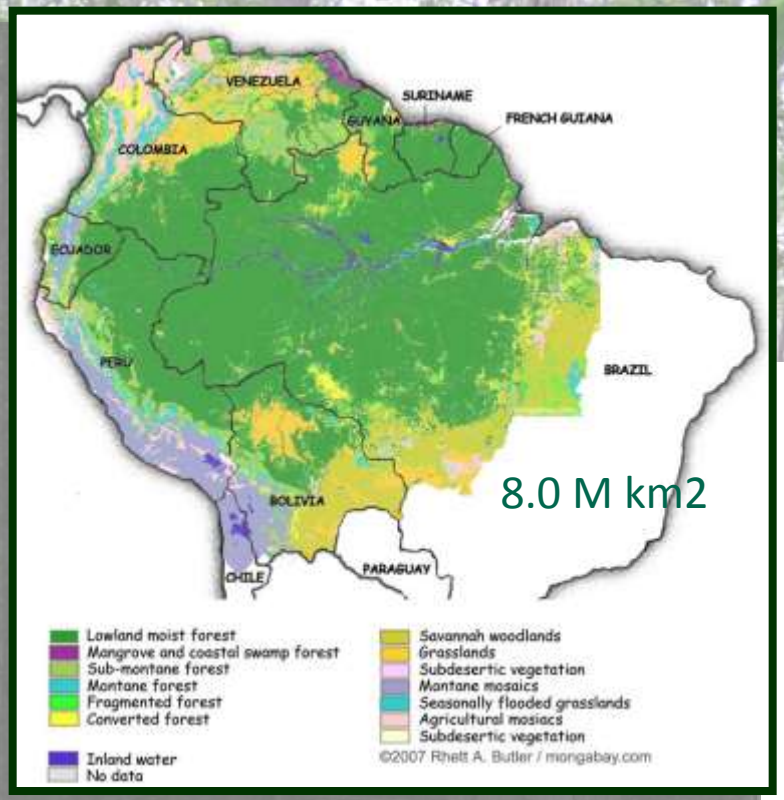
INPA/LBA Activities and Initiatives

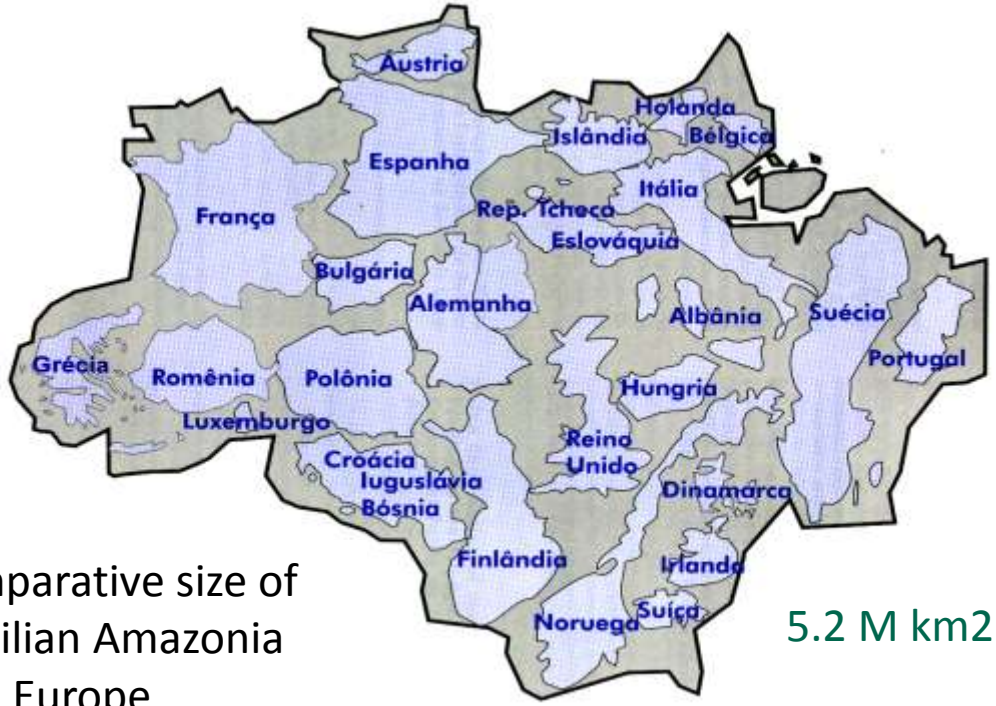
BUNIAACIC meeting, University of Manchester,

2-3 July 2012


INPA

Amazonia is big





Comparative size of Brazilian Amazonia and Europe

AMAZONIAN FRUITS









Carnegiella strigata

Monocirrhus polyacanthus
Leaf fish


Acesso à Informação
BRASIL
INPA
INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA
Orgulho da Amazônia
"Expandir os estudos sobre a biodiversidade e os recursos naturais."
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Domingo, 01 de julho de 2012
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Sobre o INPA
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Cooperação & Intercâmbio
Bosque da Ciência
Reservas e Estações
Assessoria de Comunicação
PESQUISA
Coordenações de Pesquisa
Projetos de Pesquisa
Núcleos e Laboratórios de Pesquisa
Biblioteca
Comitês de Ética
Em Evidência
2012-06-25 - 16:38:16
Inpa recebe exposição "Olhares fragmentados"
◄ Anterior
Próxima ►
III CURSO DE MESTRADO PROFISSIONAL EM GESTÃO DE ÁREAS PROTEGIDAS
INSCRIÇÕES
20 de junho à 20 de julho
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Jornal Divulga Ciência
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INPA

Brazilian Institute for Research in the Amazon

(est. 1952)

MISSION

To generate and disseminate knowledge and technology and to form human resources for the development of the Amazon.

