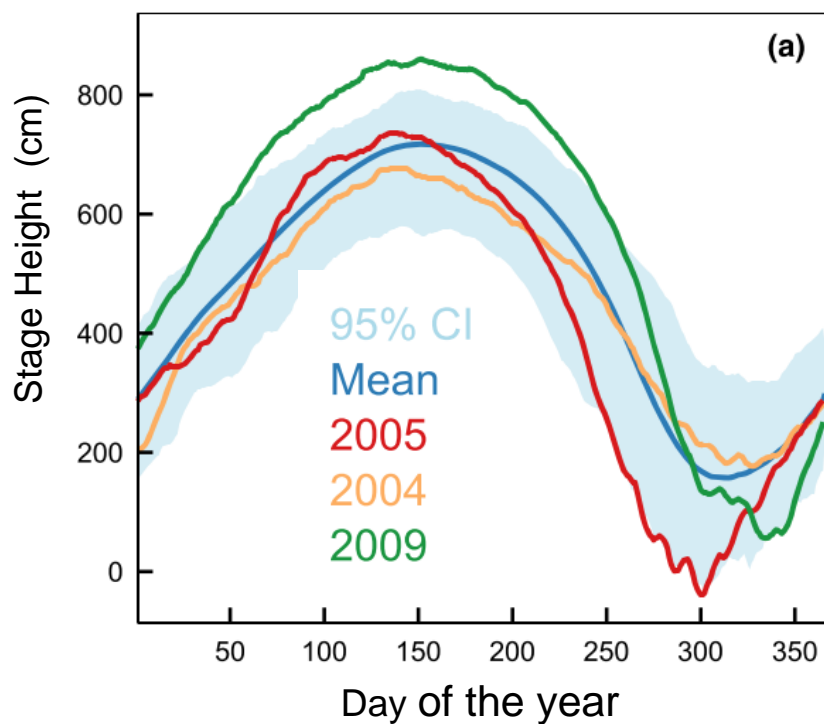
- Single date SAR images = limited information



Composição temporal

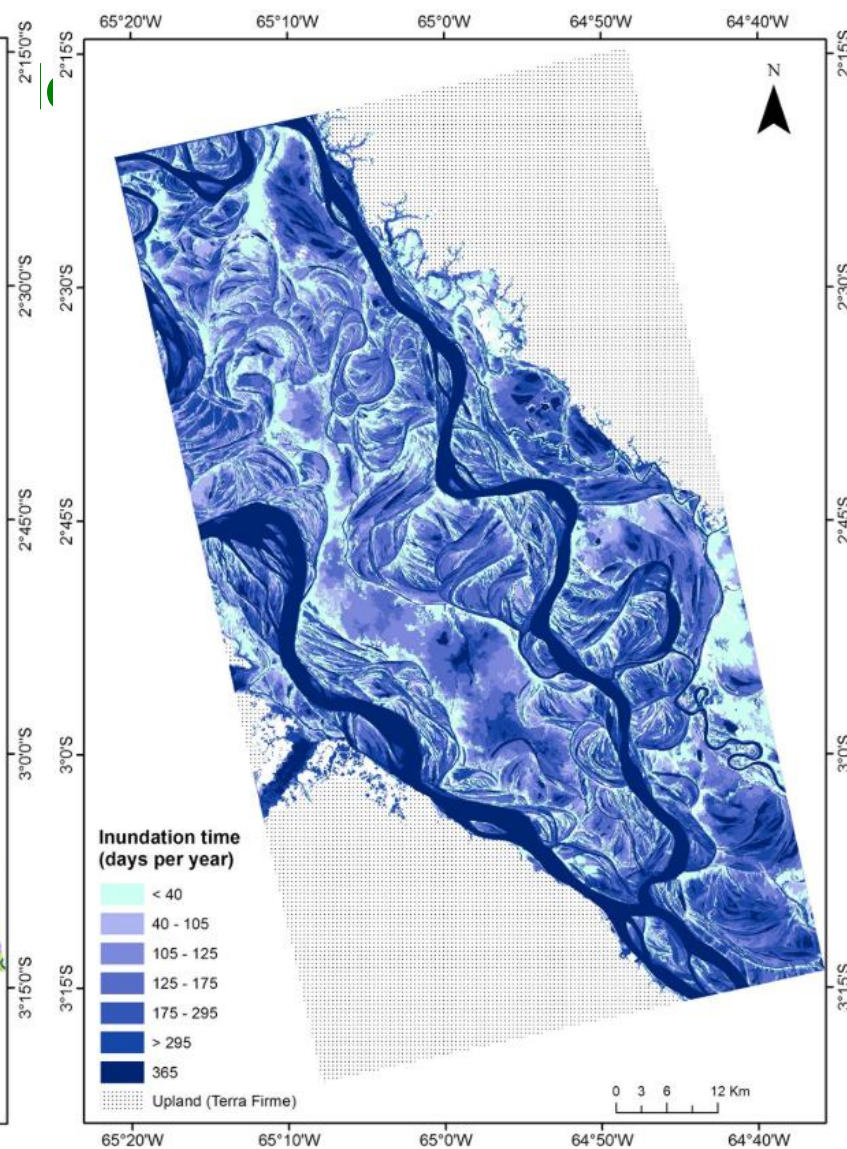
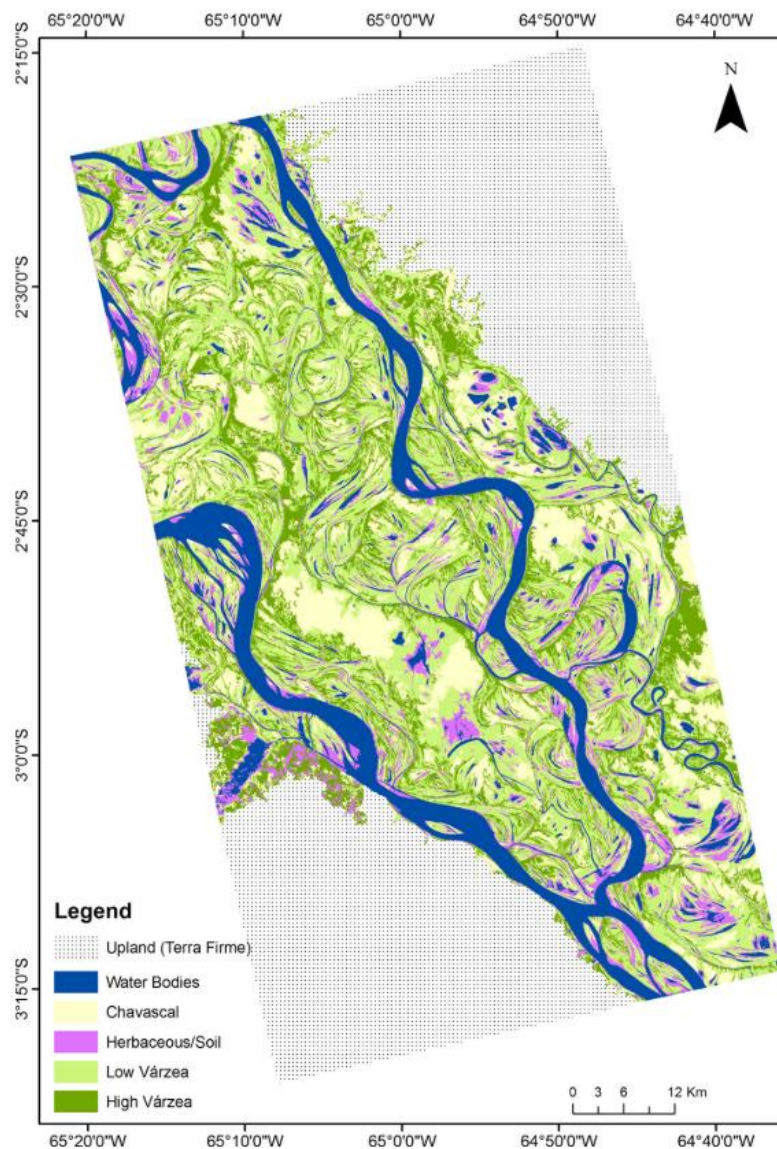
Project Rationale

