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K&C Initiative
An international science collaboration led by JAXA

K&C Phase 4 – Brief project essentials

Measuring above-ground biomass and its changes over Brazilian tropical secondary forests and savanna woodlands (Cerrado) using L-band SAR data

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Project outline and objectives

Develop, test and validate algorithms that relate *in situ* forest **aboveground biomass** (AGB) to L-band backscatter in a range of low-carbon tropical regions across the **Brazilian Amazon**: **secondary forests** and ***cerrado***

Value of L-band data for measuring AGB:

- lower range of AGB, **up to around 100 t/ha** (saturation effect at this frequency)
- monitoring forests with lower biomass and dynamics is extremely important: regenerating forests in the humid tropics and savanna woodlands (*cerrado*) of South America

Support of K&C Thematic Drivers

- Changes in biomass are important in **climate** terms:
  - Deforestation: emissions of greenhouse gases to the atmosphere
  - Forest growth: carbon dioxide uptake from the atmosphere
- Major uncertainties in these biomass-related fluxes and in the sizes of the emission processes (deforestation, degradation) compared to the uptake processes (forest growth) that together constitute the net biospheric tropical carbon flux
- Accurate maps of secondary forests and *cerrado* AGB and change
  - reduce uncertainty carbon accounting (**UNFCCC**)
  - impact on biodiversity (**CBD**)

Study areas

Secondary forests

- Manaus (Amazonas)
- Santarém (Pará)
- Machadinho d‘Oeste (Rondônia)

Savanna woodland (*cerrado*)

- Barreiras (Bahia)
- Luis Eduardo Magalhães (Bahia)

Milestones

- Initial maps of AGB of secondary forests and savanna woodlands (*cerrado*) and their changes (mid-2016)

- Validation of above-ground biomass maps of secondary forests and savanna woodlands (*cerrado*), associated error analysis and final map products, including error maps (late 2017)

Data sharing

I. High temporal resolution time series of classified images (mature forest, secondary forest, non-forest) generated from automatic classification of Landsat sensor data over secondary forest study areas

Manaus: 1973-2011 (23 dates)

Santarém: 1984-2010 (23 dates)

Machadinho d'Oeste: 1984-2011 (21 dates)

II. In situ AGB data (~20 plots) over Manaus (August 2014); Santarém and Machadinho d'Oeste (2015/2016?)

III. Very high spatial resolution satellite data (5-m RapidEye) over *cerrado* study areas (Barreiras and L. E. Magalhães)

IV. Field data over selected sites of cerrado vegetation

Machadinho d'Oeste

Data sharing

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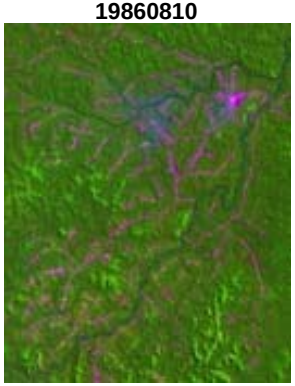
19860810



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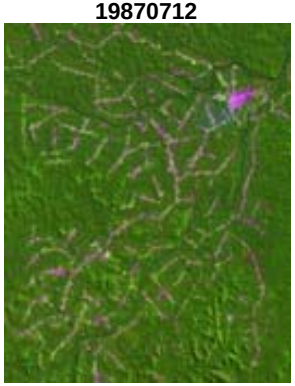

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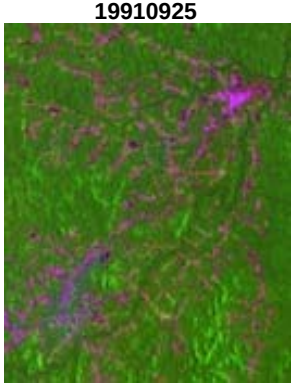

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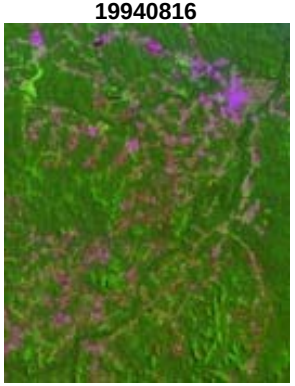

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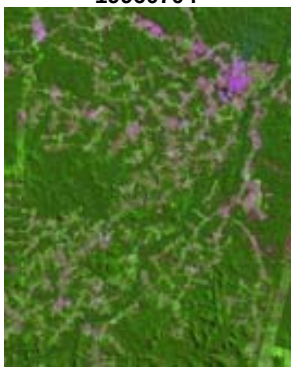

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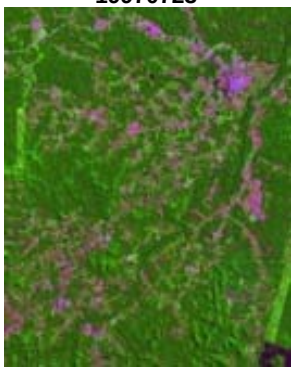

