



# Assessing carbon emissions from deforestation and degradation in tropical moist forests

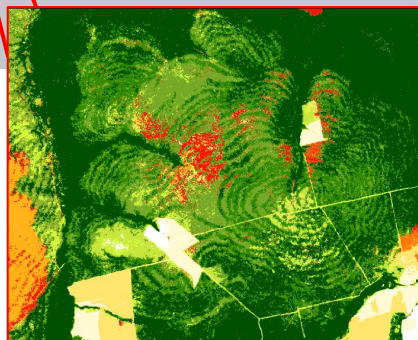
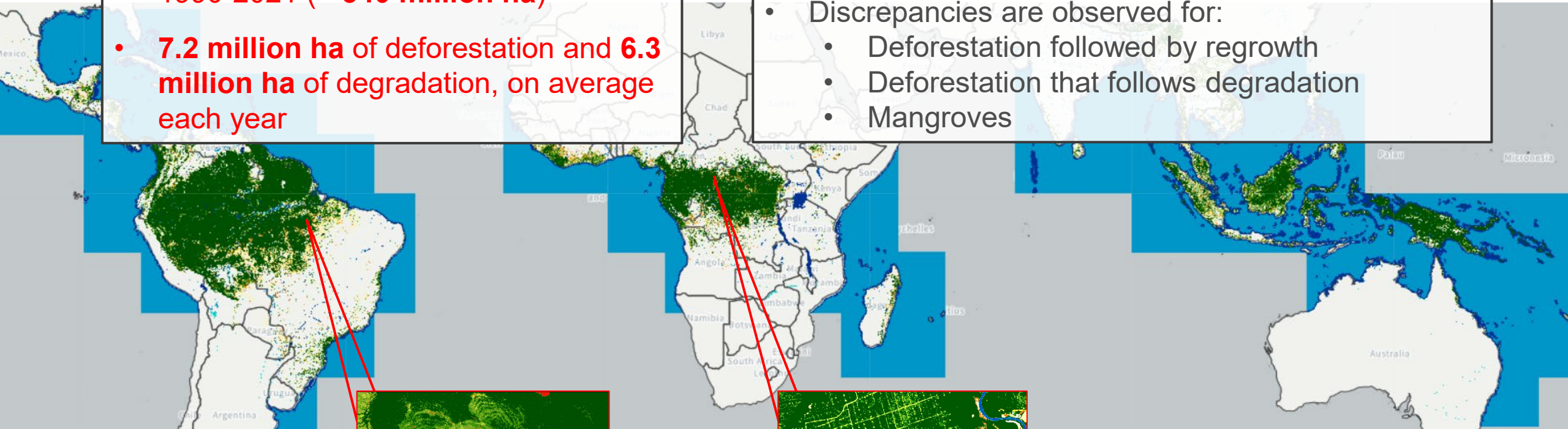
ESA Living Planet Symposium - May 25, 2022

*Clément Bourgoin, Frédéric Achard, Christelle Vancutsem, Valerio Avitabile, Lilian Blanc, Silvia Carboni, Dario Simonetti,  
JRC Directorate D - Sustainable Resources*

# Tracking long-term (1990-2021) deforestation, degradation and regrowth in tropical moist forests

- About **26% loss** of undisturbed TMF 1990-2021 (~ **340 million ha**)
- **7.2 million ha** of deforestation and **6.3 million ha** of degradation, on average each year

- **75%** of the degraded TMF is not depicted by **GFC**
- Discrepancies are observed for:
  - Deforestation followed by regrowth
  - Deforestation that follows degradation
  - Mangroves