- Temporal composites



ALOS

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An international science collaboration led by JAXA



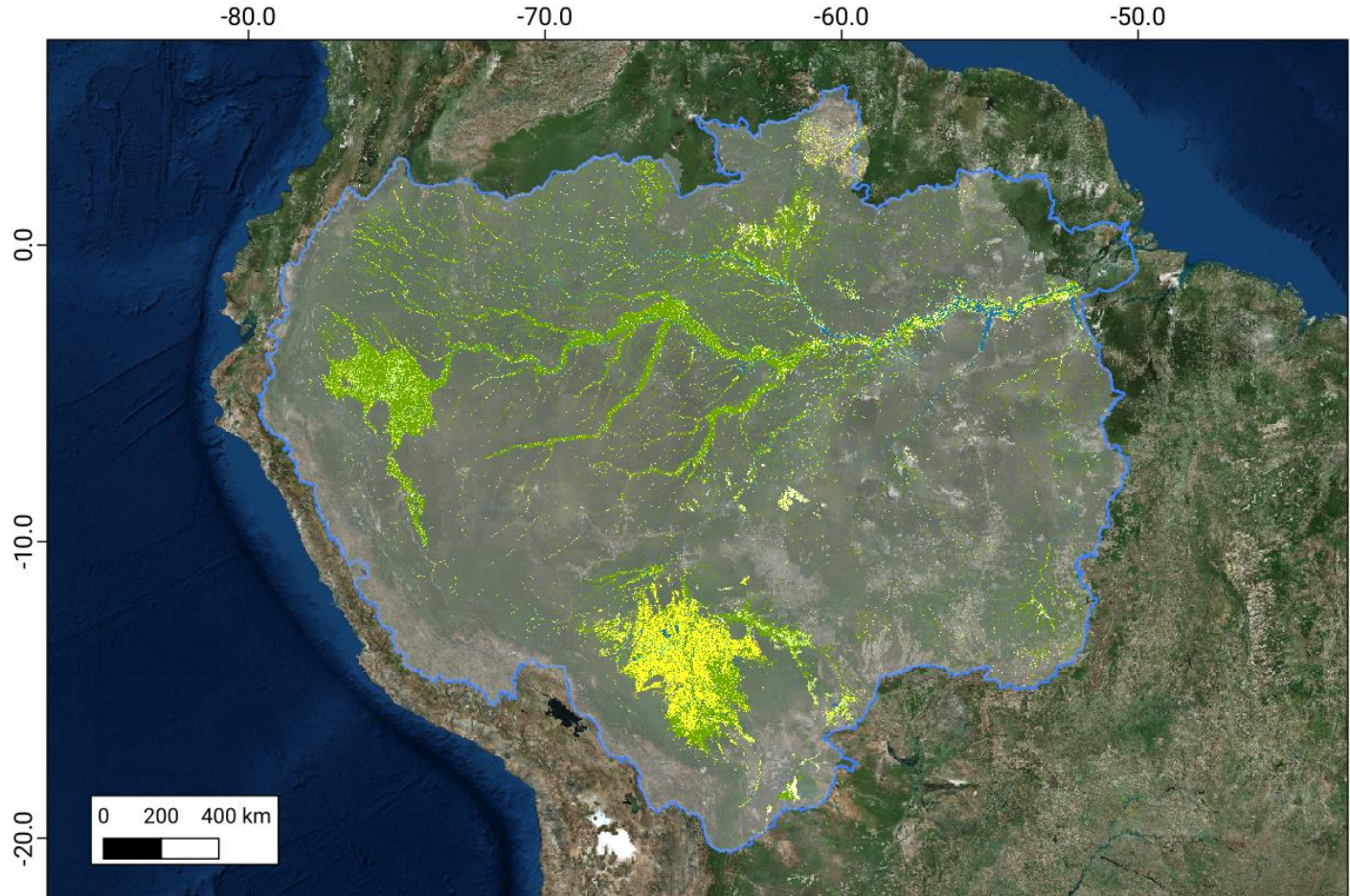
Ferreira-Ferreira et.
al.