INPA
INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA

Ministério da Ciência, Tecnologia e Inovação

GOVERNO FEDERAL
BRASIL
PAÍS RICO É PAÍS SEM POBREZA

Employees

Ph.D.: 155

M.Sc.: 47

B.Sc.: 154

MBA: 99

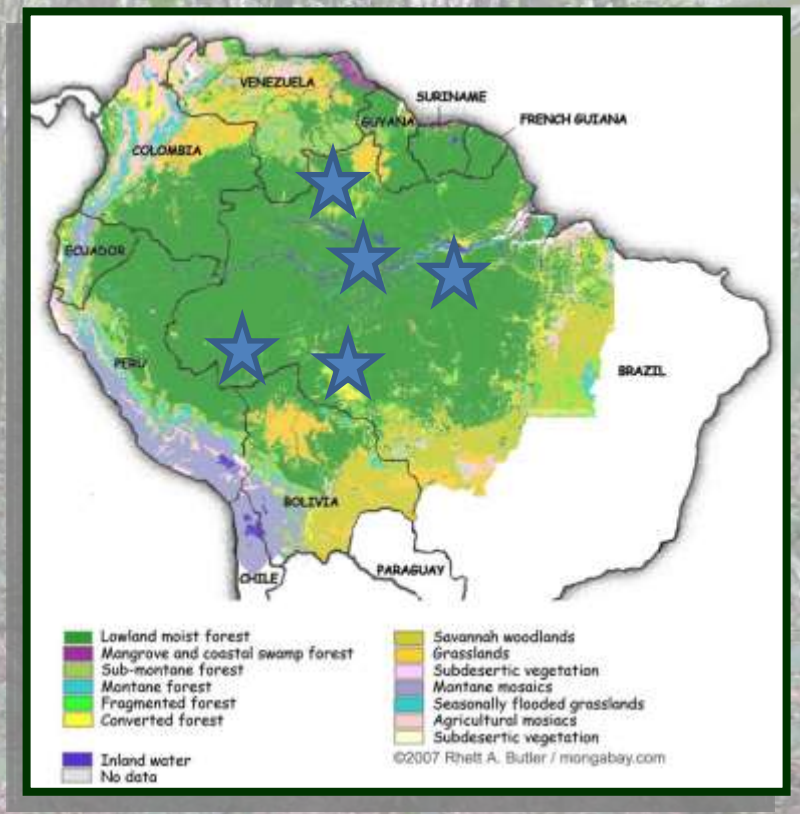
Technical & Administration: 275

Total: 730

Fellows, visiting scientists, students: 3.100

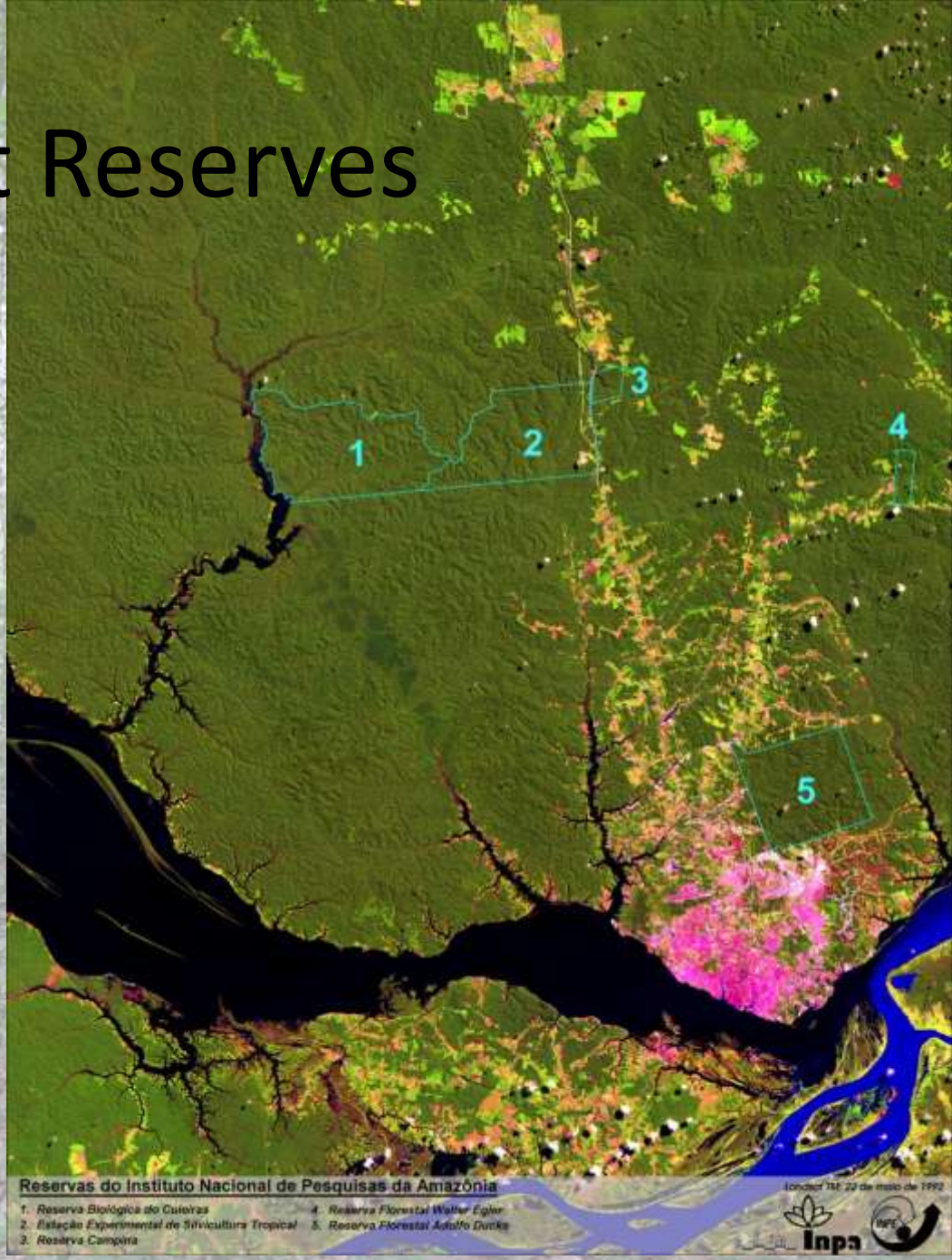
Regional centres

- Manaus, AM
- Santarém, PA
- Rio Branco, AC
- Boa Vista, RR
- Porto Velho, RN



Forest Reserves

1. Reserva Biologica Cueiras, Manaus, AM
2. Estacao Experimental da Silvicultura Tropical
3. Reserva Biológica de Campina (900 ha)
4. Reserva Florestal Egler (760 ha)
5. Reserva Florestal Adolpho Ducke (10,000 ha)



Institutional research focus

- ✓ Biodiversity
- ✓ Technology and innovation
- ✓ Environmental dynamics
- ✓ Society, Environment and Health

INPA's research programmes

PDBFF
INPA-SI

Biological Dynamics of Forest Fragments

Quem é Quem
Núcleos e Escritórios Regionais
Cooperação & Intercâmbio
Bosque da Ciência
Reservas e Estações
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Órgãos Colegiados
Coleções Biológicas
Revista Acta Amazonica
Publicações
ENSINO
Pós-graduação
Lista de bolsas
Oportunidades
ATUALIDADES
Notícias
Eventos
Clippings
Editais e Licitações

Segue, abaixo, a lista de projetos de pesquisa do INPA que possuem site WEB.

- ADAPTA - Adaptações da Biota Aquática da Amazônia
- AGROECO - Impacto Ambient. e Capac. de Suporte
- LBA - Biosfera-Atmosfera na Amazônia
- PDBFF - Proj. Dinâmica Biol. de Frag. Florestais
- PELD - Pesquisas Ecológicas de Longa Duração
- Pimentas de Roraima
- Programa PPbio
- Projeto Biotupé
- Projeto CTPetro
- Projeto Gavião-real
- Projeto Geoma
- Projeto Madeiras da Amazônia
- Projeto Pirada
- Projeto Sementes do Brasil
- Pupunha-Net
- SIGLAB
- TEAM
- Projeto Povos Indígena e Recursos Comuns
- ZEE-DAS Componente Biodiversidade
- Projeto Igarapés
- Instituto Nacional de Ciência e Tecnologia dos Serviços Ambientais da Amazônia
- Projeto Insetos Aquáticos
- Instituto Nacional de Ciência e Tecnologia de Estudos Integrados da Biodiversidade Amazônica - CENBAM

Para acessar a relação com os projetos e programas multi-institucionais e internacionais, clique aqui.

National Science and Technology Institutes

- National Institute of Science and Technology for the Environmental Services of Amazonia (SERVAMB)
- National Institute of Science and Technology
  of Woods from Amazonia
- National Institute of Science and Technology Center for Integrated Studies of Biodiversity in the Amazon (INCT-CENBAM)
- National Institute of Science and Technology
  Centre for studies of Adaptations of Aquatic
  Biota of the Amazon

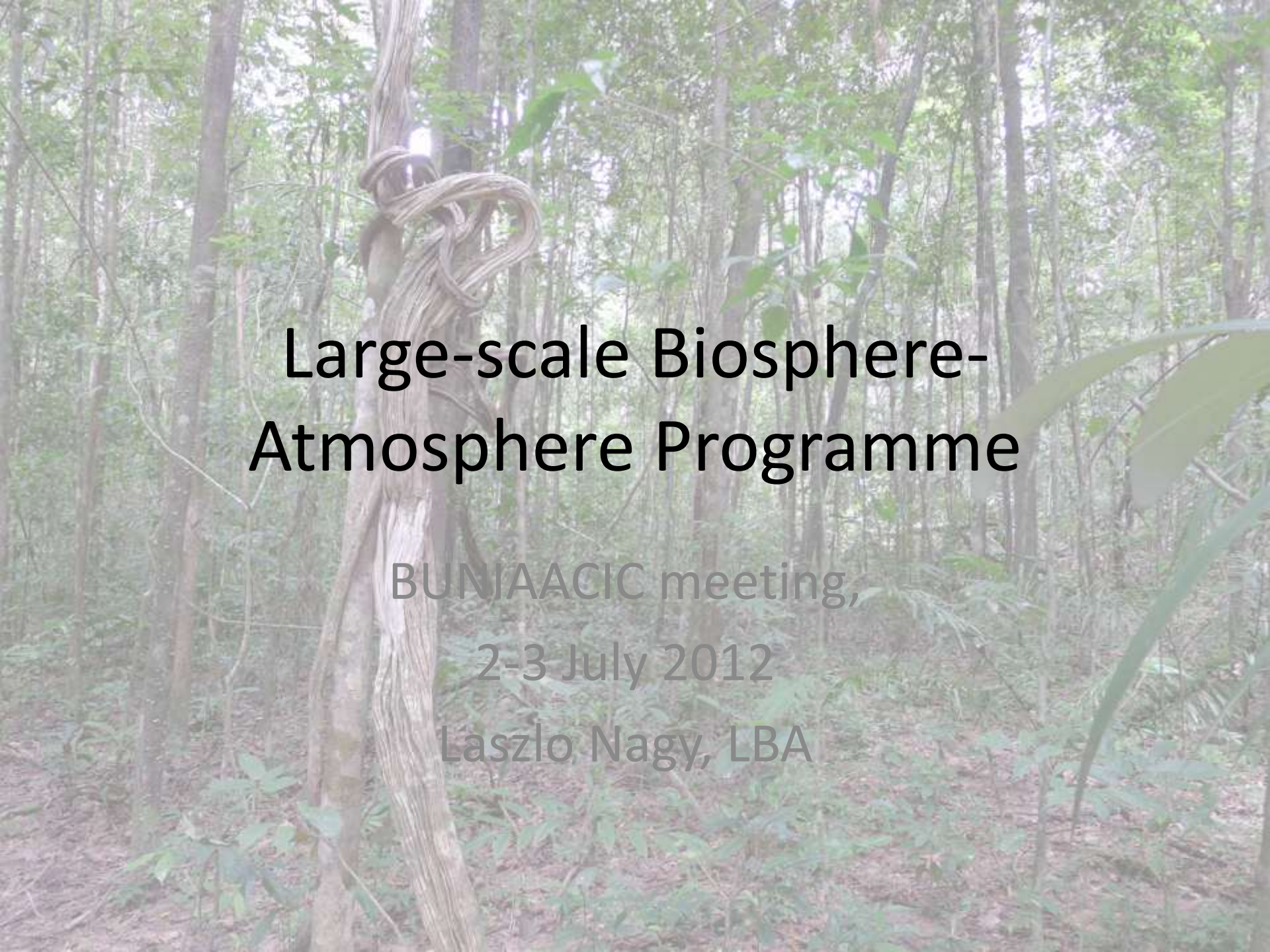
Master and PhD Programs

Ecology
Botany
Entomology
Tropical Agriculture
Tropical Forest Science
Aquatic Biology and Fisheries
Genetics, Conservation & Evolutionary Biology
Climate and Environment
Biological Reserves Management

More than 1,550 professionals formed

Partnerships

Biotechnology (UFAM)
Biotechnology and Regional Products (UEA)
Food Sciences (UFAM)
Aquaculture (INPA/UEA/CUNL)



Large-scale Biosphere-Atmosphere Programme

BUNIAACIC meeting,

2-3 July 2012

Laszlo Nagy, LBA

::LBA::

lba2.inpa.gov.br/site/pt/

LBA Programa de Grande Escala Biosfera-Atmosfera na Amazônia FASE 2

Español
English

- Sobre o LBA
- Área de Pesquisa
- Educ. e Treinamento
- Projetos
- Bancos de Dados
- Notícias e Mídia
- Espaço Público
- Inf. para Uso Interno
- Inf. para Estrangeiros
- Como Chegar

NEWS

Destaques

- » Queimadas na Amazônia estão em queda segundo MCTI
- » Pesquisa do clima
- » Meio ambiente e desenvolvimento
- » Ação cidadania e clima
- » Nível dos rio começa a descer.