<https://forobs.jrc.ec.europa.eu/TMF/>

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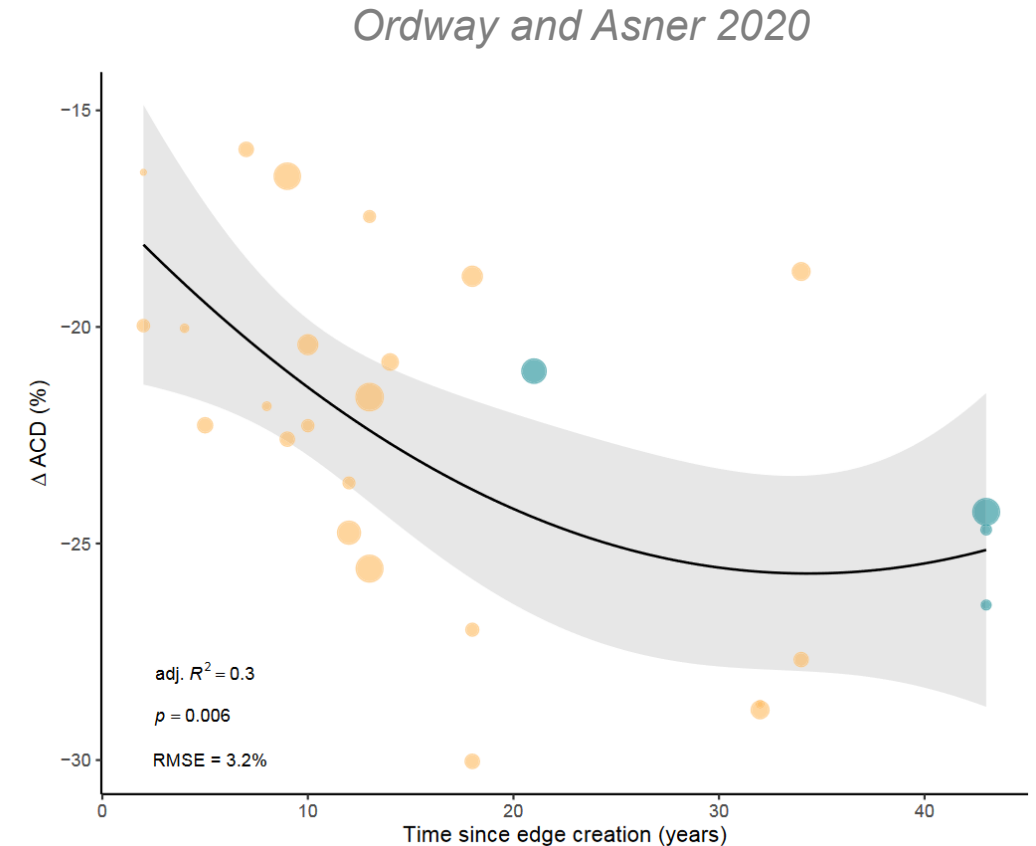
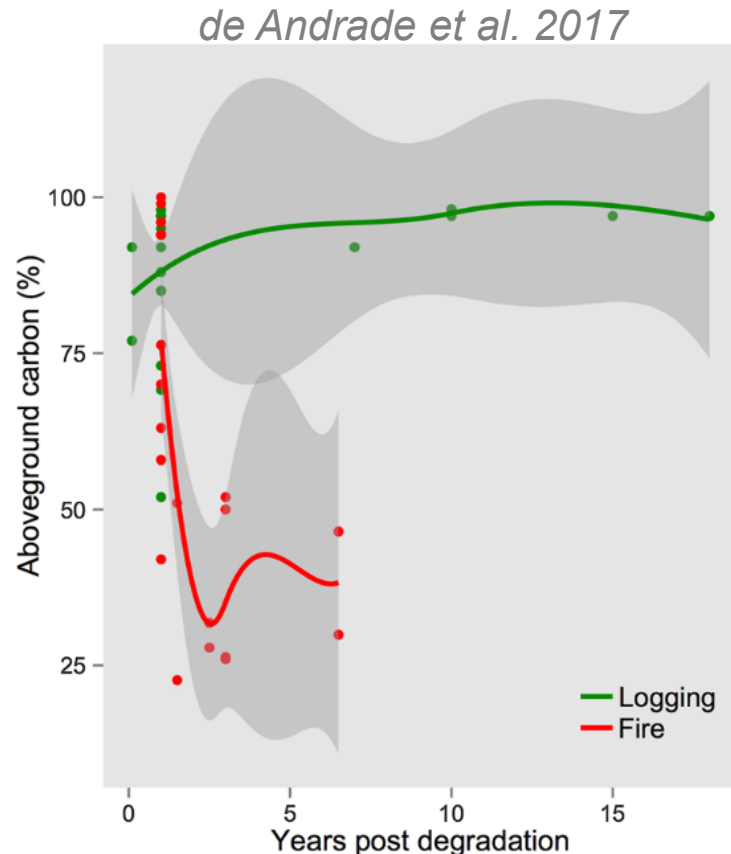
ENVIRONMENTAL STUDIES