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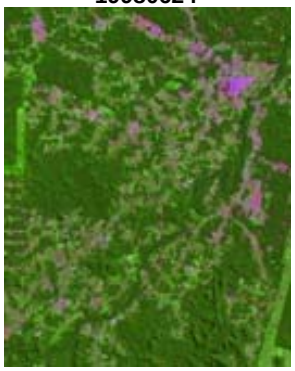

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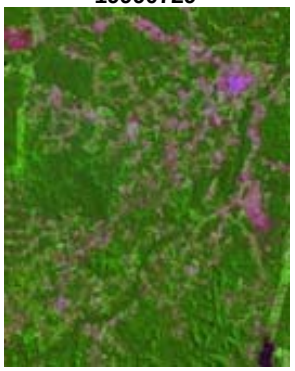

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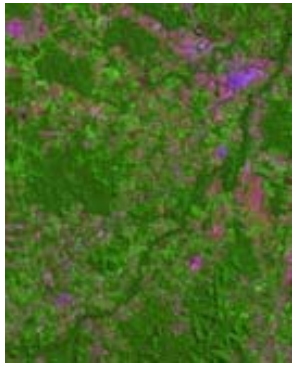

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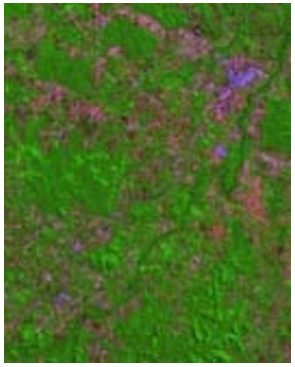

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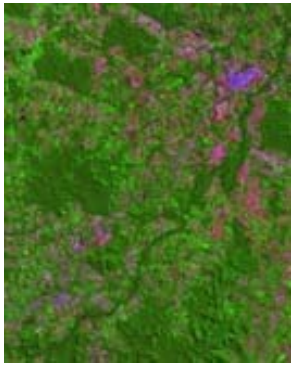

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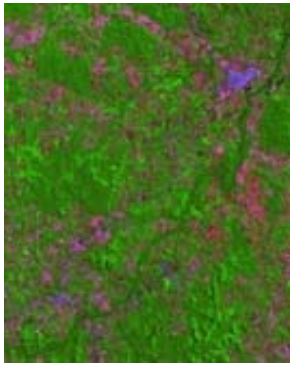

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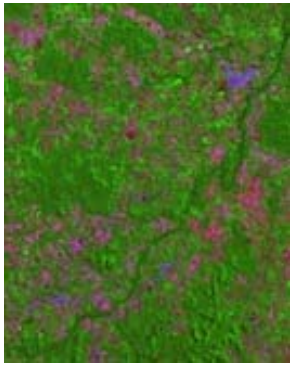

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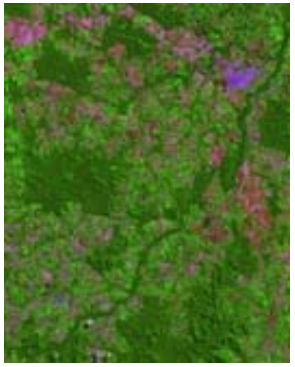

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Machadinho d'Oeste

Data sharing

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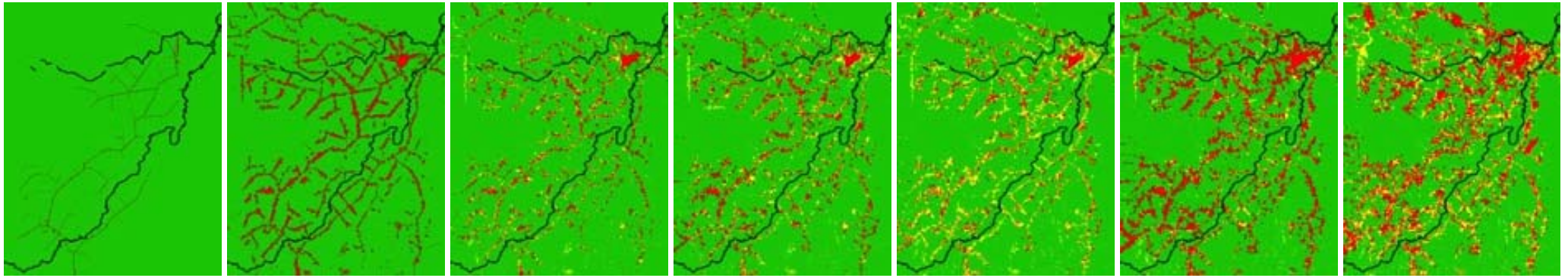

