SOME IDEAS ABOUT AN INTEGRATED SYSTEM OF FOREST MONITORING

FOCUS ON THE AMAZON REGION

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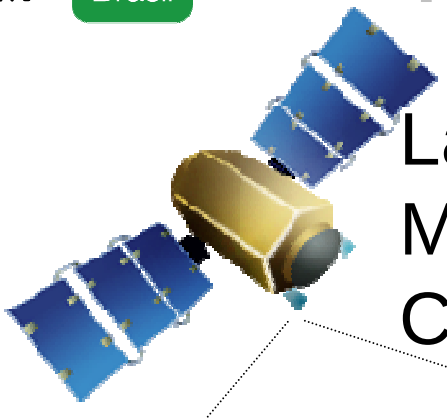
Three Key Questions for Monitoring:

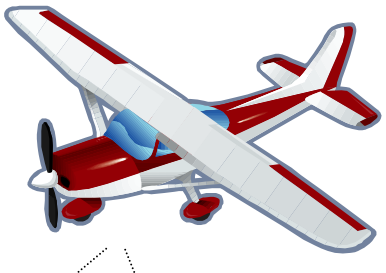
- **Forest Degradation**
  - What are the causes and effects?
- **Vulnerability**
  - What are the probabilities of future occurrence of degradation events ?
- **Biodiversity**
  - What are the past effects of forest degradation and the future effects of vulnerability?

- **General questions**
  - How to define and measure at diverse scales?
  - How to apply the data?

Three Scales for Monitoring



Landsat,
MODIS, ALOS,
CBERS



Radar
(LIDAR)

1. Region

2. Landscapes

3. Permanent

Key Questions: Forest Degradation

- Definition: Forest cover disturbed in relation to a baseline for a given forest type
- Measurement:
  - Improved detection via satellite will permit more precise measurement of forest degradation and may reveal that it occurs over a larger area than anticipated
  - ***Key challenge****: Verification of causes and effects at increasingly fine scales (radar, in situ data collection)*
- Distinction of causes: timber extraction, forest fires, massive die-off (e.g., bamboo forests), diseases/plagues induced by climate changes, etc.
- Effects:
  - Increased carbon emissions above and beyond those from deforestation
  - Vulnerability to future degradation

Key Questions: Vulnerability

- Definition: probability of future forest degradation or deforestation
- Measurement:
  - Improved detection of forest degradation will permit more precise measurement of vulnerability
  - Improved land use models will improve the forest conversion dynamics prediction
  - ***Key challenge***: *Correlate with indicators such as flammability, which will require data at finer scales*
- Probability of future occurrence
  - Correlated with indicators such as past degradation, flammability, El Niño events, expanding infrastructure and bio- indicators

Key Questions: Biodiversity

- Measurement
  - – Empty forests => biodiversity monitoring
  - ➢In situ data collection in permanent plots
  - ➢***Key challenge****: Correlation of situ data at larger scales*
- Effects of forest degradation and vulnerability
  - ➢Possible to detect or predict by crossing data at finer scales with those at larger scales?

Information Gaps: Forest Degradation

- ***Satellite data***: Improved confidence and additional data gathered at finer scales
  - ➢ "Ground truth" via radar/lidar and *in situ data collection to determine validity, causes and effects*
- ***In situ collection*** in permanent plots of data on biomass and indicators of causes and effects of degradation
- ***Radar*** over landscape strips containing permanent plots to detect threats and correlate data collected at smaller and larger scales
  - ➢ Especially effective for scaling up biomass estimates

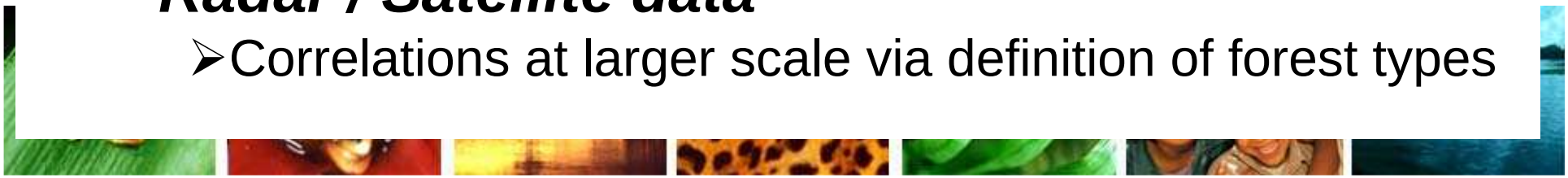
Information Gaps: Vulnerability

- ***Satellite data***: Correlation of data on degradation with additional information (e.g., flammability) at smaller scales
- ***In situ collection*** of data on necromass, soil type and characteristics, etc.
- ***Radar*** over landscape strips containing permanent plots to detect threats and correlate data collected at smaller and larger scales