Long-term (1990–2019) monitoring of forest cover changes in the humid tropics

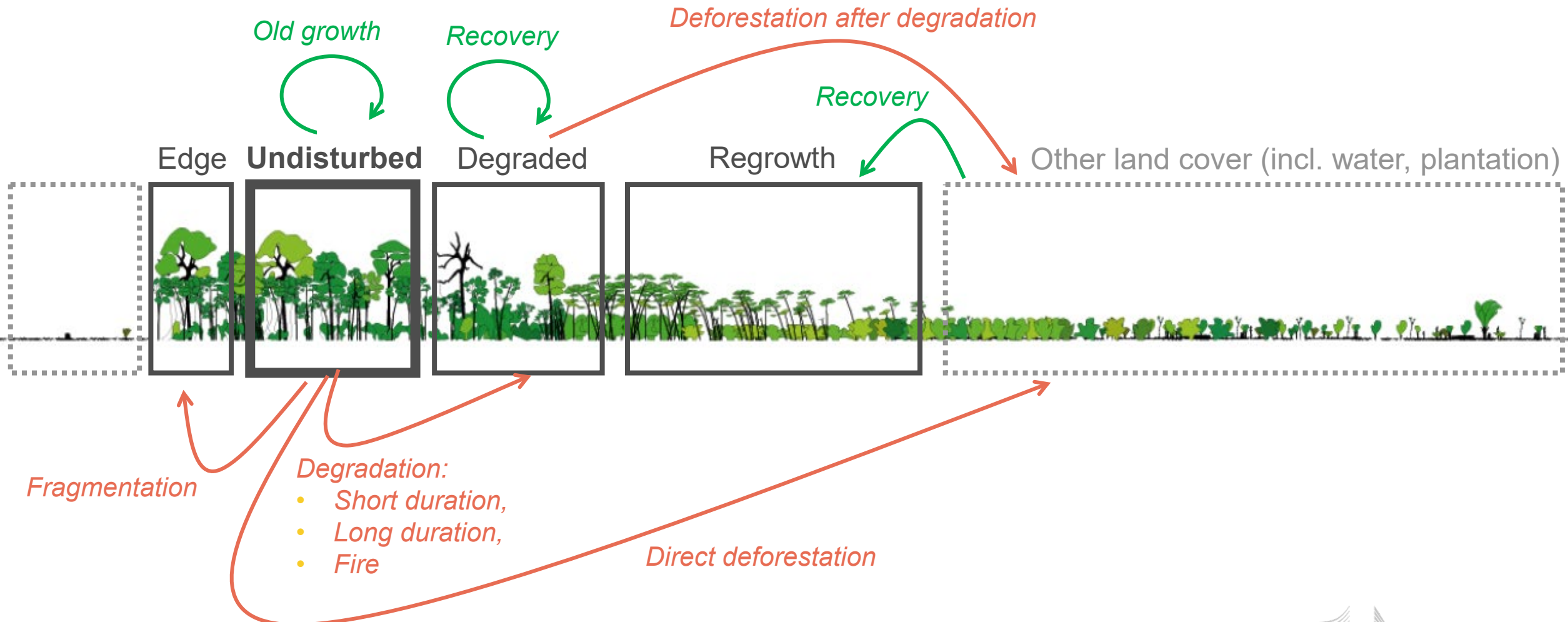
C. Vancutsem<sup>1\*</sup>, F. Achard<sup>1</sup>, J.-F. Pekel<sup>1</sup>, G. Vieilledent<sup>1,2,3,4</sup>, S. Carboni<sup>5</sup>, D. Simonetti<sup>1</sup>, J. Gallego<sup>1</sup>, L. E. O. C. Aragão<sup>6</sup>, R. Nasi<sup>7</sup>

# How to account for the major role of degradation in carbon losses?

- **Degradation** affects forest structure and causes around **25-75%** of carbon loss depending on the **intensity / type** (logging, fire...) and **frequency** of disturbances
- **Edge effect** following deforestation causes around **25%** of carbon loss due to microclimatic changes leading to increasing tree mortality rate