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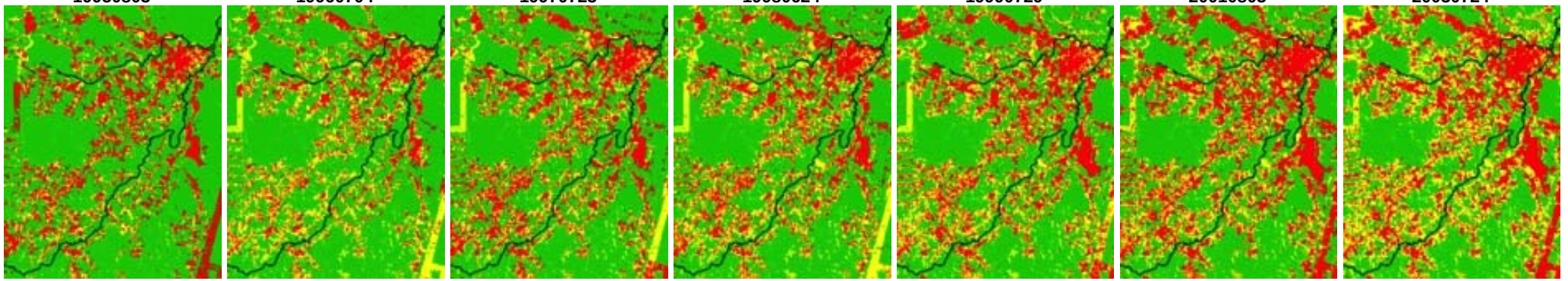