Information Gaps: Biodiversity

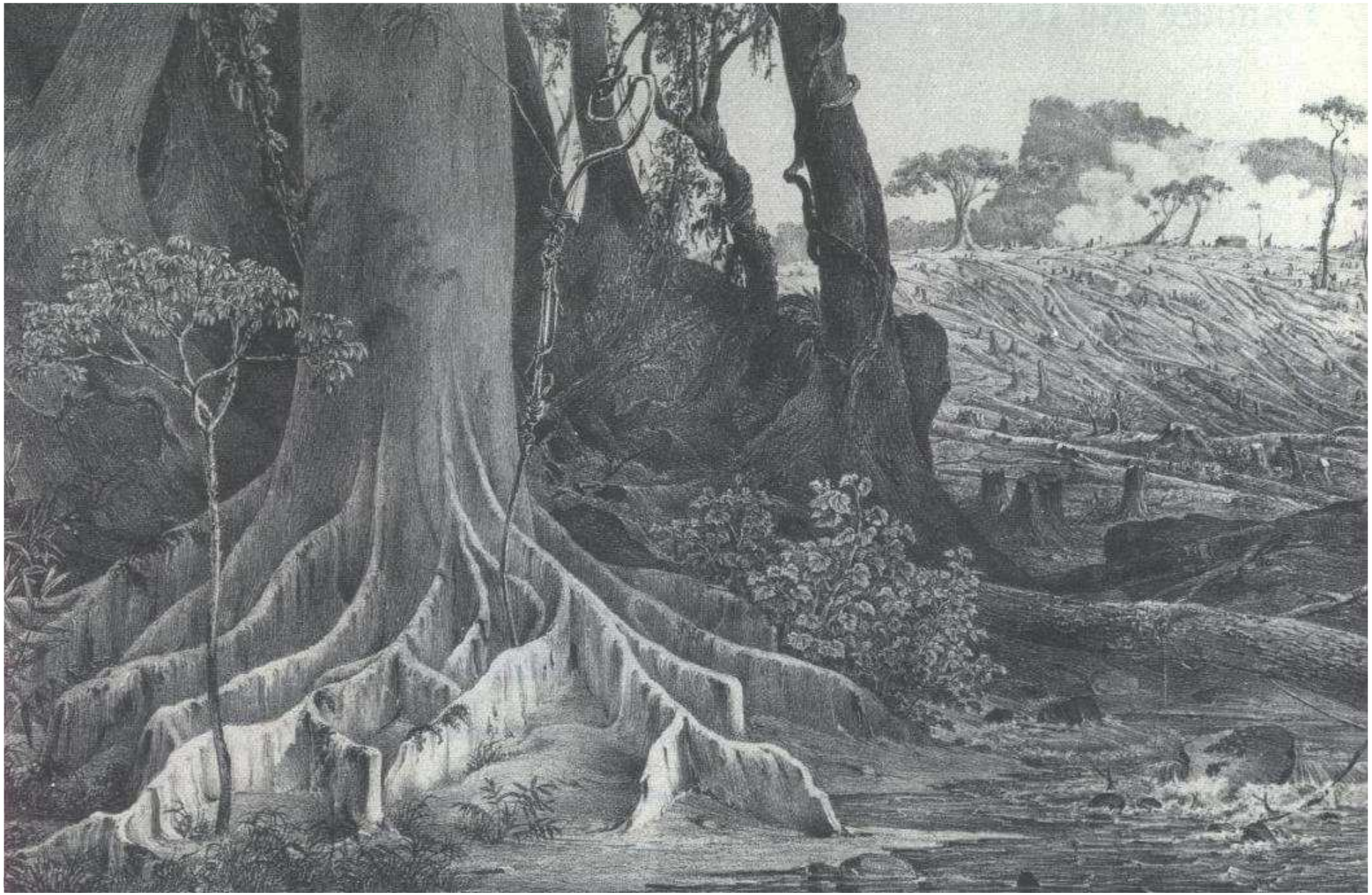
- ***In situ collection*** of data ***(permanent plots)***:
  - Information exchange between networks of permanent plots (e.g., EMBRAPA, MMA, CI,), with a view to adopting general standards, including other countries (e.g., in Amazon basin)
  - More detailed classification of forests (via physical data on structure, soil types, etc.)
  - Sampling of bio- indicators (e.g., amphibians, butterflies, dragonflies etc.): Relevance to biodiversity, forest degradation and vulnerability
  - Making data public (e.g., via Google Earth)
  - Long term ecological research network

- ***Radar / Satellite data***
  - Correlations at larger scale via definition of forest types



Potential Applications

- Forest degradation
  - Management plans for timber harvesting
  - Illegal logging
  - Legal Reserves and Areas of Permanent Protection more precisely defined
  - Carbon emissions => REDD mechanisms
- Vulnerability
  - Identification of strategies for preventative actions
  - Definition of priorities
- Biodiversity
  - Creation and management of protected areas
  - Systematic Conservation Planning frameworks



- Martius 1840-1869

Some hot issues ...