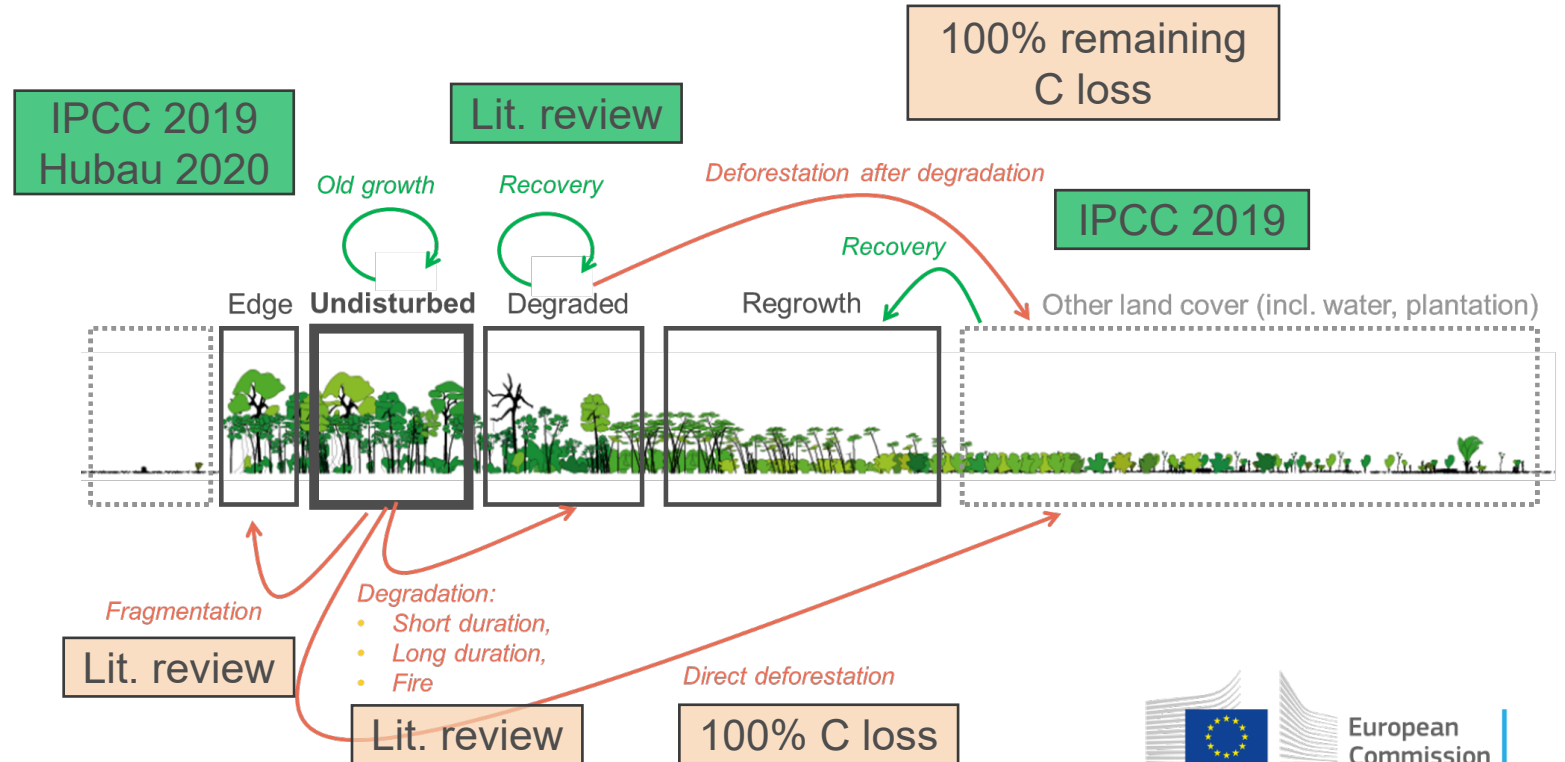
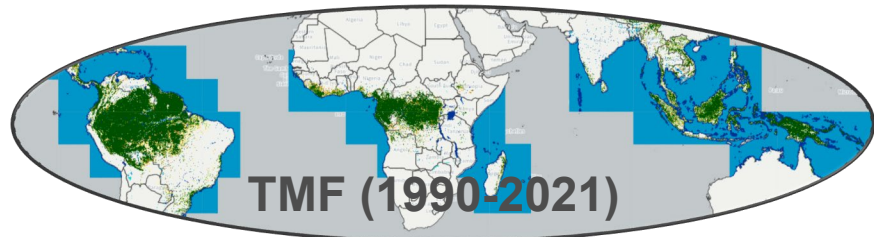
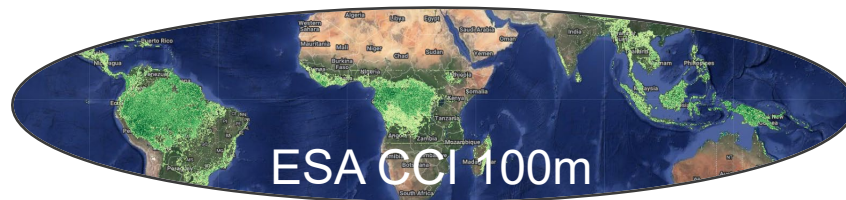