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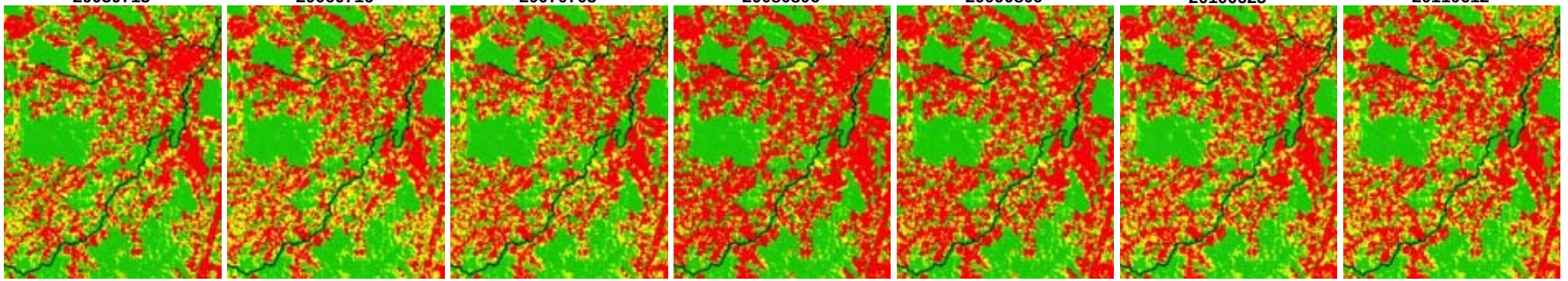
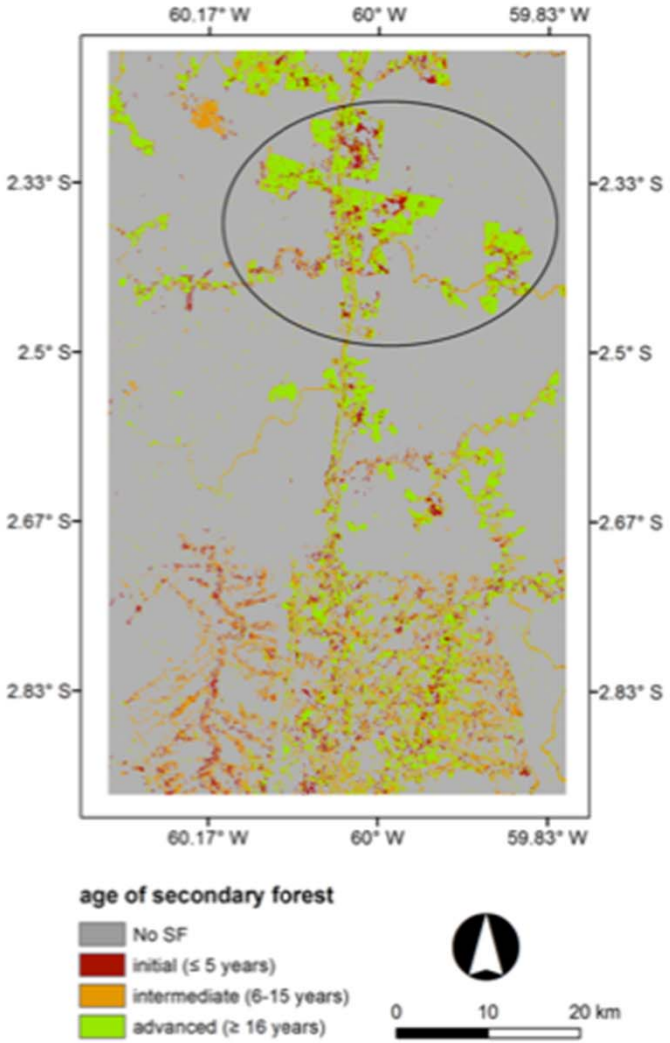
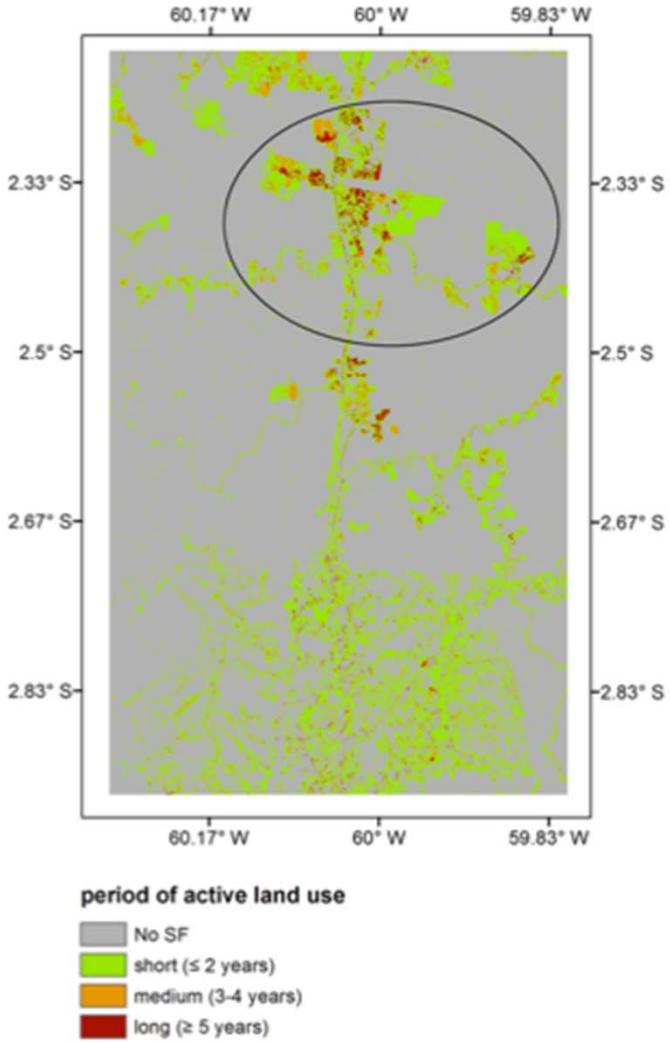
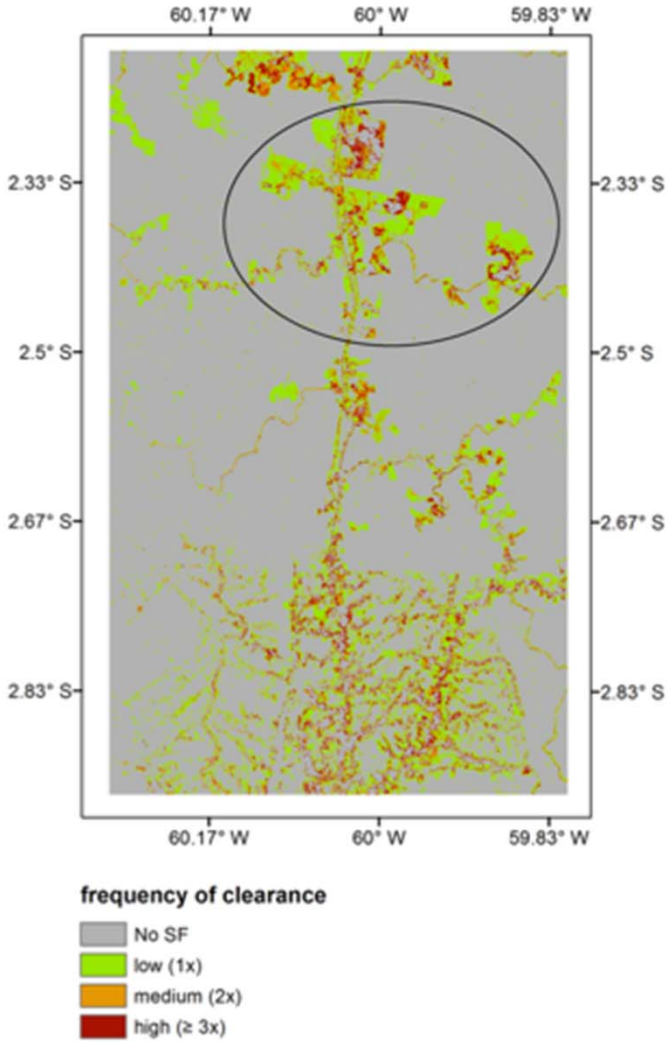