What are the roles of Amazon forest ?

- What are the consequences of the implementation of the protected area system throughout the Amazon with respect to Amazon climate and teleconnections ?

- Talking about teleconnections, we urgently need improved information particularly related to southeastern Brazil climate, but also the rest of the world

- What are the consequences of eventual changes in discharge patterns resulting from climate change with respect to viability of hydroelectric expansion plans for the Amazon?

Protected Areas Contribute to Reduced Carbon Emissions

Scenarios

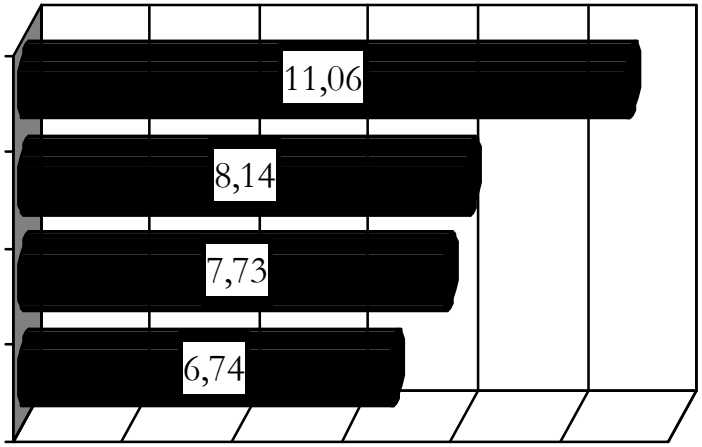
(Billion tons C)

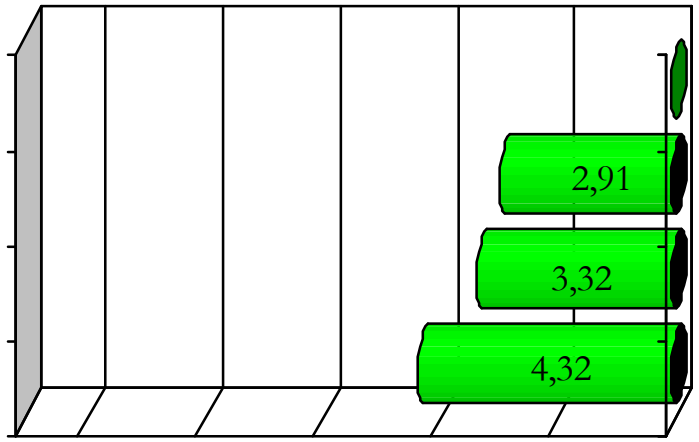
With PAs created by 2002 (baseline)

+PAs created by 2007 without ARPA

+PAs created by 2007 with ARPA

+ PAs proposed by 2008 under ARPA





Simulated Emissions by 2050

Simulated Reductions by 2050

Tipping points: how much forest ?

- it is critical to integrate ecosystem/climate modeling with land use modeling and systematic conservation planning.

- Can the modeling identify the tipping point where increased forest fragment resulting from reduced conservation percent will lead to dieback under current climate conditions? How will this be affected by global warming?

the resiliency/vulnerability of forest in changing environments

- What is the probability that a large block of forest will survive in the south eastern Amazon if different fire occurrence scenarios ? How will this probability be affected by climate change ?

- Is a 10 million ha block of forest large enough to maintain its climate envelope if it is surrounded by agricultural matrix ? And 5 million ? 1 ? What are the regional differences ?

- What is happening under the deforestation mask ? What is the role of secondary forest ?

Final remarks

•As the models become better integrated, one focus point should be making outputs more accessible to a wider audience – more user friendly, internet accessibility, better interfaces for predicting future land use scenarios, informing decision makers, and enabling land use planning.

•It´s very easy and fascinating to get immersed in the soup of acronyms, better algorithms/models, more comprehensive tasks and institutional arrangements, and in the end of day the connection with the floor of forest could be lost

- Changing values => changing cost opportunities of forest conservation

Martius 1840-1869

Thank you ！