# Dynamic accounting of carbon loss and gain following forest cover change trajectories

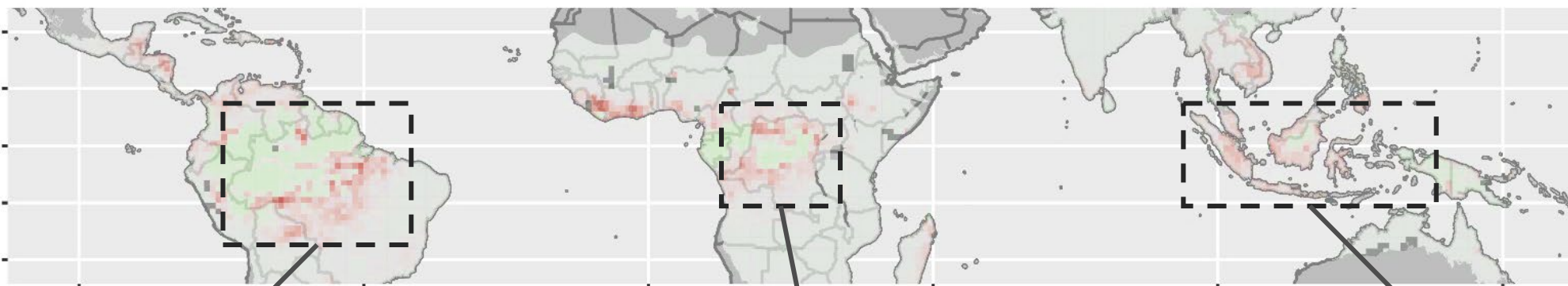




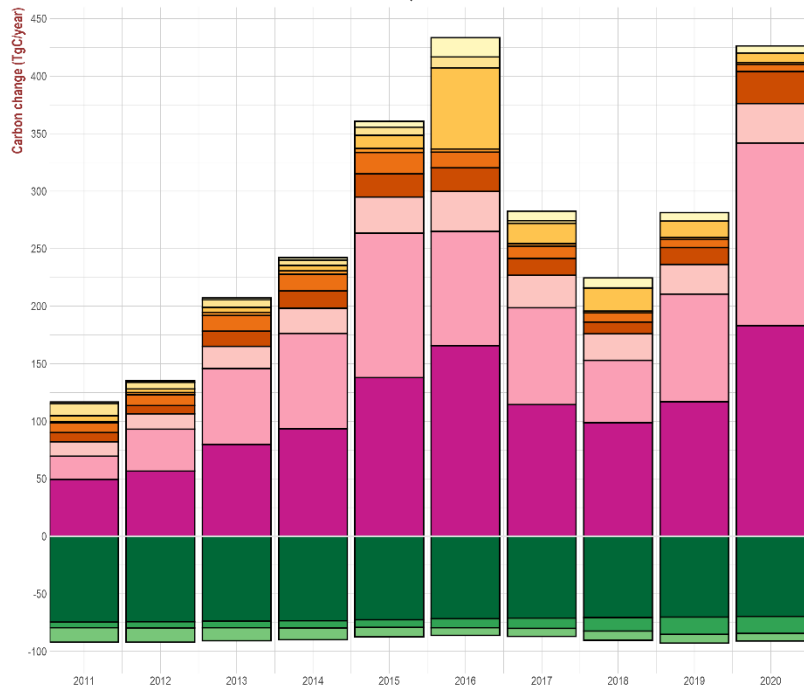