Escritório Central do Programa LBA - Campus II
Av. André Araújo, 2936,
Bairro Aleixo Manaus - AM
Caixa Postal 478 CEP 69060-000
lbamao@inpa.gov.br
Tel: +55 (92) 3643-3238 Fax: (92) 3236-5131

FINEP INPA MCTI BRASIL

lba2.inpa.gov.br/site/pt/pagina/a87ff679a2f3e71d9181a67b7542122c

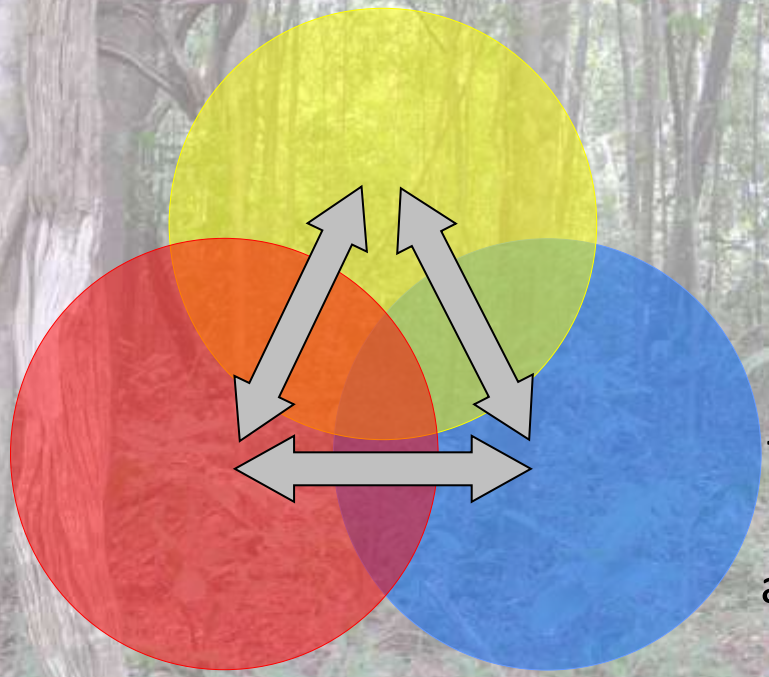
LBA today

- ca. 50 projects in execution
- Over 1600 scientific publications
- 350 M.Sc. theses; 250 Ph.D. theses completed

LBA sites / towers

LBA Phase II Towards Integration and Interdisciplinarity

Multi-scale physico-chemical interactions at biosphere- atmosphere interface



Physico-chemico-biological processes in aquatic and terrestrial ecosytems and their interactions

The social dimensions of environmental change and the dynamics of land cover change

Phase II – Foci

- The changing environment of Amazonia
- Environmental sustainability (of ecosystem services) and the sustainability of current terrestrial and aquatic production systems
- Variability and changes in climatic and hydrologic systems – feedback, adaptation and mitigation

Project list

- Hyperlink to Excel file

Two highlights

- ATTO
- ✓GoAmazon2014

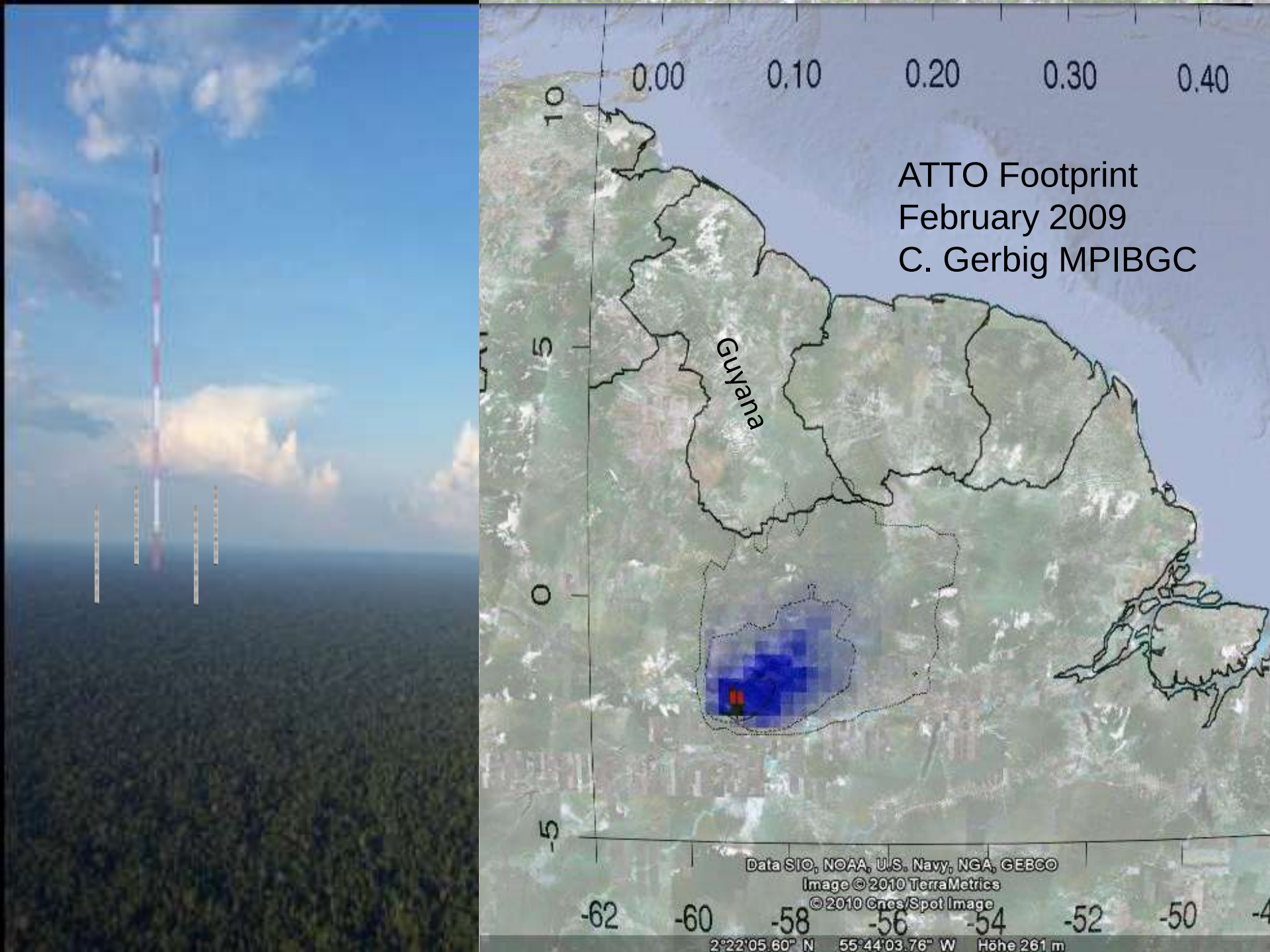
ATTO (INPA and Max Planck Institute)

OBJECTIVE:

Obtain reliable estimates of the sources and sinks of trace gases (CO_2, CH_4 e N_2O) and of the formation of aerosols in Amazonia

> 300 m tall → large 'footprint' (continuous observation over a very large area)
Climate, atmospheric physics & chemistry and Amazonian ecosystems, incl. human impacts
Input into carbon cycle models
Part of Global Carbon Project and Earth System Science Partnership

Ministério da Ciência e Tecnologia
BRASIL UM PAÍS DE TODOS GOVERNO FEDERAL
INPA INSTITUTO NACIONAL DE PESQUISAS DA AMAZÔNIA
GOVERNO DO ESTADO DO AMAZONAS
MAX-PLANCK-GESELLSCHAFT
Bundesministerium für Bildung und Forschung