Data sharing

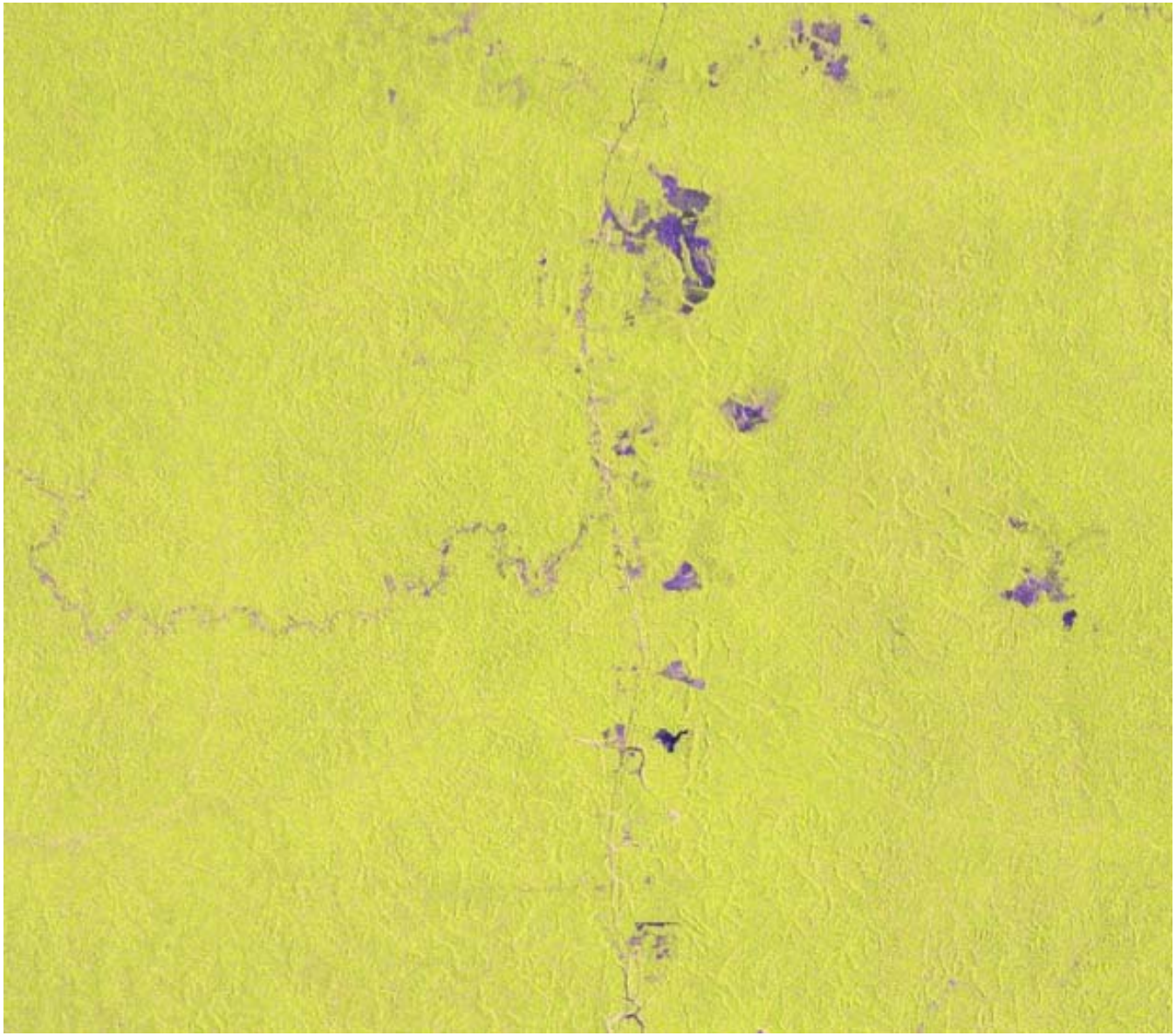
Manaus







Data sharing



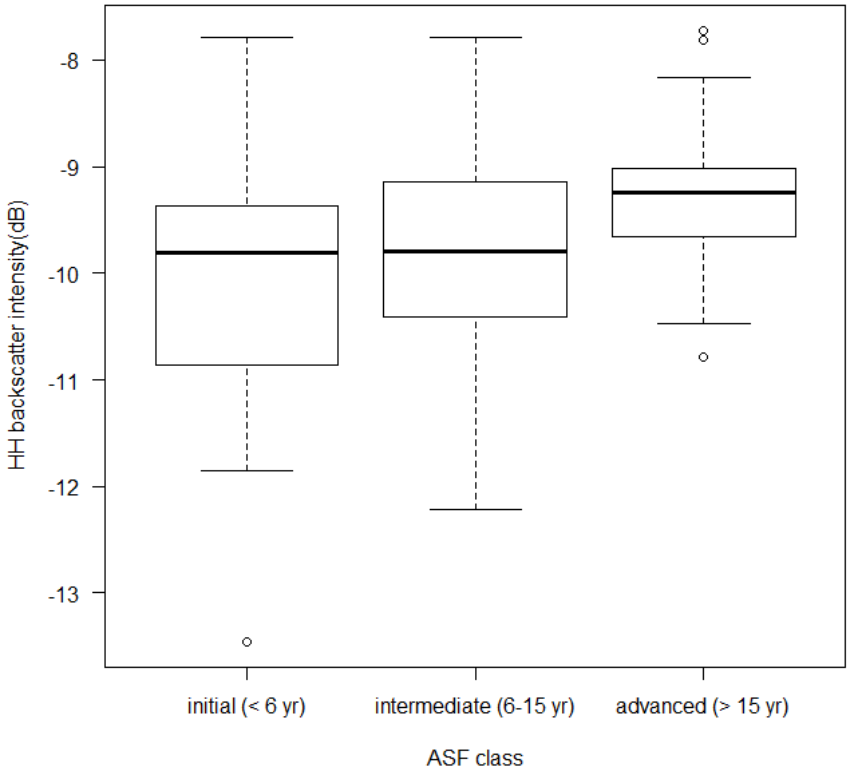
Manaus
ALOS PALSAR FBD 2010
RGB: HH, HV, HH/HV