Wetlands Ecology
and Management
(2015)

The best basin-wide Amazon wetlands map



UCSB

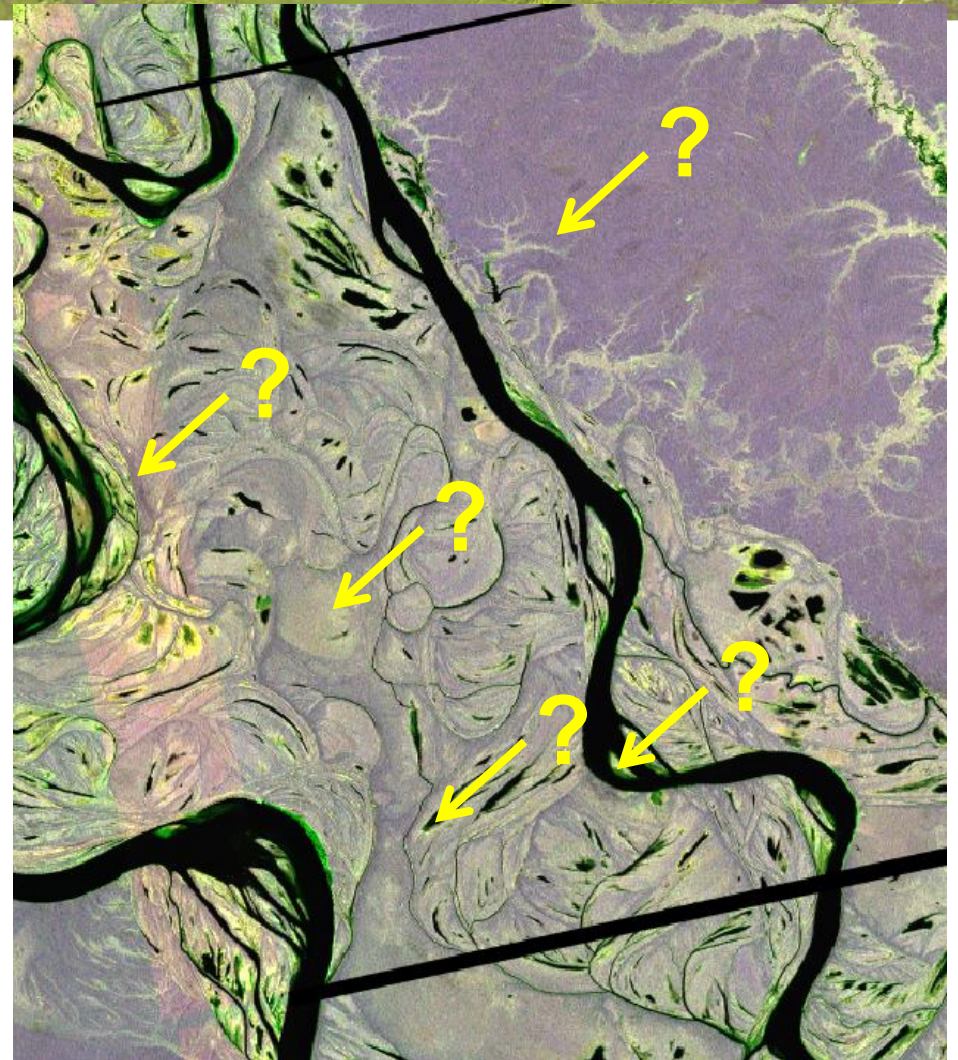
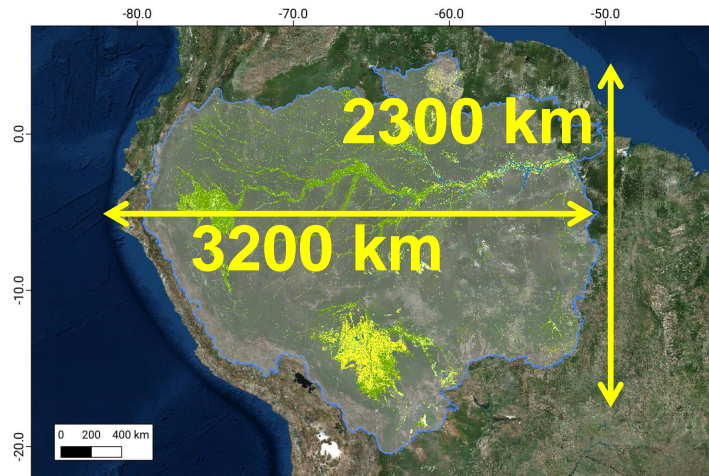




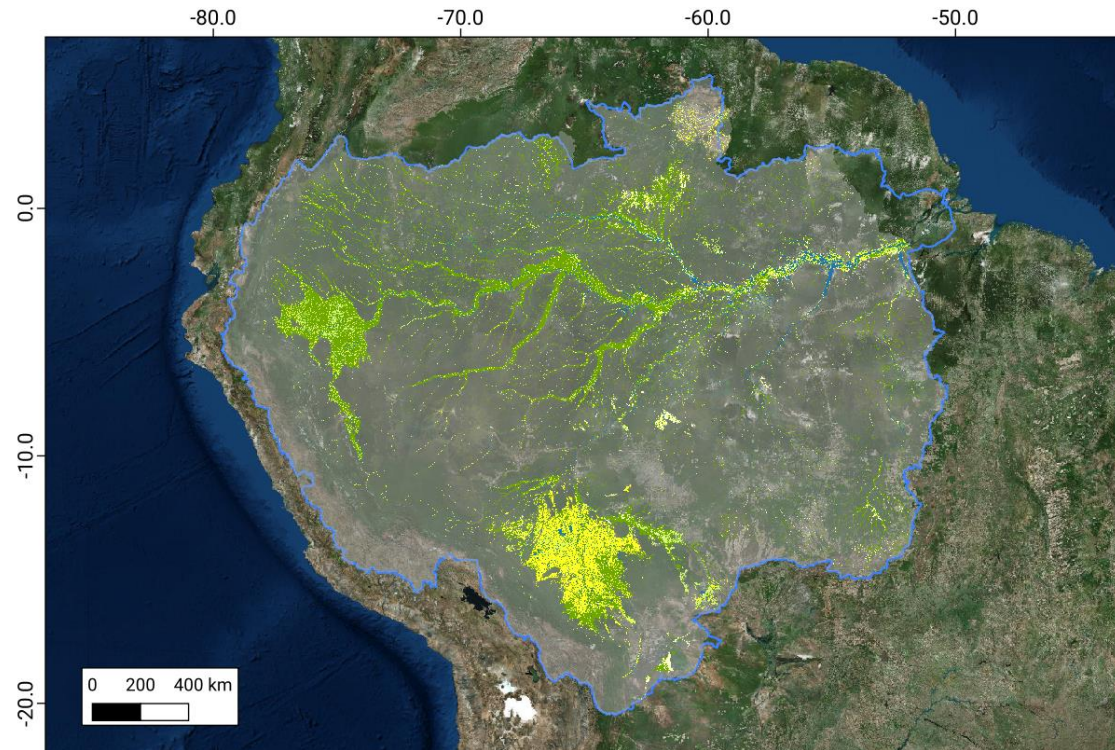
**50 paths * 40 rows * ~15
observations at full resolution =
30k images**