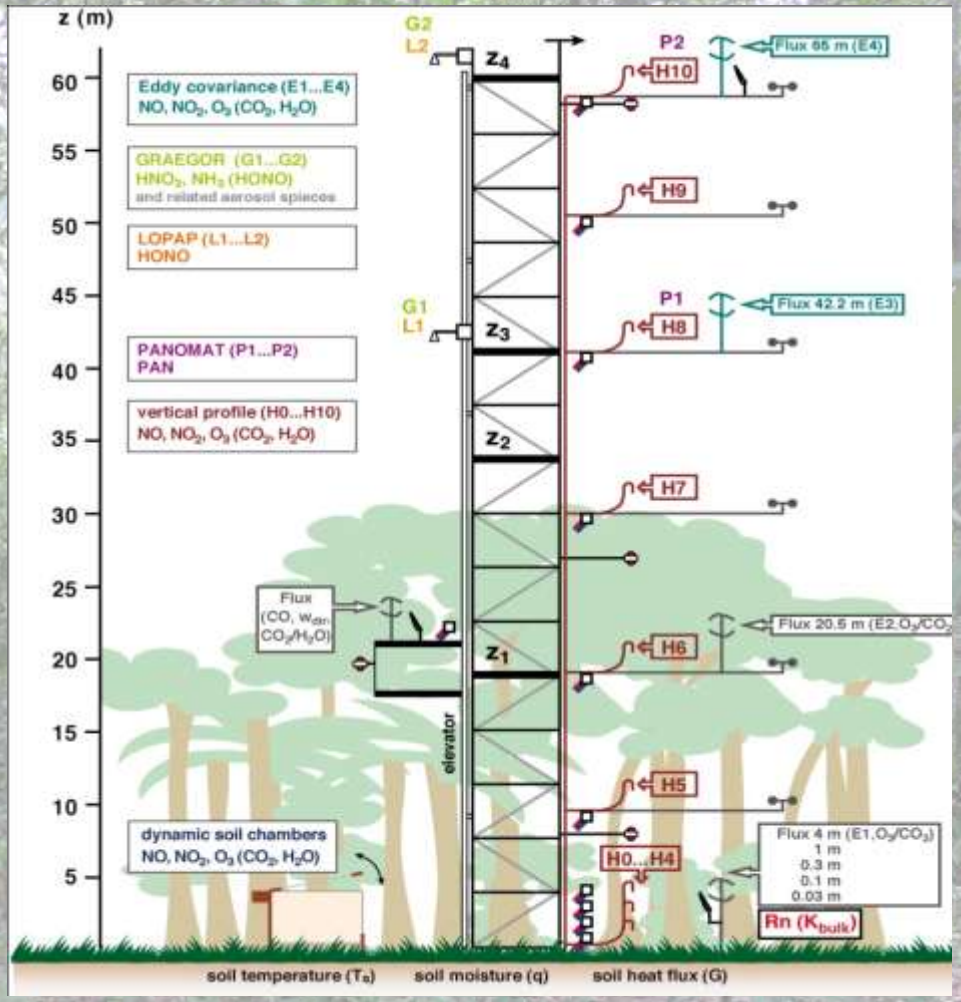

ATTO Footprint
February 2009
C. Gerbig MPIBGC
Guyana
0.00
0.10
0.20
0.30
0.40
10
5
0
-5
-62
-60
-58
-56
-54
-52
-50
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 TerraMetrics
© 2010 Cnes/Spot Image
2°22'05.60" N 55°44'03.76" W Höhe 261 m

ATTO & CLAIRE* (INPA and Max Planck Institute)

CLAIRE: The Cooperative LBA Atmospheric Regional Experiment

- Collaborators

INPA, Manaus
UEA, Manaus
MPIC, Germany
USP, São Paulo
INPE, São José dos Campos
UFSM, Santa Maria-RS
Wageningen University, Netherlands
Havard University, USA
Helsinki University, Finland



The scheme of the so-called fat tower of CLAIRE

ATTO – expected outputs I

- Determination of concentrations, sinks and sources of radiative greenhouse gases (CO_2, CH_4, CO, N_2O - measurement above the layer that is affected by diurnal changes)
  - Meteorological measurements (exchanges over the footprint area)
  - Isotope analysis ($^{13}C/^{12}C$, D/H, $^{18}O/^{16}O$; ^{14}C ^{18}O on CO_2 and CH_4) to determine the relative contribution of human-induced impacts

ATTO – expected Outputs II

- Assessment of turbulance and transport processes in the atmospheric boundary layer (between surface and atmosphere)
- Estimation of biosphere-atmosphere carbon exchange rates
- Development and validation of dynamic vegetation models, atmospheric boundary layer models and models for heat, moisture, aerosol and trace gas fluxes
- Monitoring trace gases and aerosol particles and their effects on climate
- Evaluation of satellite estimates of greenhouse gases, temperature and humidity profiles

Plant Ecology & Diversity

SPECIAL ISSUE:
Ecosystem Dynamics of Amazonian Forests

Publishing soon in Volume 5, Issue 3
(September 2012)

Sign up for ***Plant Ecology & Diversity*** table of contents alerts to ensure you don't miss this issue!