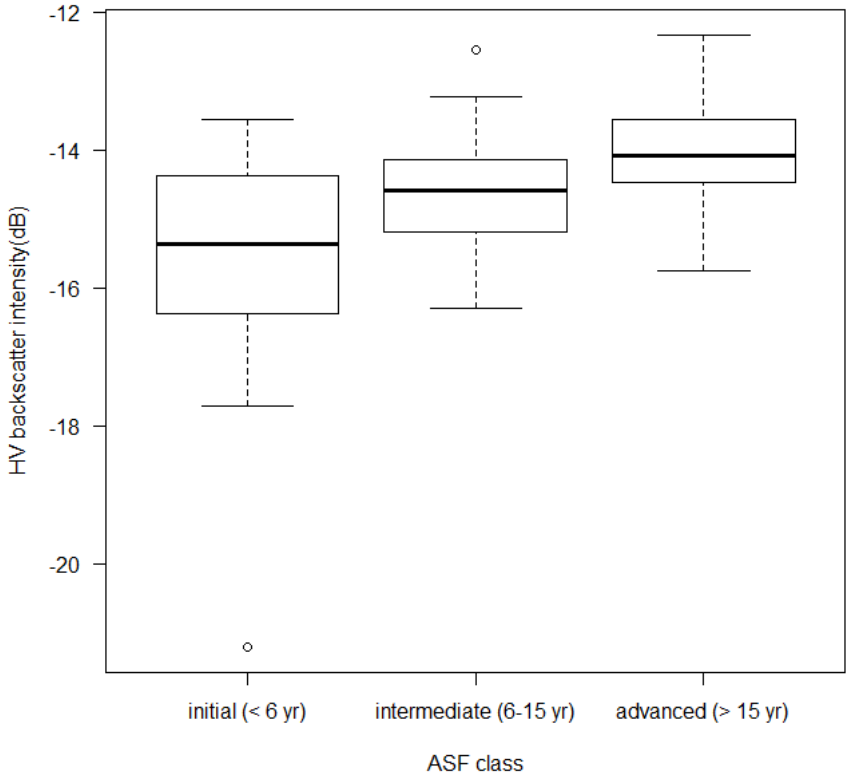
JAXA ALOS 4th RA | PI No. 1208
Assessing the distribution of above-ground biomass in a range of forest types across the pan-tropical belt using L-band SAR data

Data sharing

Manaus | ALOS PALSAR FBD backscatter intensity over secondary forests

Discrimination by age classes | initial (n=21), intermediate (n=40), advanced (n=38)