# Workflow



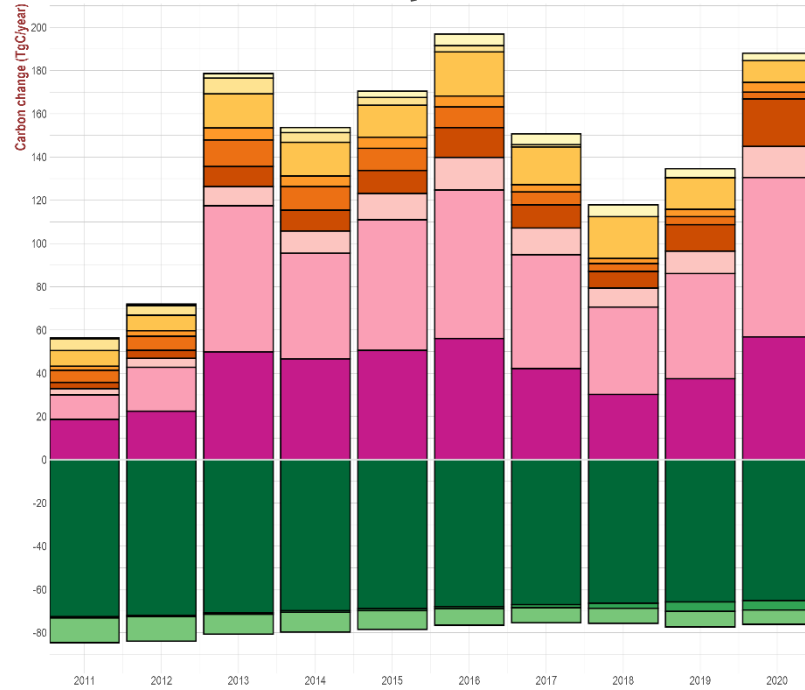




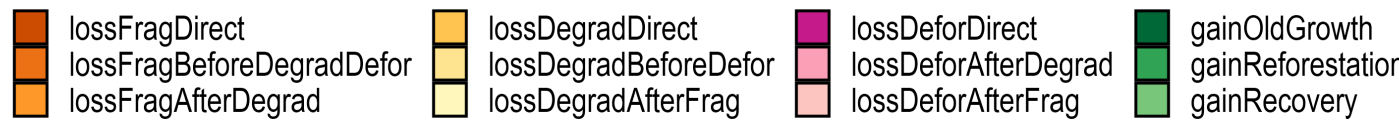
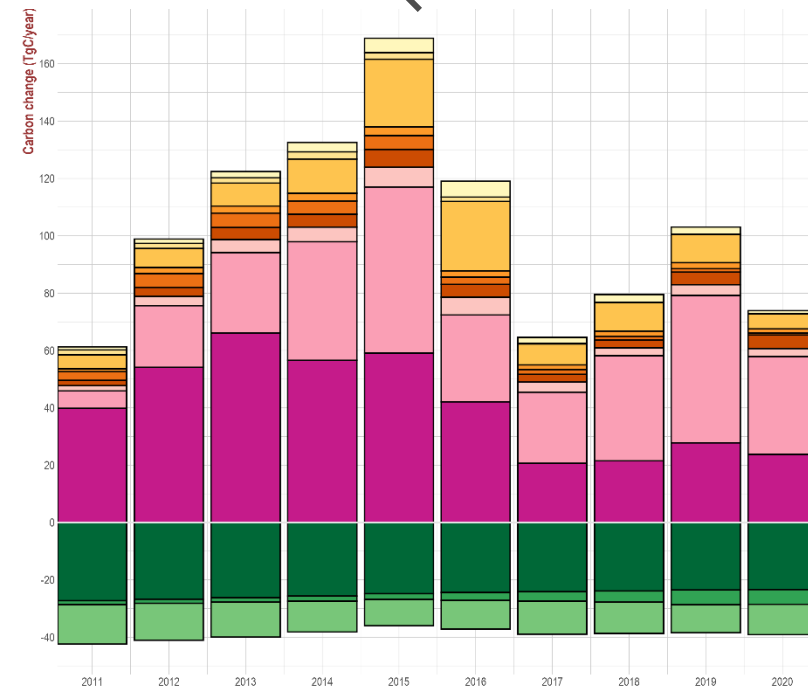
Brazil