**30k images * 150 MB =
4.5 Terabytes**

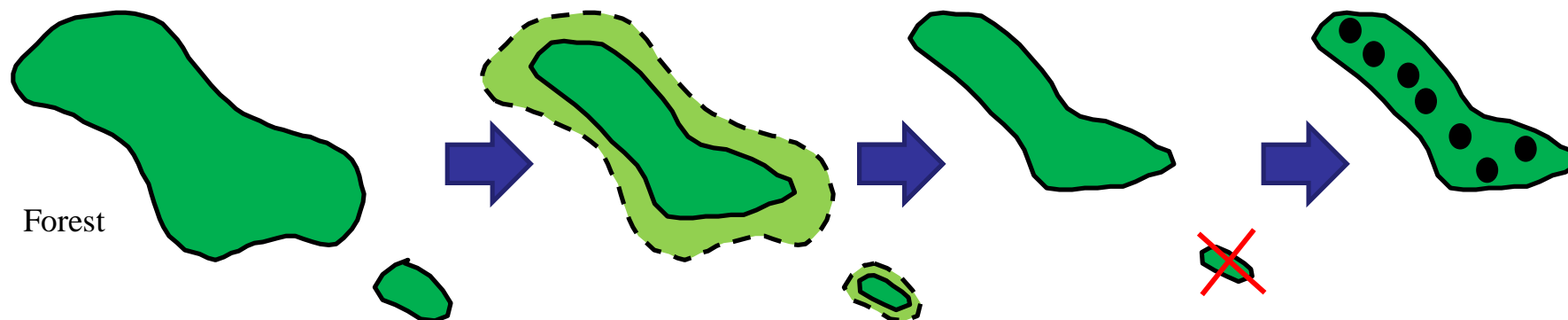
- Largest challenge:
- How to sample it for training?
- Field missions?



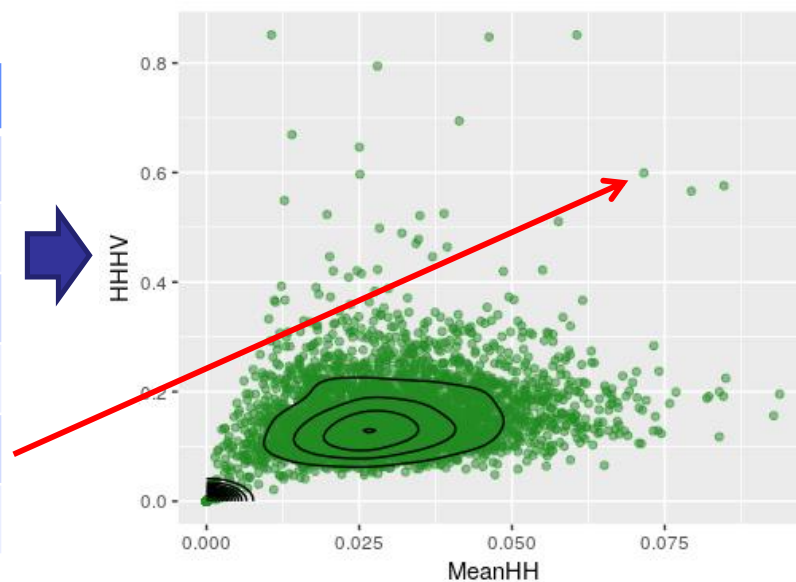
- Use the previous knowledge! Hess et al. 2003
- Advantages: full coverage, validated
- Disadvantages: low resolution, changes since 1996