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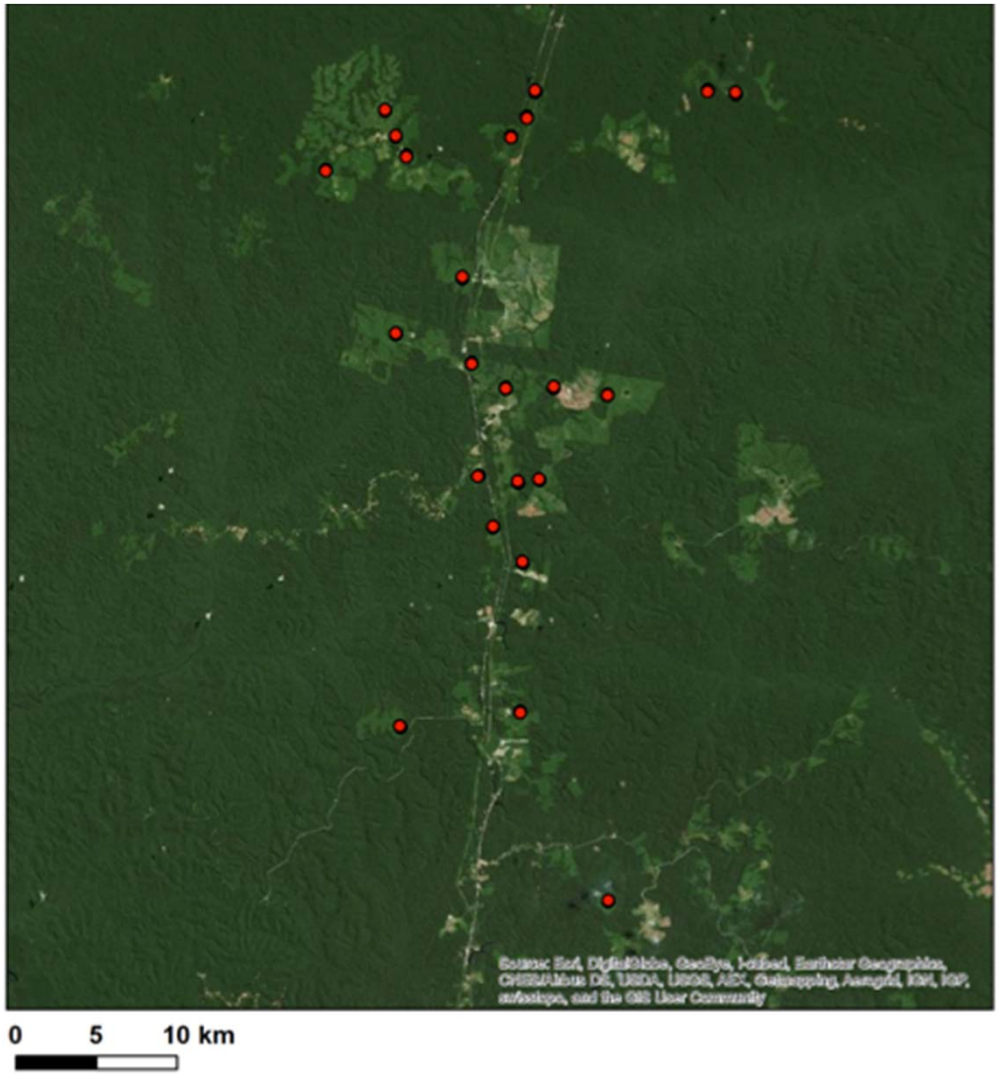
Assessing the distribution of above-ground biomass in a range of forest types across the pan-tropical belt using L-band SAR data

Data sharing

Manaus | August 2014



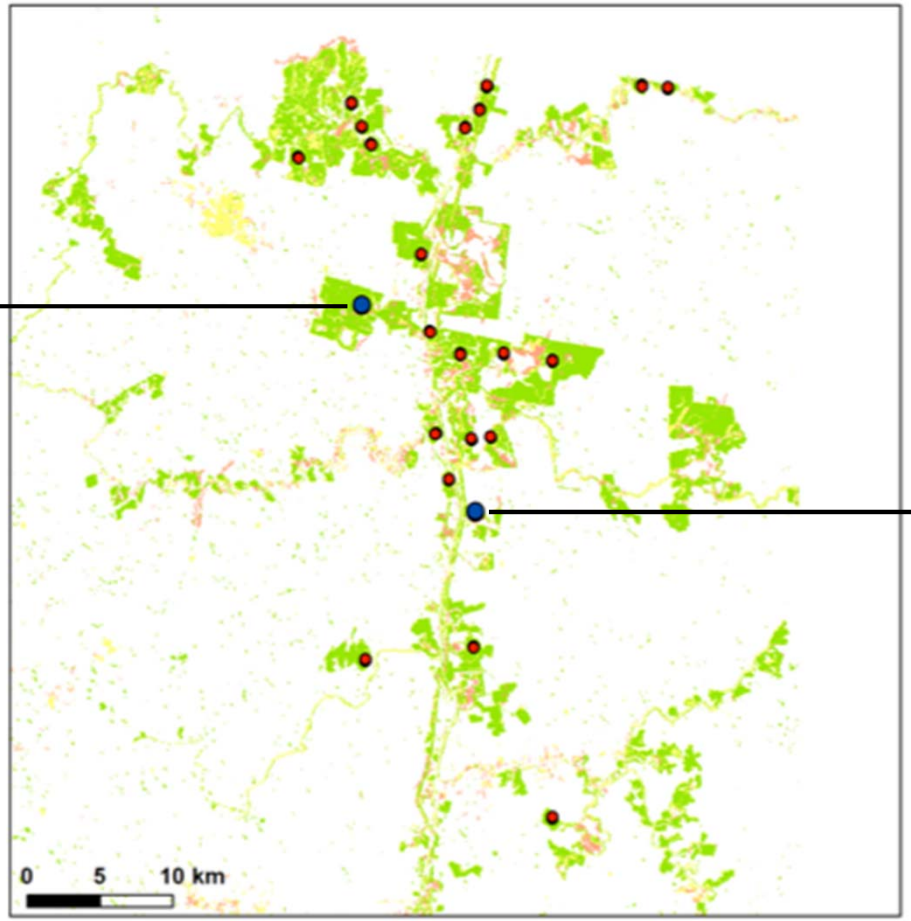
Stratification by classes:

- age of secondary forest
  - initial (≤ 5 yr)
  - intermediate (6-15 yr)
  - advanced (≥ 16 yr)
- period of active land use
  - short (≤ 2 yr)
  - medium/long (≥ 3 yr)
- frequency of clearance
  - low (1x)
  - medium/high (≥ 2x)