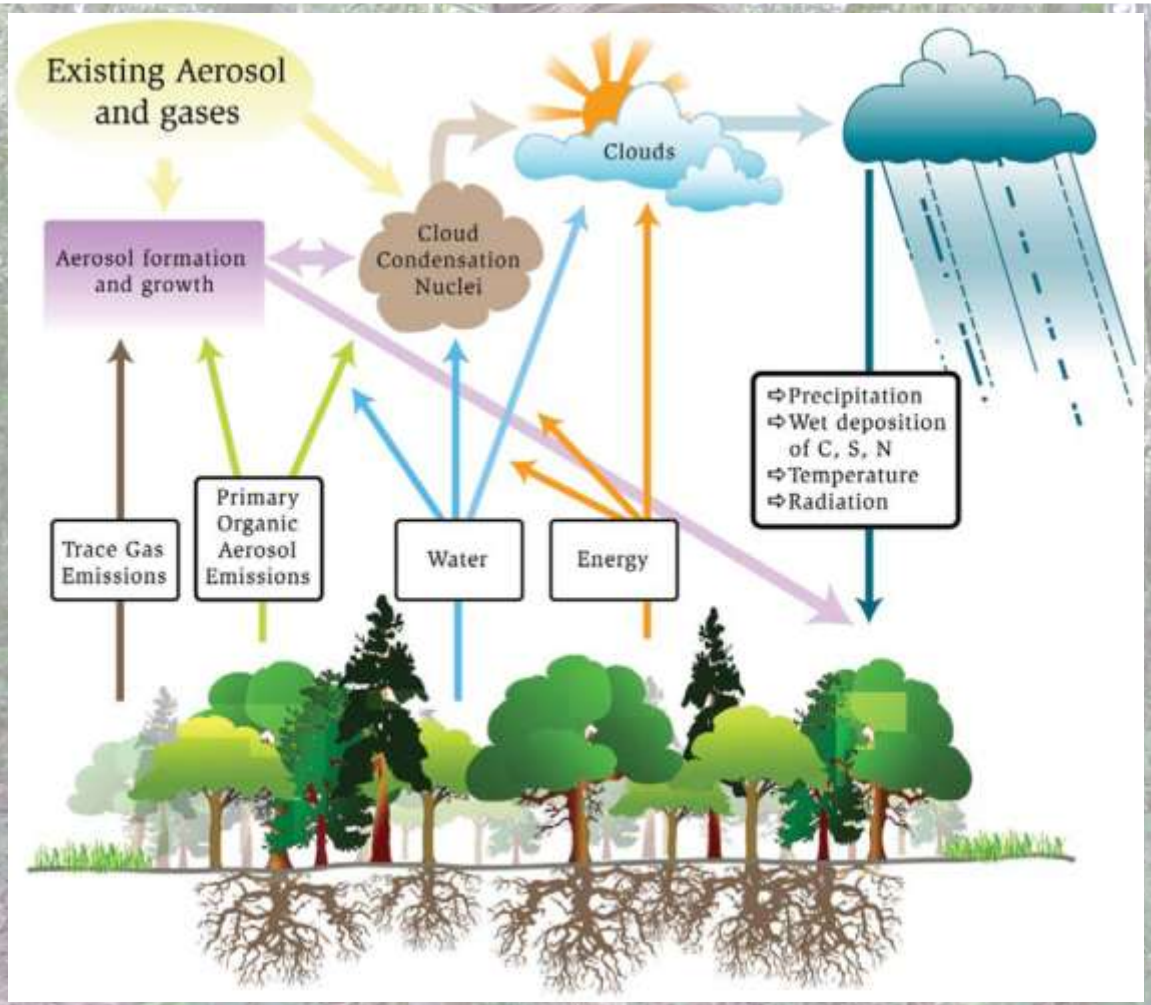
2010
IMPACT FACTOR:
2.053*

Taylor & Francis
Taylor & Francis Group

Green Ocean Amazon 2014

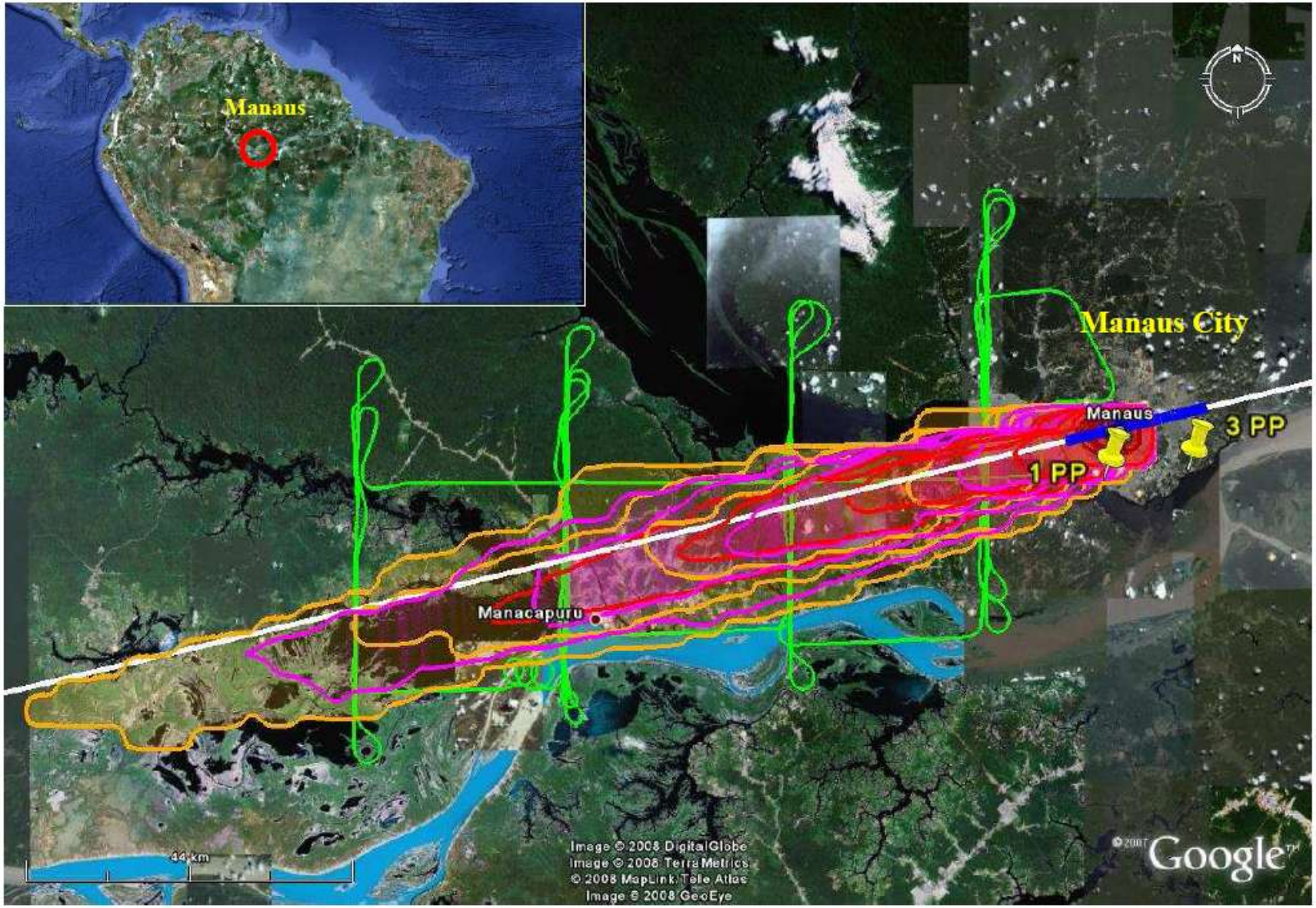
- The ultimate goal is to estimate future changes in direct and indirect radiative forcing, energy distributions, regional climate, ecosystem functioning, and feedbacks to global climate.
- (GOAmazon2014 - led by Scot Martin, Harvard)

Amazon Basin has strong coupling between terrestrial ecosystem and the hydrologic cycle: The linkages among carbon cycle, aerosol life cycle, and cloud life cycle need to be understood and quantified.

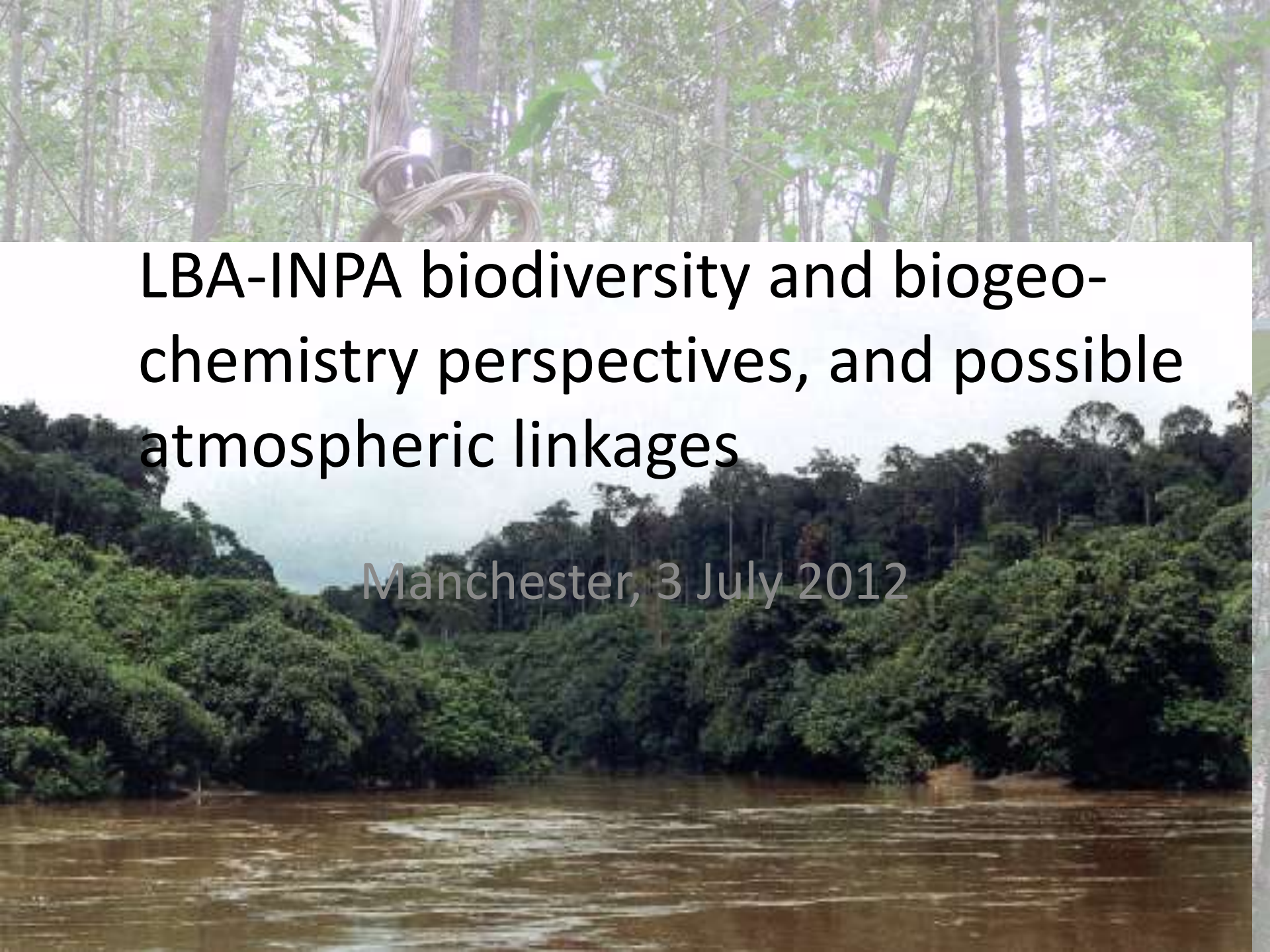


Source: Barth et al., "Coupling between Land Ecosystems and the Atmospheric Hydrologic Cycle through Biogenic Aerosol Particles," *BAMS*, *86*, 1738-1742, 2005.

Susceptibility and expected reaction to stresses of global climate change as well as pollution introduced by future regional economic development are not known or quantified at present time.



Reference: Kuhn, U.; Ganzeveld, L.; Thielmann, A.; Dindorf, T.; Welling, M.; Sciare, J.; Roberts, G.; Meixner, F. X.; Kesselmeier, J.; Lelieveld, J.; Ciccioli, P.; Kolle, O.; Lloyd, J.; Trentmann, J.; Artaxo, P.; Andreae, M. O., "Impact of Manaus City on the Amazon Green Ocean atmosphere: Ozone production, precursor sensitivity, and aerosol load," *Atmos. Chem. Phys.* **2010**, *10*, 9251-9282.



LBA-INPA biodiversity and biogeo-chemistry perspectives, and possible atmospheric linkages

Manchester, 3 July 2012

Do species differences matter for biogeochemical cycling?