Refining samples

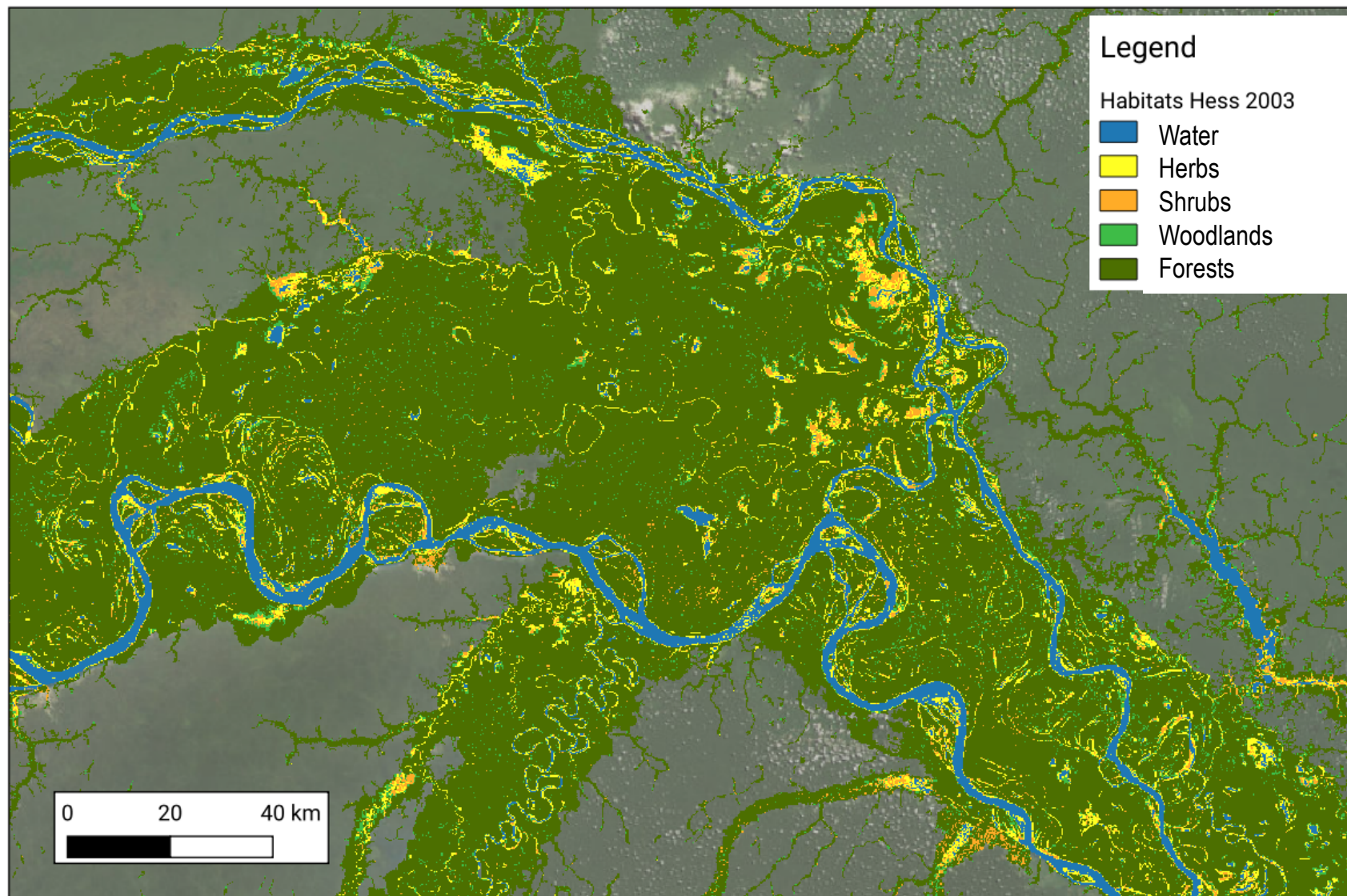


Class	Sample	MeanHH	HHHV
Forest	1	0.026	0.234
Forest	2	0.021	0.156
Forest	3	0.043	0.222
Forest	4	0.018	0.134