Data sharing

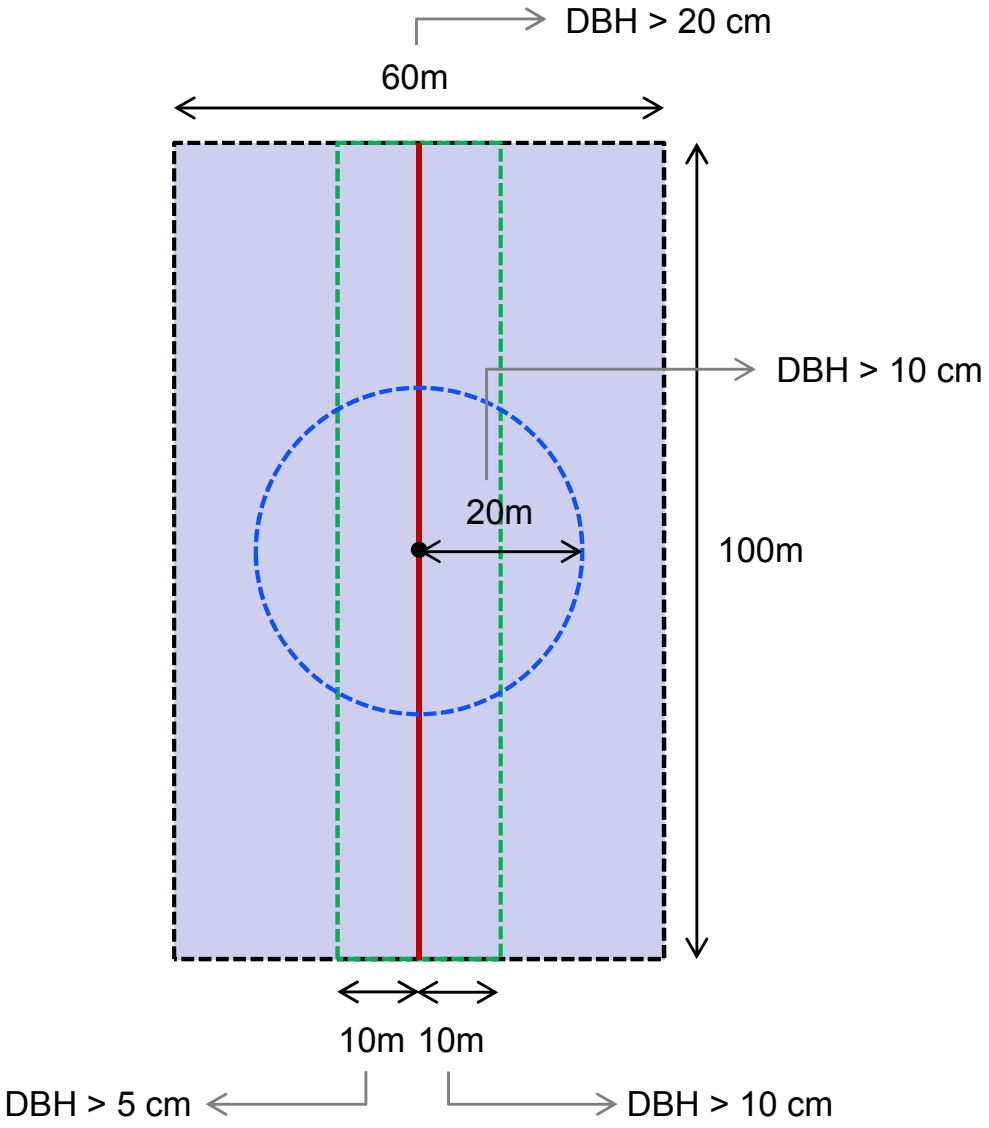
Manaus | August 2014

Adv22_18
ASF = 19 yr
PALU = 7 yr
FC = 2x



Adv12_2
ASF = 23 yr
PALU = 1 yr
FC = 2x

Data sharing



Test the impact of:

Plot size

Plot shape

Minimum measured DBH

Deliverables

- Above-ground biomass map of secondary forests over areas of approximately 200x200 km around each regrowth hotspot site (Manaus, Santarém and Machadinho d'Oeste)
- Above-ground biomass map of cerrado in the eastern part of the municipalities of Barreiras and Luis Eduardo Magalhães, Bahia State
- Decadal scale change maps for these regions and assessment of their implications for carbon and biodiversity

Acknowledgements

- JAXA ALOS 4th RA | PI No. 1208
- Foundation for Science and Technology, Portugal
  REGROWTH-BR - Remote Sensing of Regenerating Tropical Forests in Brazil: Mapping and Retrieving Biophysical Parameters (PTDC/AGR-CFL/114908/2009)
- NERC National Centre for Earth Observation (NCEO) (R8/H12/82)
- United States Geological Survey (USGS)

Thank you!

Obrigado!

Credits: Josh Jones