- No
  - Most photosynthetic organisms operate the Calvin cycle
  - Greenness – estimate of photosynthesis
  - Productivity dependent on energy absorbed
  - Convergent vegetation types have comparable productivities
- Yes
  - Species-specific impacts on resource capture and use impact on biogeochemistry

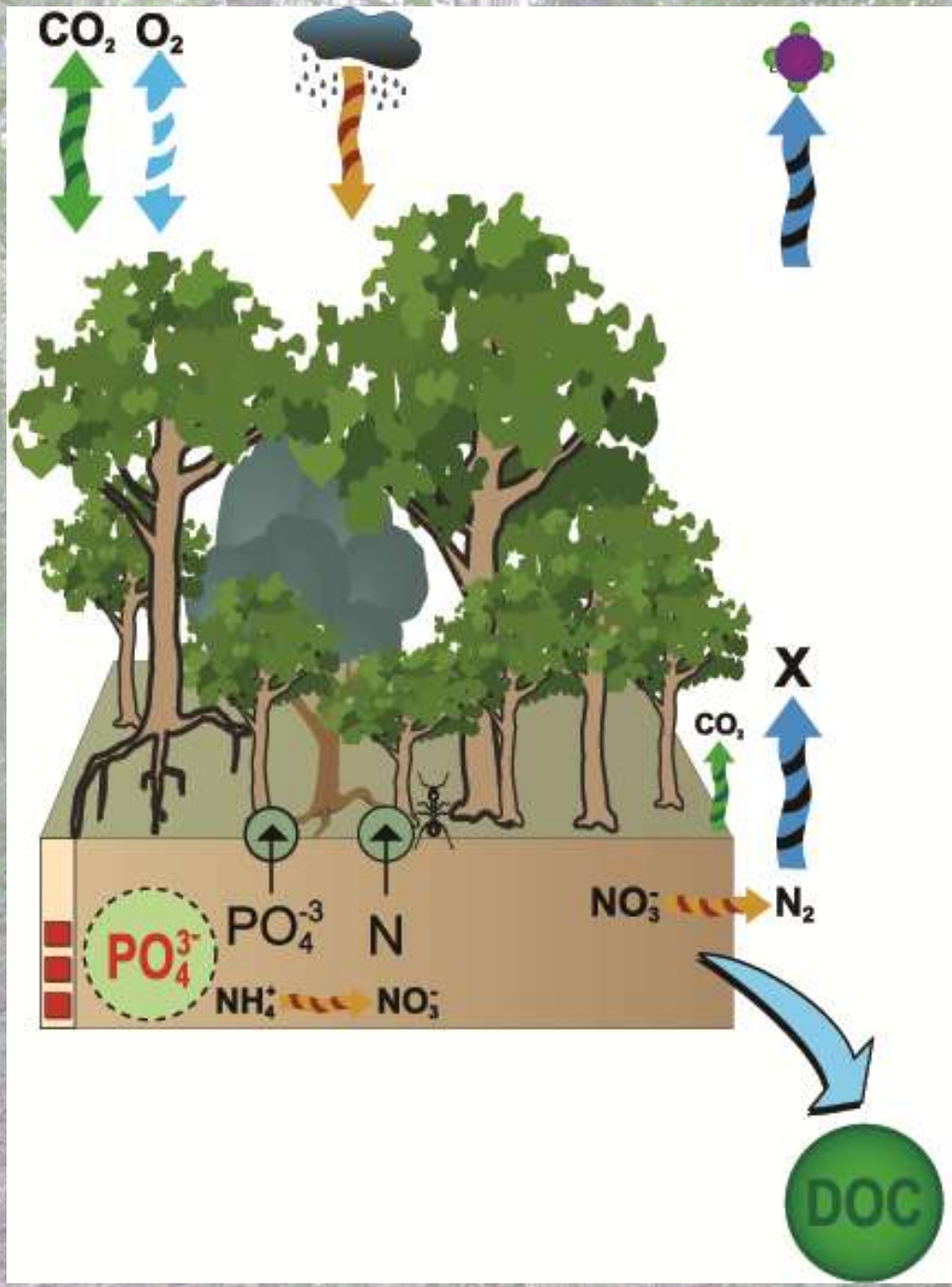
Mooney (2001) Biological Diversity, Evolution, and Biogeochemistry. In: Global Biogeochemical Cycles in the Climate System

Type of diversity and biogeochemical functioning

- Structural diversity (canopy roughness - turbulent transfer / boundary layer impacts) – land surface-atmosphere transfer models
- (Species) Functional type diversity – are they functional?

Biodiversity and biogeochemistry in Amazonia

- Variety of natural forest types: lowland evergreen rainforest (*terra firme*), heath forest, seasonally flooded forest, swamp forest, treeless vegetation, aquatic ⇒ (differences in species composition, nutrient cycling, production of BVOC?)
- Anthropogenic vegetation types: secondary forest (various, following temporary land use), cropland, plantation ⇒ (differences in species composition, nutrient cycling, production of BVOC)



Exchange with atmosphere:
- deposition, N fixation;
- BVOC production

Plant processes:
Uptake & storage, use for growth, internal recycling

Recycling within the forest:
litterfall, root turnover, root exudates, canopy leaching

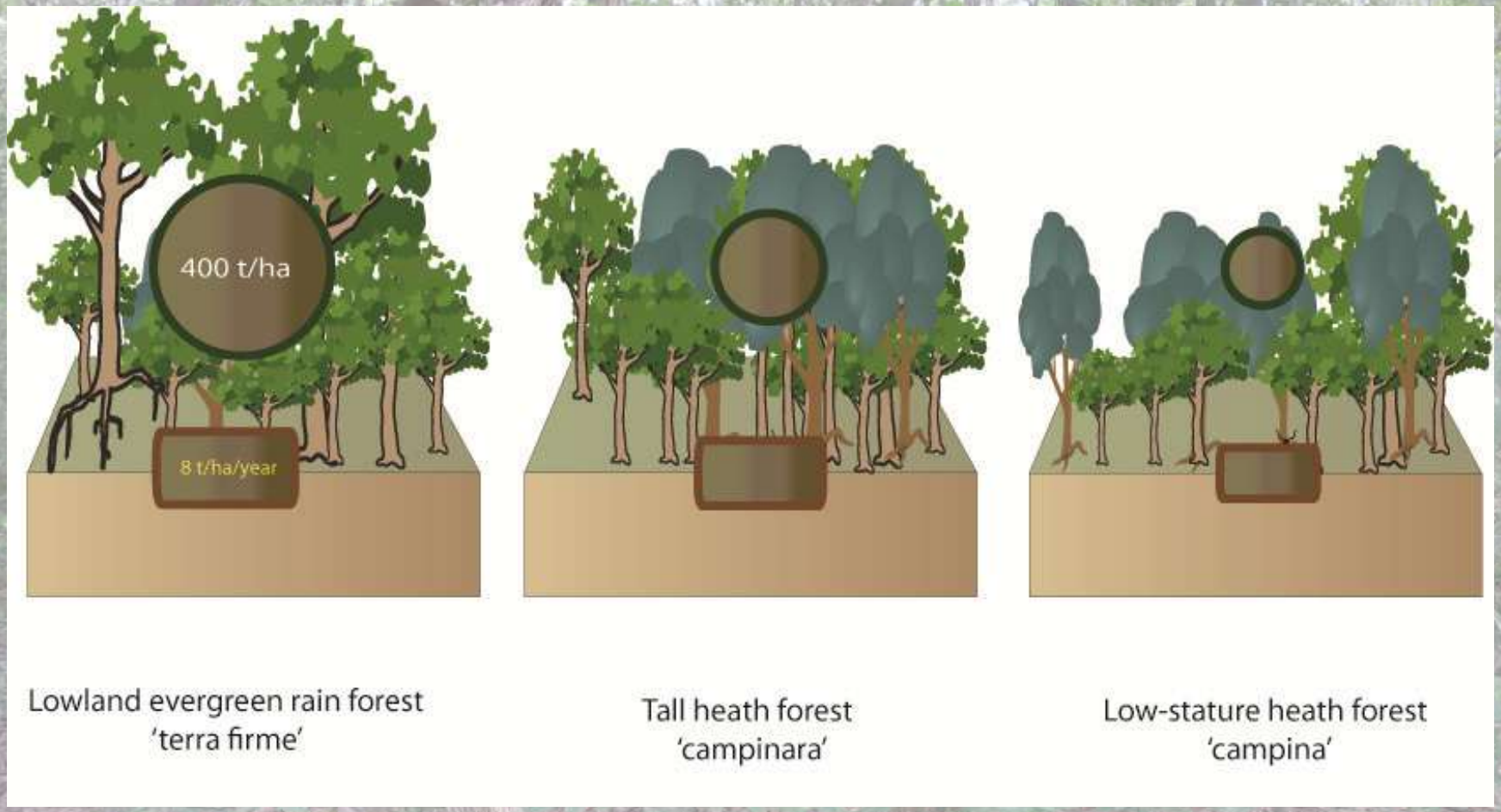
Litter:
fragmentation, mixing, microbial decomposition, humus formation (+/-)