Forest	5	0.074	0.620
...



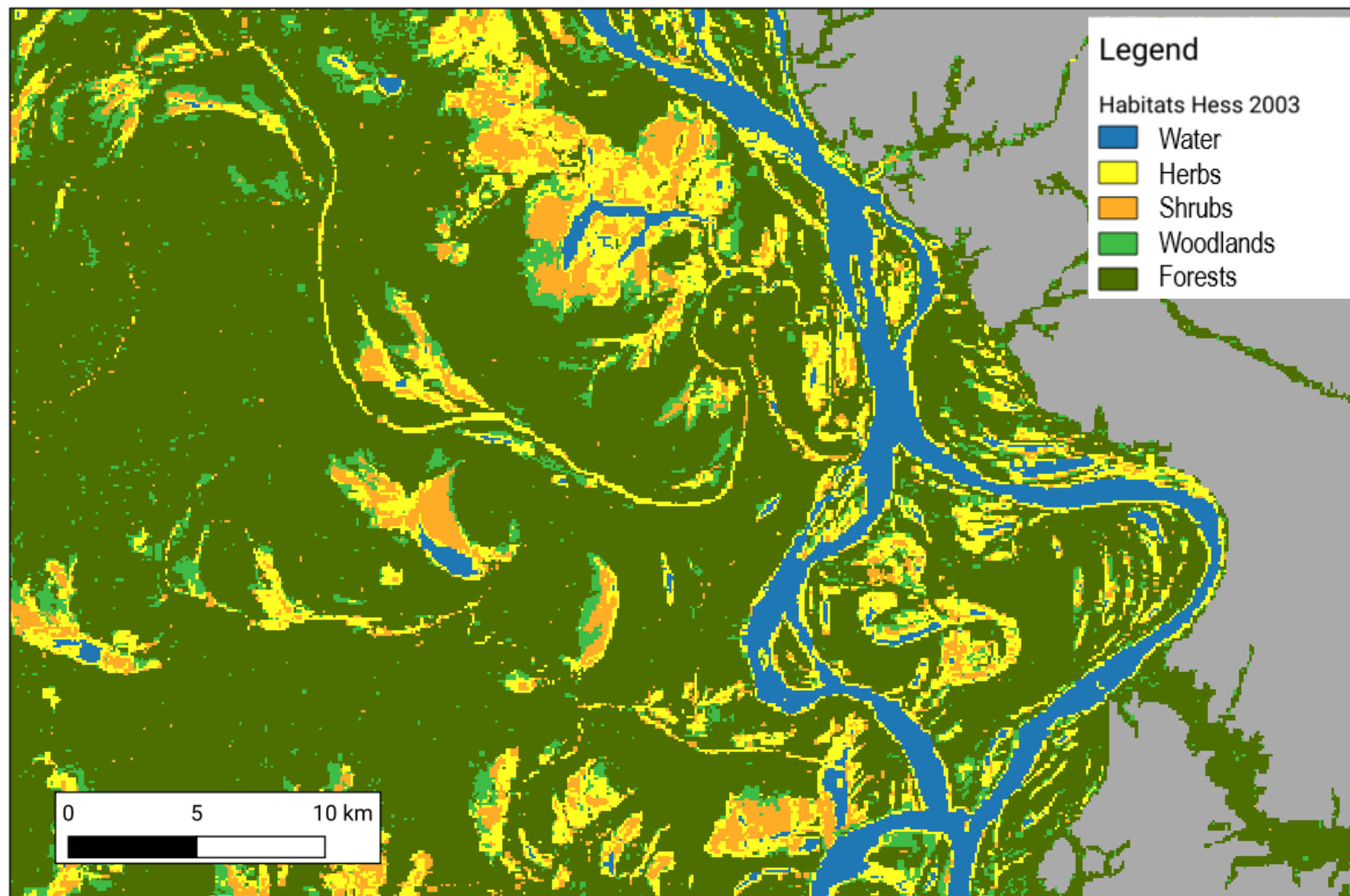
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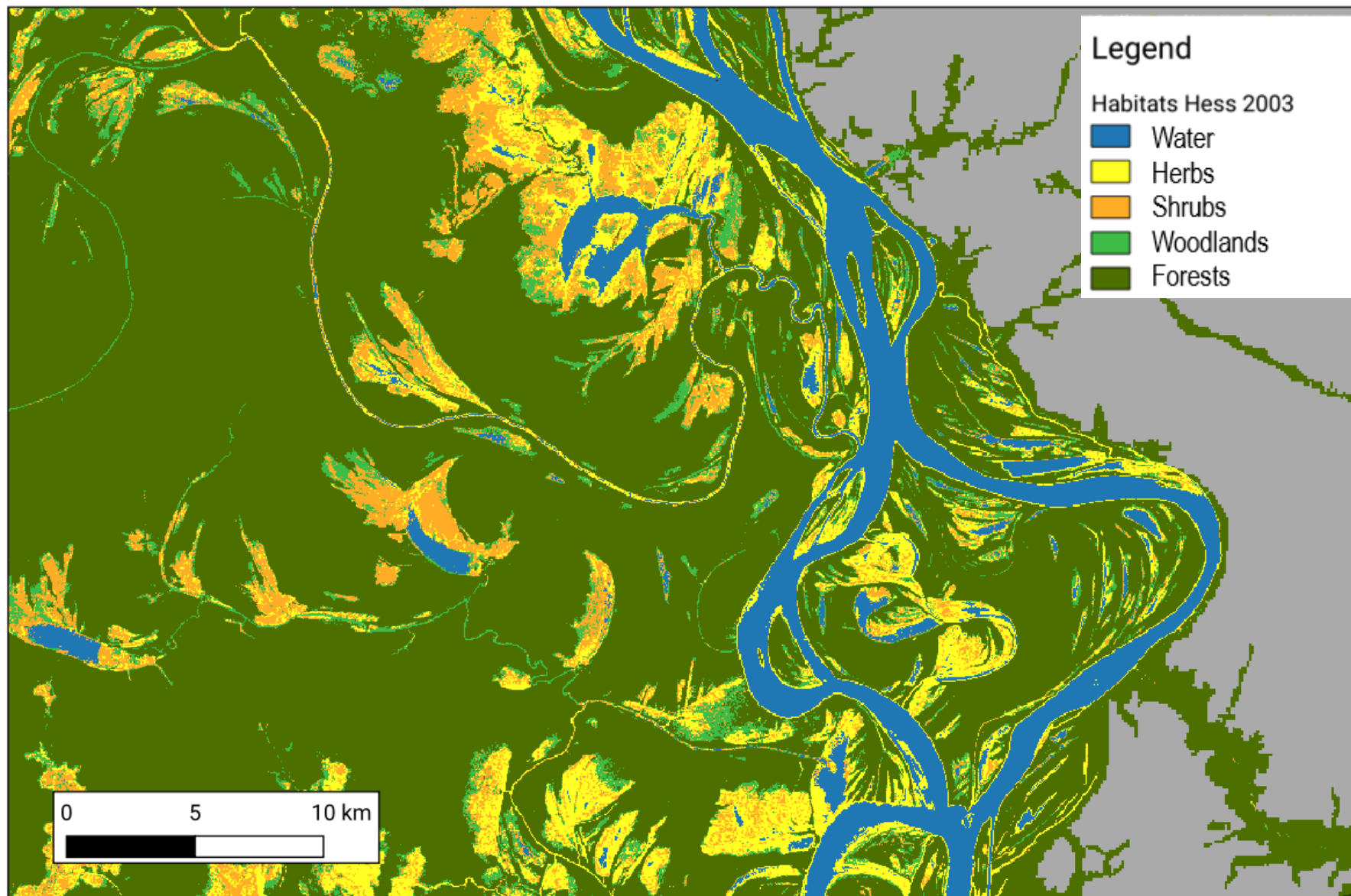
ALOS