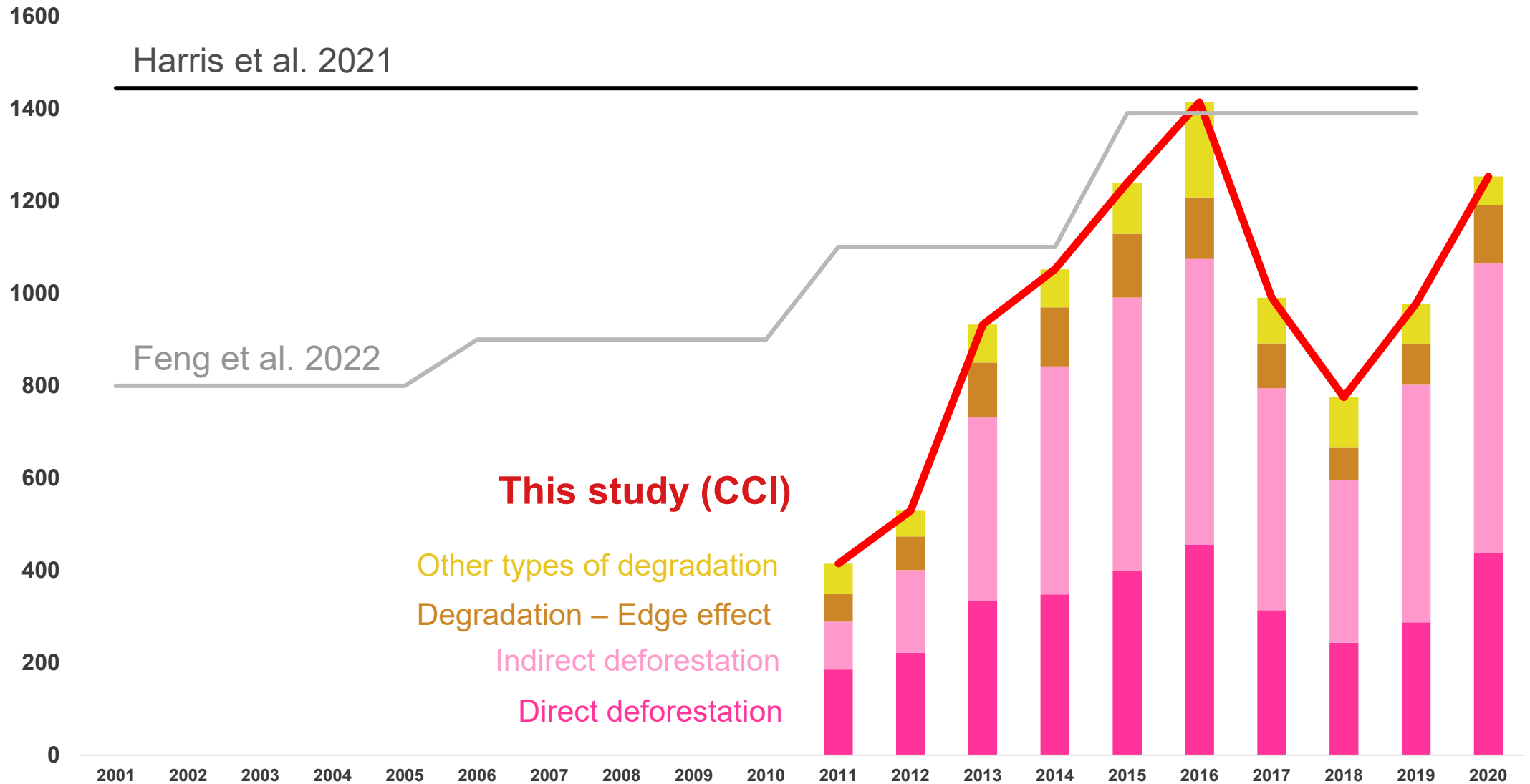
DRC



Indonesia

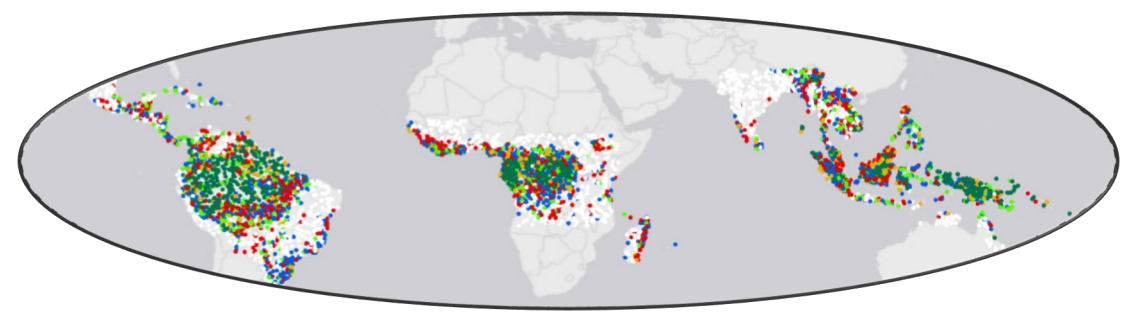


# Global Carbon losses from tropical forest changes (Tg C/yr)





# Validation and accuracy assessment of the transition map



Undisturbed forest  
Forest degradation

Deforestation  
Regrowth

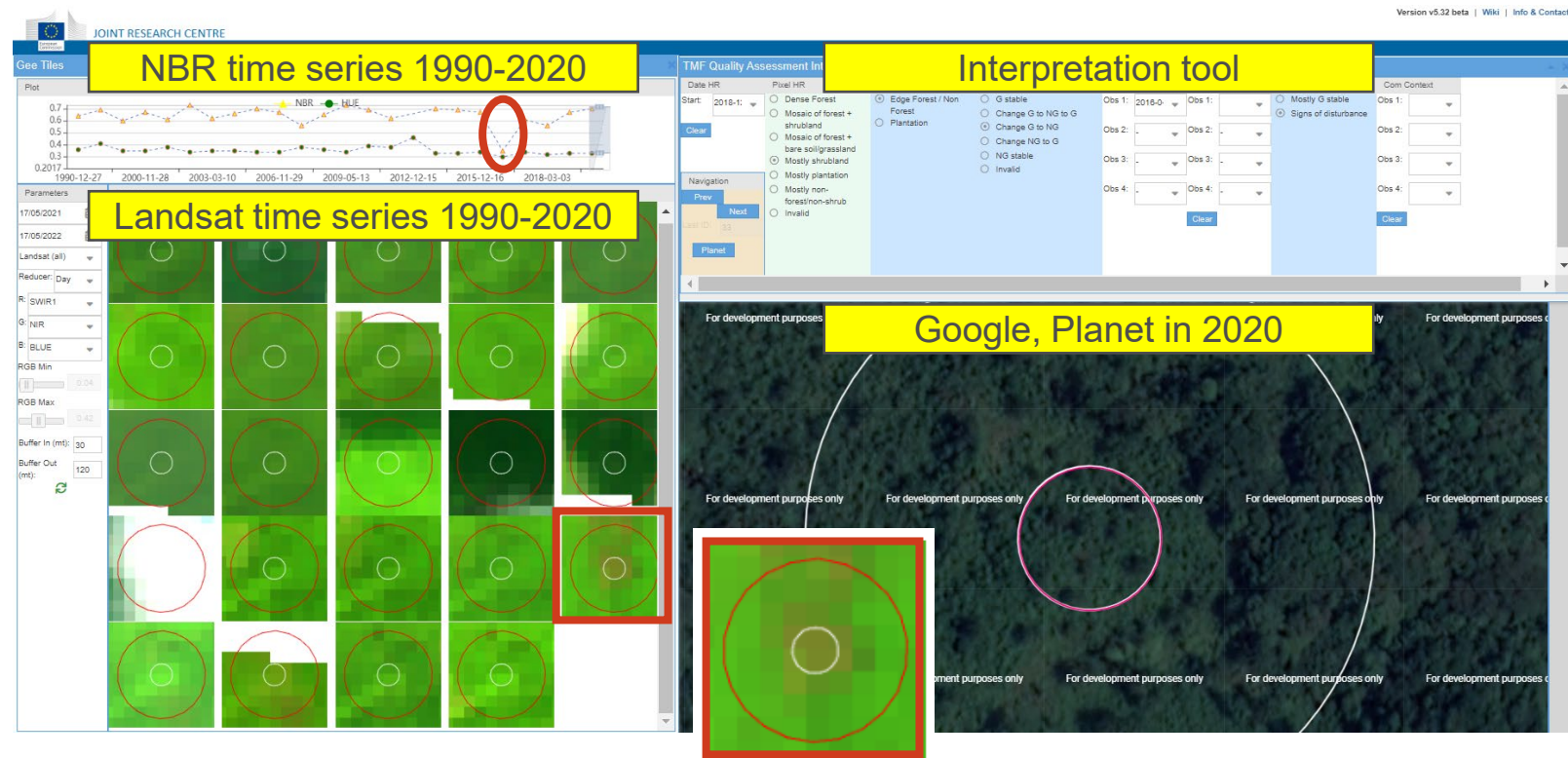
- Quantify the uncertainties of area estimates from the TMF Transition map
- Produce unbiased estimates of activity data and 'correct' the related estimates of C loss

## • Sampling design:

Random stratified sampling of 6000 points

## • Response design:

Multi-dimensional interpretation (Google/Bing HR + Planet basemaps in 2020, Landsat time series, pixels and context level)



# Conclusion and next steps

- First pantropical study on forest carbon flux integrating **spatial-temporal dynamics** of **carbon losses** due to different types of **degradation** and **deforestation** with **carbon removals** due to **old-growth** and **recovery of secondary and degraded forest**
- Loss is occurring much more rapidly than removal, resulting in a **total net carbon loss of 5.64 Pg C** over the study period (2011-2020)
- **Major contribution of forest degradation**, especially as a precursor of deforestation in the carbon cycle
- Sensitivity analysis of emission/removal factors: more work to do on the characterization of forest degradation (drivers/type, intensity etc.). Potential to use GEDI data to calibrate the duration of forest disturbances used so far as a proxy of degradation intensity
- Correct estimations of C loss and gain using the accuracy assessment
- Conservative approach: can detect more disturbances with Sentinel-2. **Presentation made by Frederic Achard on 26 May 2021 in session A3.12 .1 Forest Monitoring**