Soil:
mineralisation, (im)mobilisation, ion exchange, adsorption

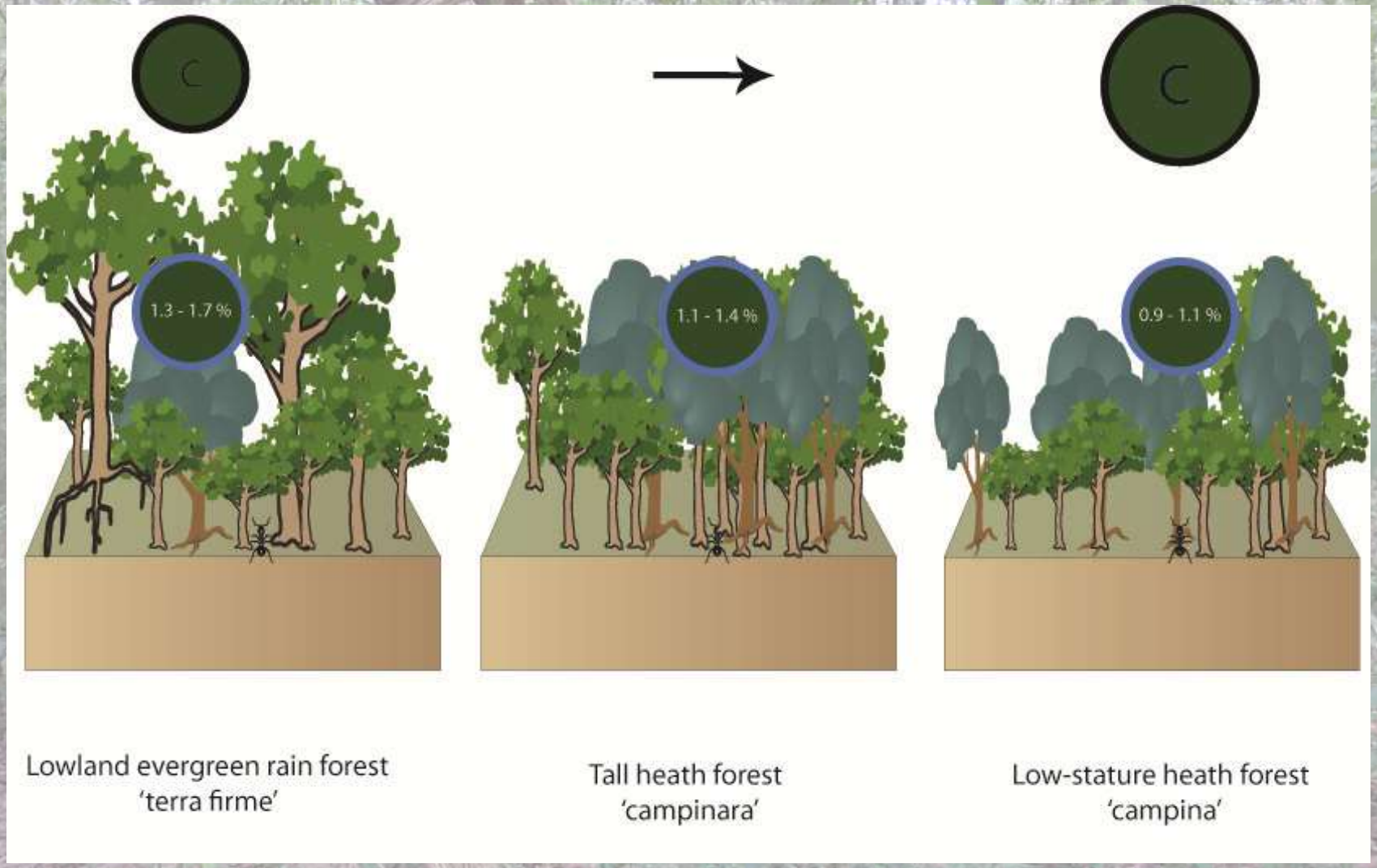
Geology:
clay, ion fixation in mineral lattices