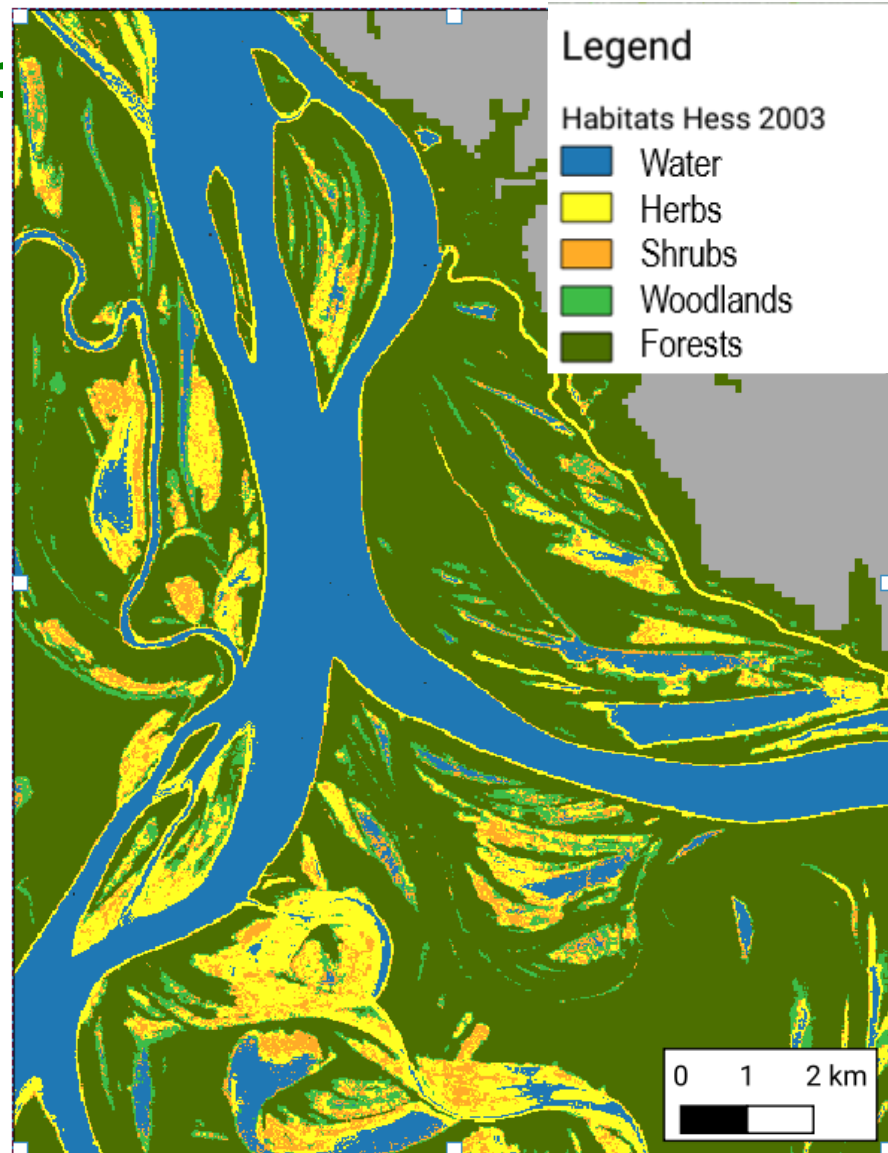
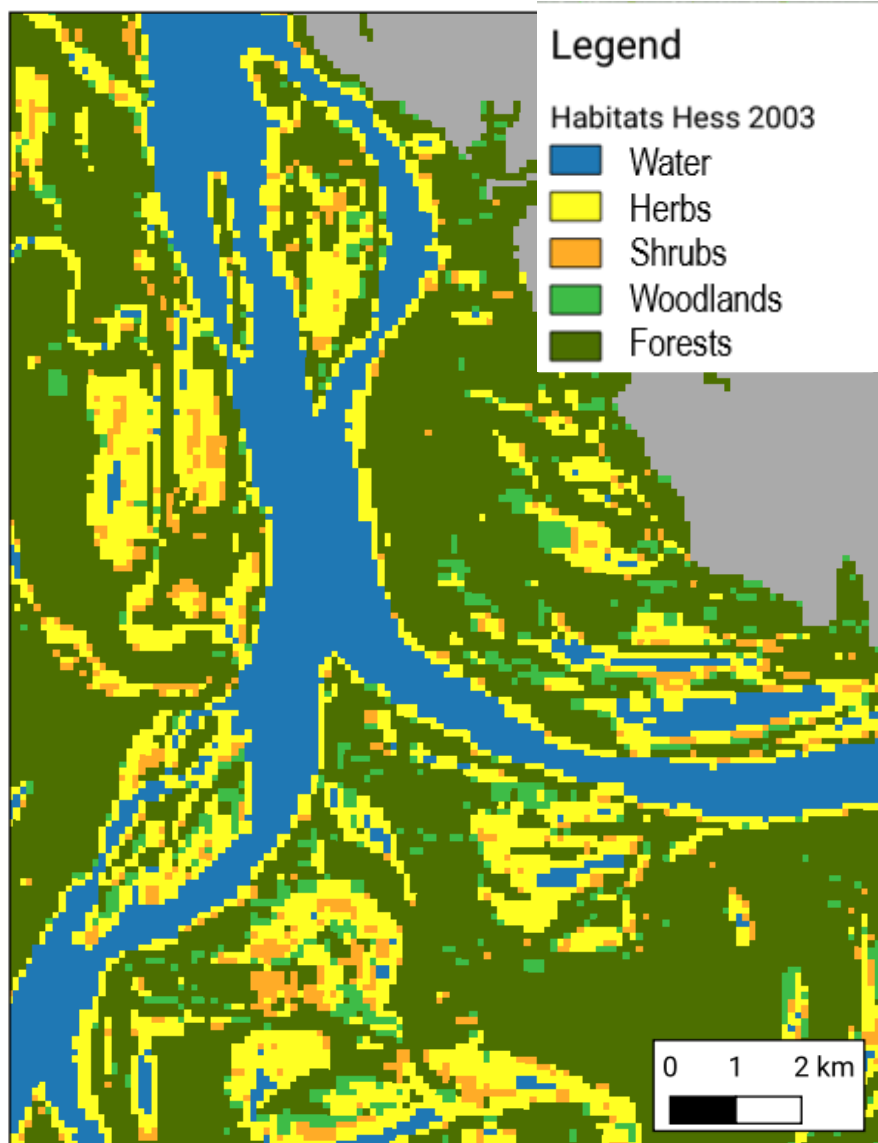
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Community mapping

- Can we aggregate community knowledge
- Hundreds of wetlands scientists visit the Amazon each year
- What if we could aggregate that knowledge:



PEER Mapping - Mozilla Firefox

PEER Mapping

127.0.0.1:7178

120%

Projeção de Amostragem

Revisão

Estatísticas

Projeto PEER

Instruções

Seleção de Amostras

Revisão

Estatísticas

Land use

- Varzea Forest
- Igapo Forest
- Woodlands
- Palm Swamps
- Shrubs
- Herbaceous
- Urban
- Sand Bank
- Bare Rocks
- White Water
- Black Water
- Clear Water

200 m

500 ft

Loglet | © OpenStreetMap contributors, CC-BY-SA, Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community

Escolha a classe a ser identificada:

(Antes de clicar, aproxime o zoom até 200 m!)

White Water

Pontos Coletados

Show 4 entries

Id	class	lon	lat
15	White Water	-55.796	-2.1056
13	White Water	-55.7992	-2.104
14	White Water	-55.7992	-2.1062
12	Woodlands	-55.8087	-2.1076

Showing 1 to 4 of 35 entries

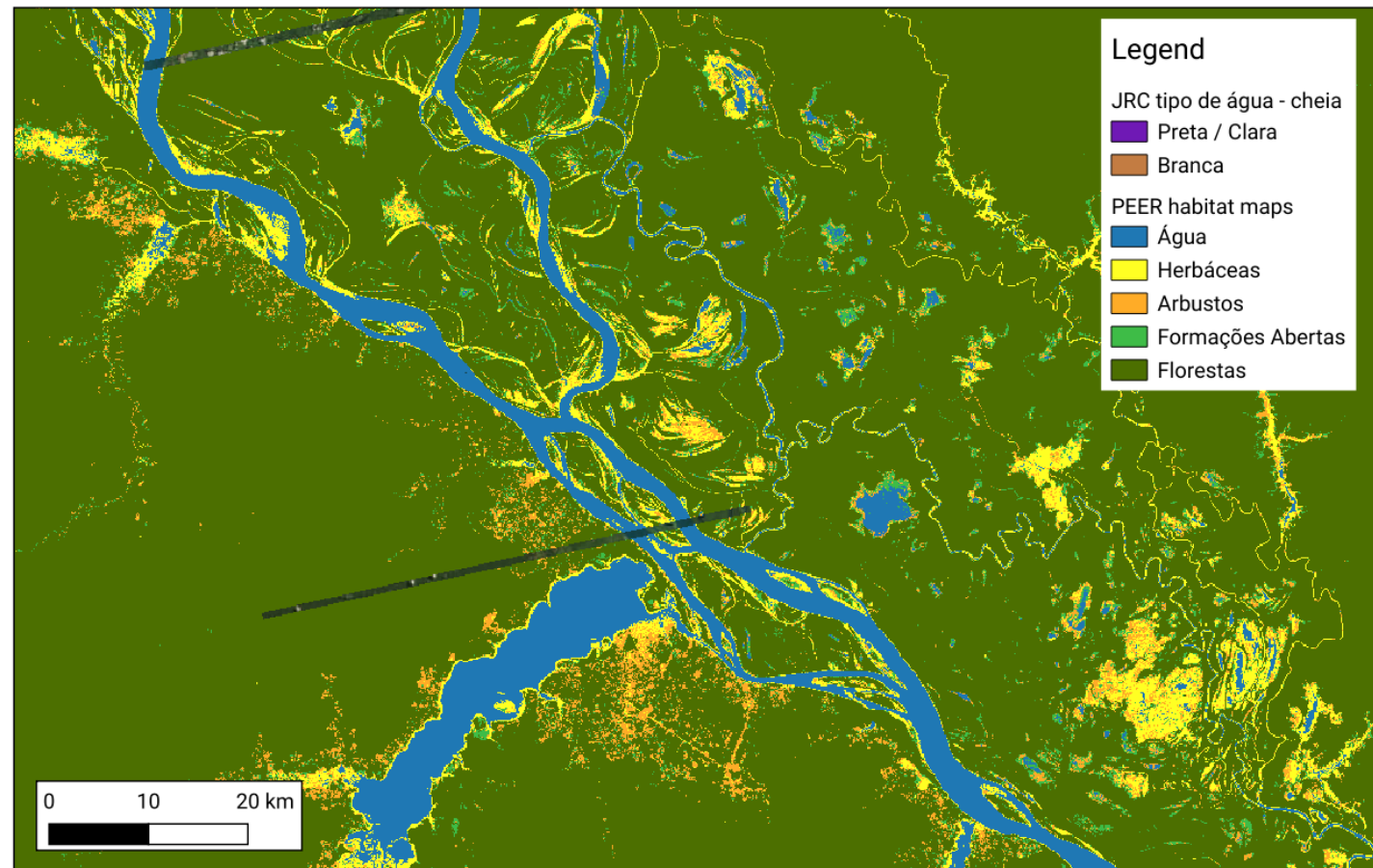
Previous 1 2 3 4 5 ... 9 Next

Clique aqui para finalizar (não é possível adicionar pontos depois!)

Finalizar!

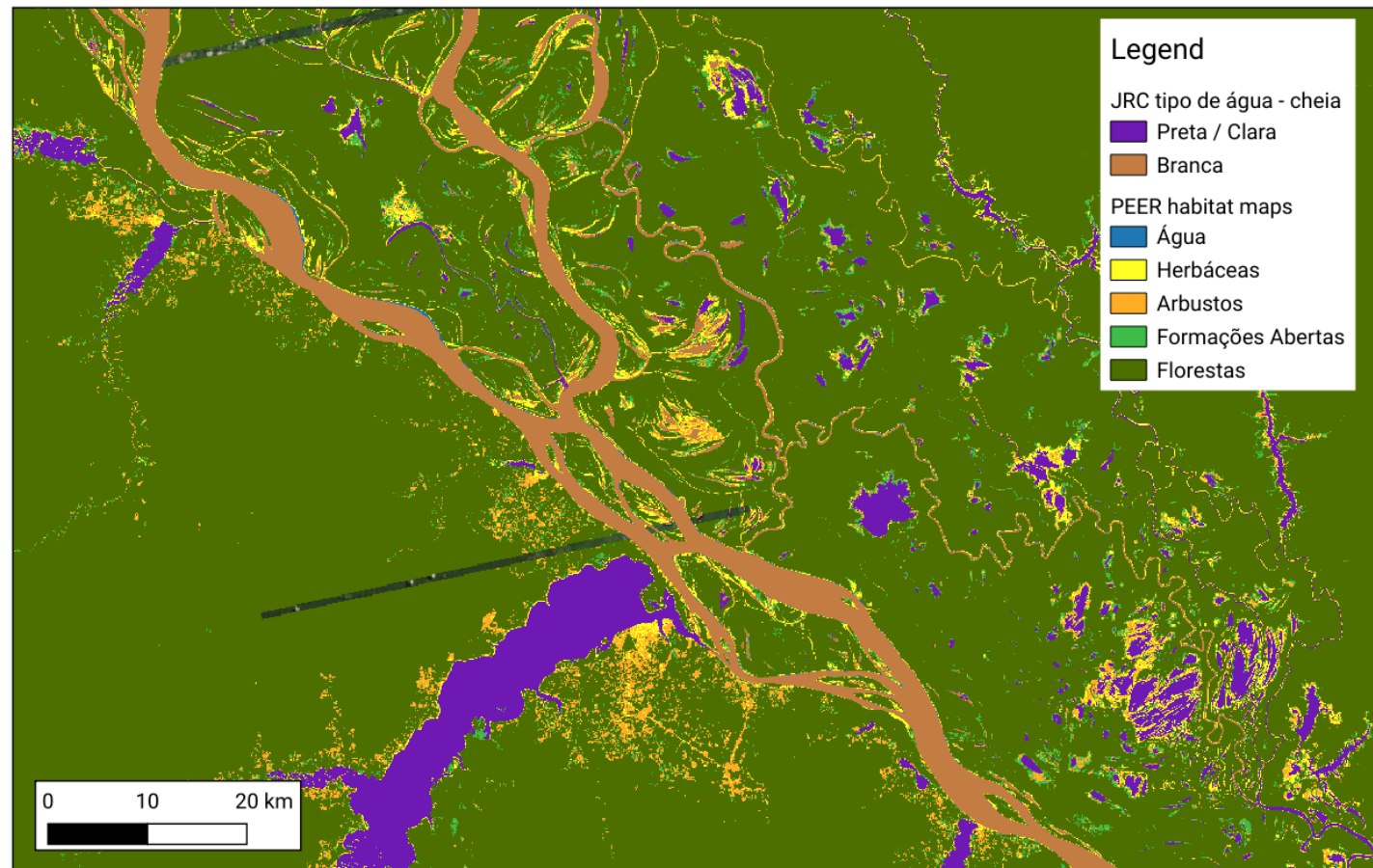
Amazon water type classification:

- White Water
- Black Water
- Clear Water



Amazon water type classification:

- White Water
- Black Water
- Clear Water



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Preliminary test: Tefe to Manaus



Deliverables and other output

Item	Description
Articles	1) Combining existing land cover maps and crowdsourcing for mapping habitats at a regional scale: a reproducible study case from the Amazon wetlands – Method in Ecology and Evolution– Year 1
	2) An updated habitat map for the Amazon wetlands using high spatial resolution optical and synthetic aperture data – PLOS One – Year 1
	3) An automated workflow for generating combined optical and SAR analysis ready data (ARD) cubes for monitoring wetlands – Remote Sensing of Environment - Year 2
	4) Using combined optical and SAR analysis ready data to monitor South American wetlands - Remote Sensing of Environment – Year 3
Conference Presentations	▪ Ongoing results will be presented and discussed at international meetings such as AGU, EGU, IGARSS etc. as well as on annual JAXA PI meetings.
Algorithms	▪ All algorithms will be made available through GitHub repositories, and versions will be made citable by sharing the repositories via the Zenodo data sharing service.
Media	▪ We will use the media services provided by the University of Stirling produce text and videos aimed at the general public.

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PALSAR/PALSAR-2 data access

Please list the PALSAR/PALSAR-2 data you have:

- ALOS-2 / PALSAR-2 Fine Beam imagery (none requested yet)

Have you had sufficient data to complete your research (according to your K&C agreement)?

- Yes considering the publicly available PALSAR-1 data, use of PALSAR-2 contingent on image availability

Thank you!

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