Export from ecosystem:
microbial gas emissions, leaching, erosion, fire, harvest

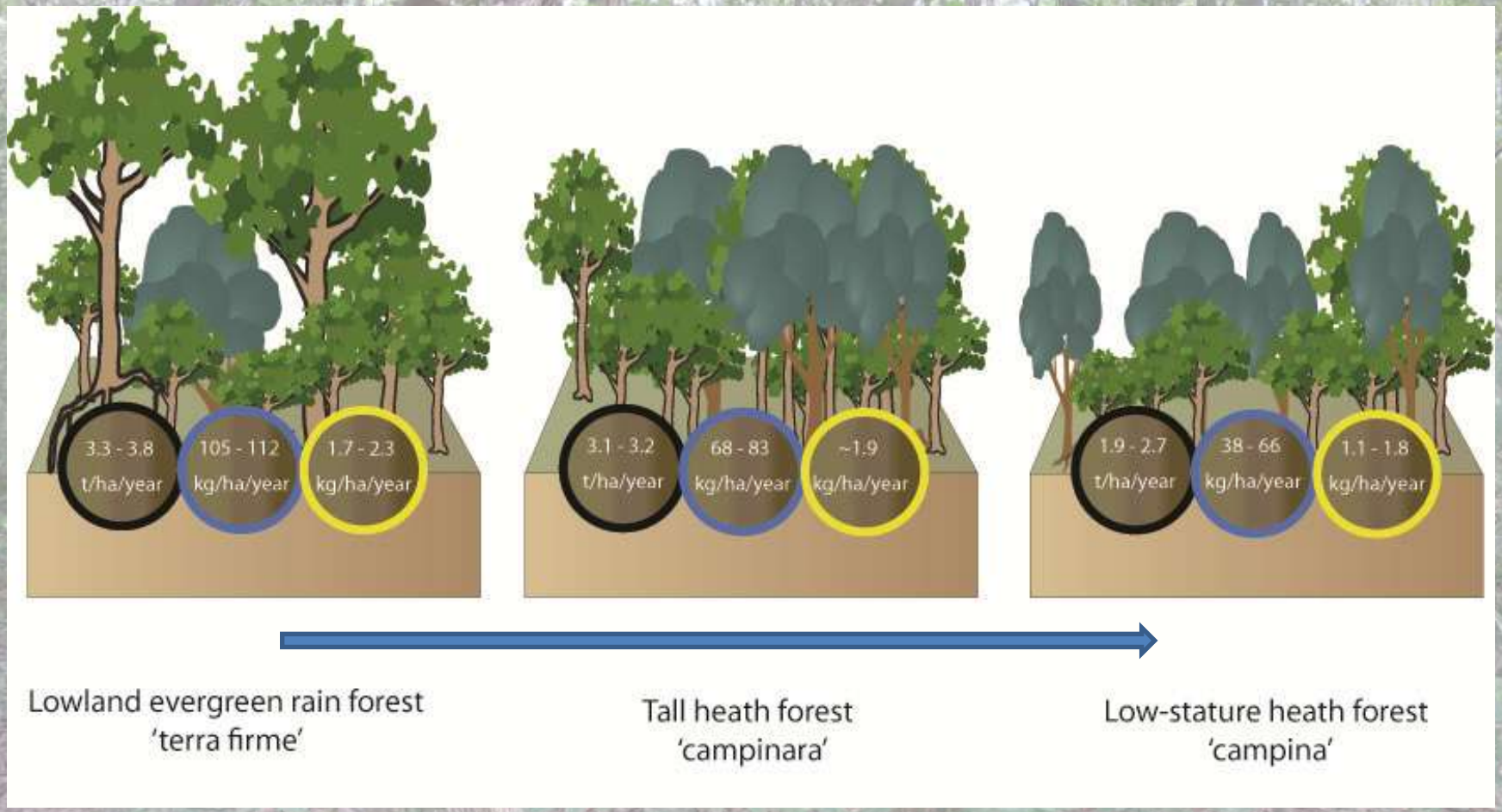
Forest types Amazonia: biomass



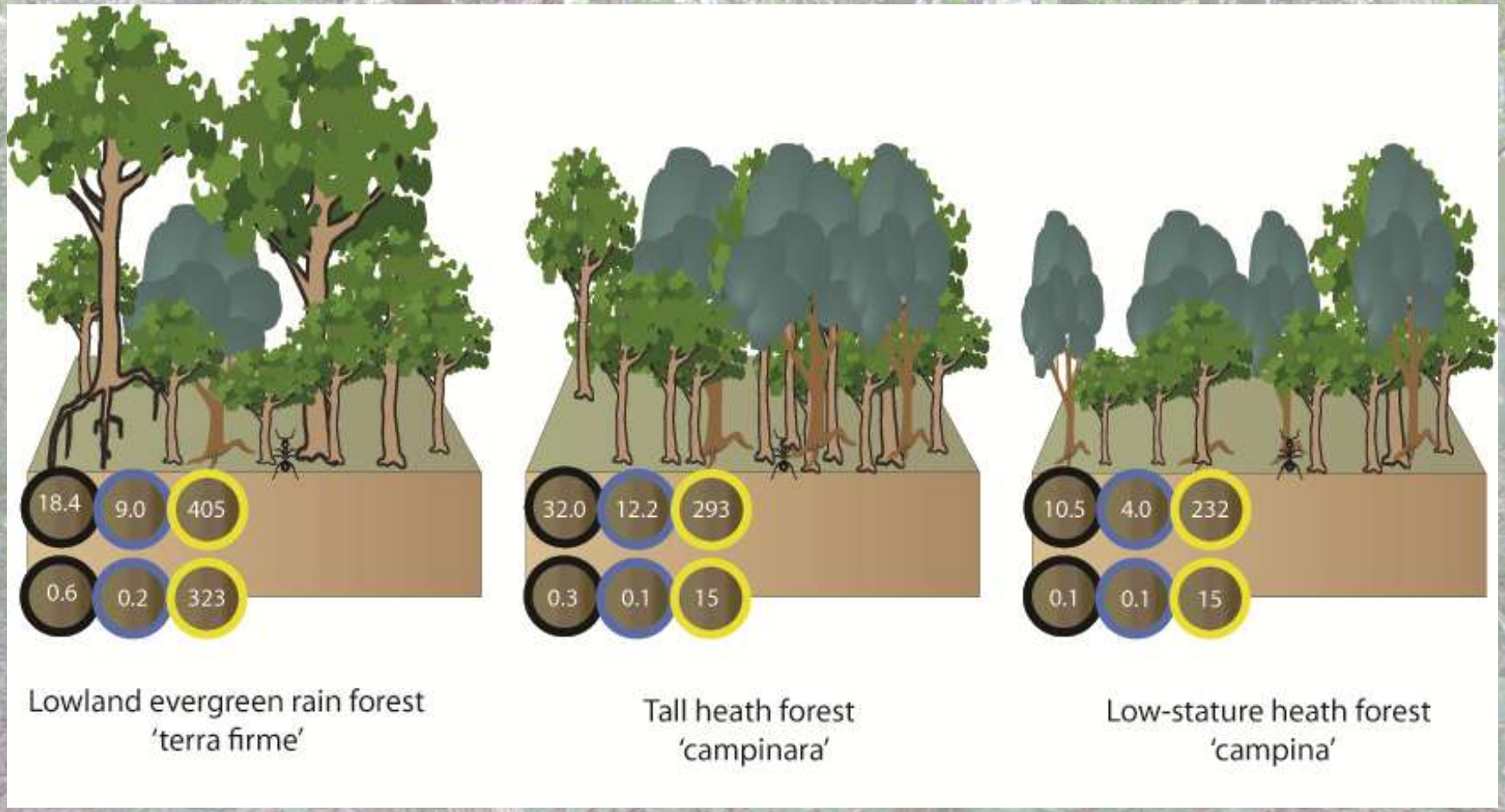
C:N ratio in foliage



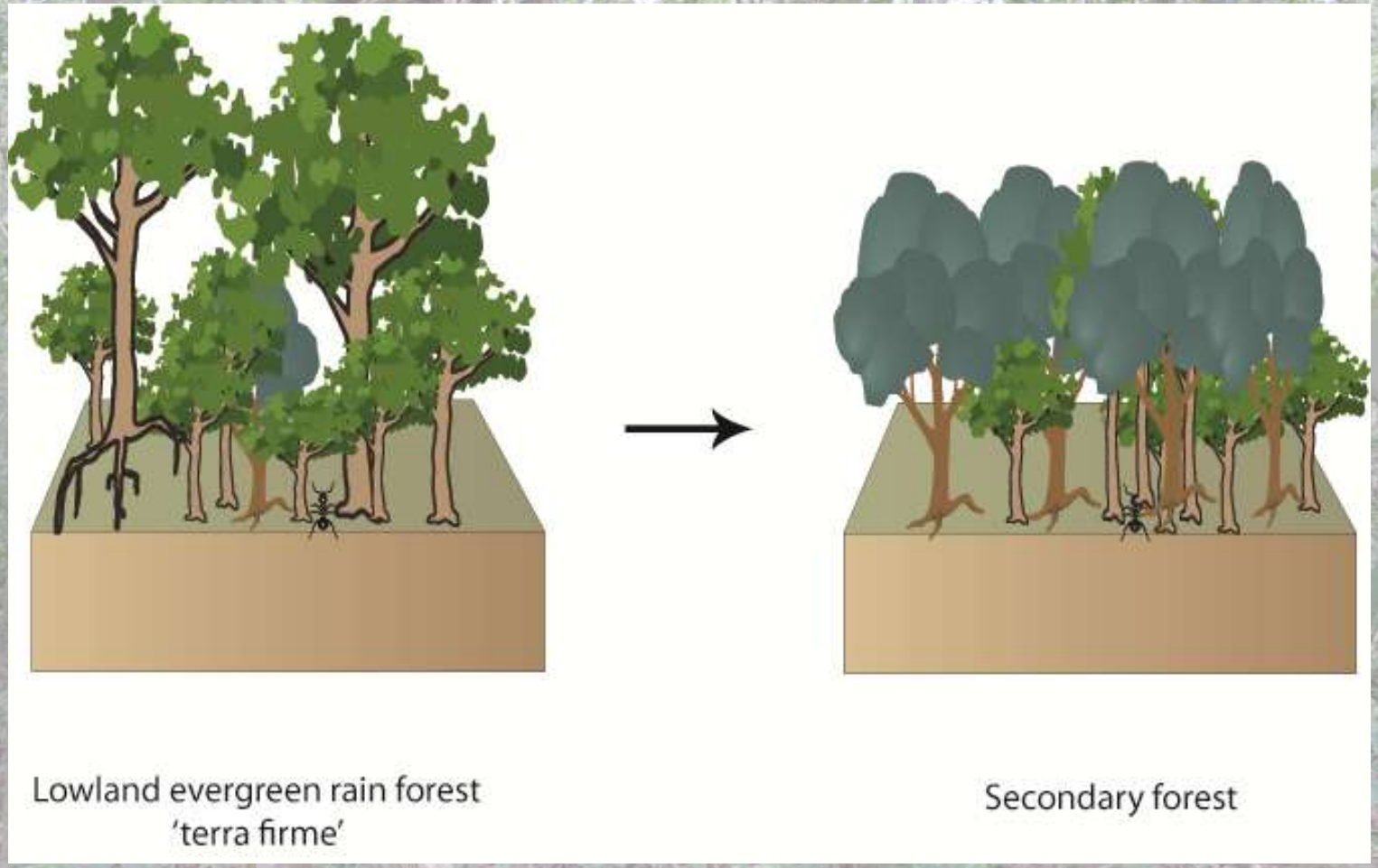
Litter C, N, P


3.3 - 3.8
t/ha/year
105 - 112
kg/ha/year
1.7 - 2.3
kg/ha/year
3.1 - 3.2
t/ha/year
68 - 83
kg/ha/year
~1.9
kg/ha/year
1.9 - 2.7
t/ha/year
38 - 66
kg/ha/year
1.1 - 1.8
kg/ha/year
Lowland evergreen rain forest
'terra firme'
Tall heath forest
'campinara'
Low-stature heath forest
'campina'

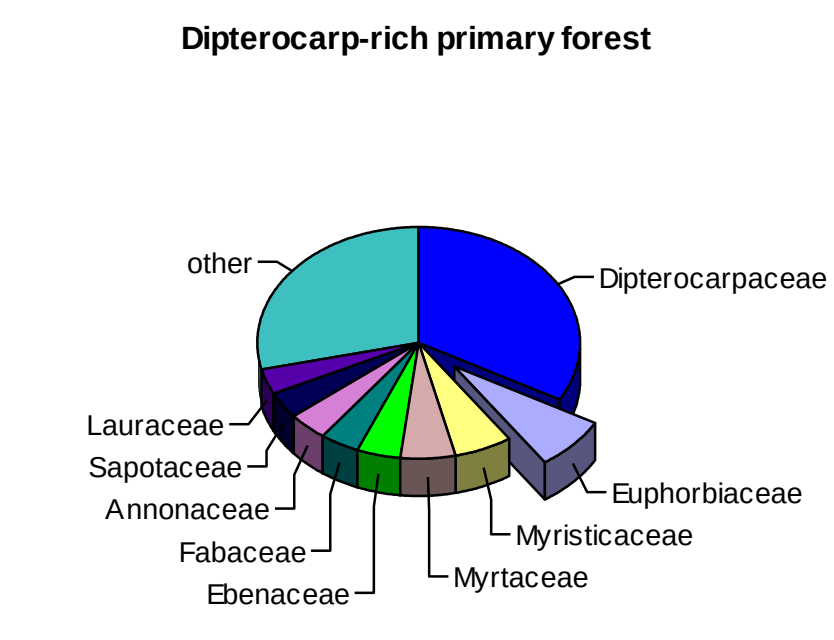
Soil C, N, P

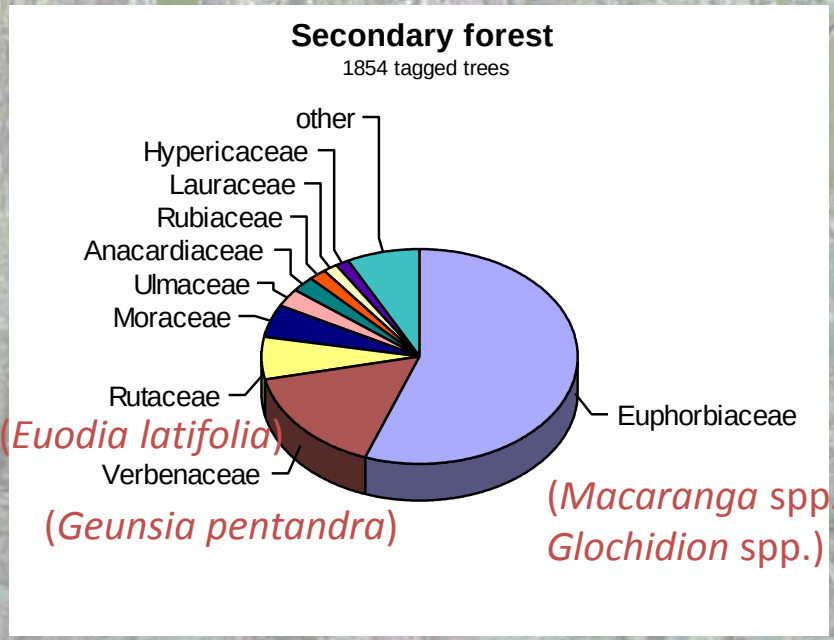

18.4
9.0
405
0.6
0.2
323
Lowland evergreen rain forest
'terra firme'
32.0
12.2
293
0.3
0.1
15
Tall heath forest
'campinara'
10.5
4.0
232
0.1
0.1
15
Low-stature heath forest
'campina'

Differences between primary and secondary forest



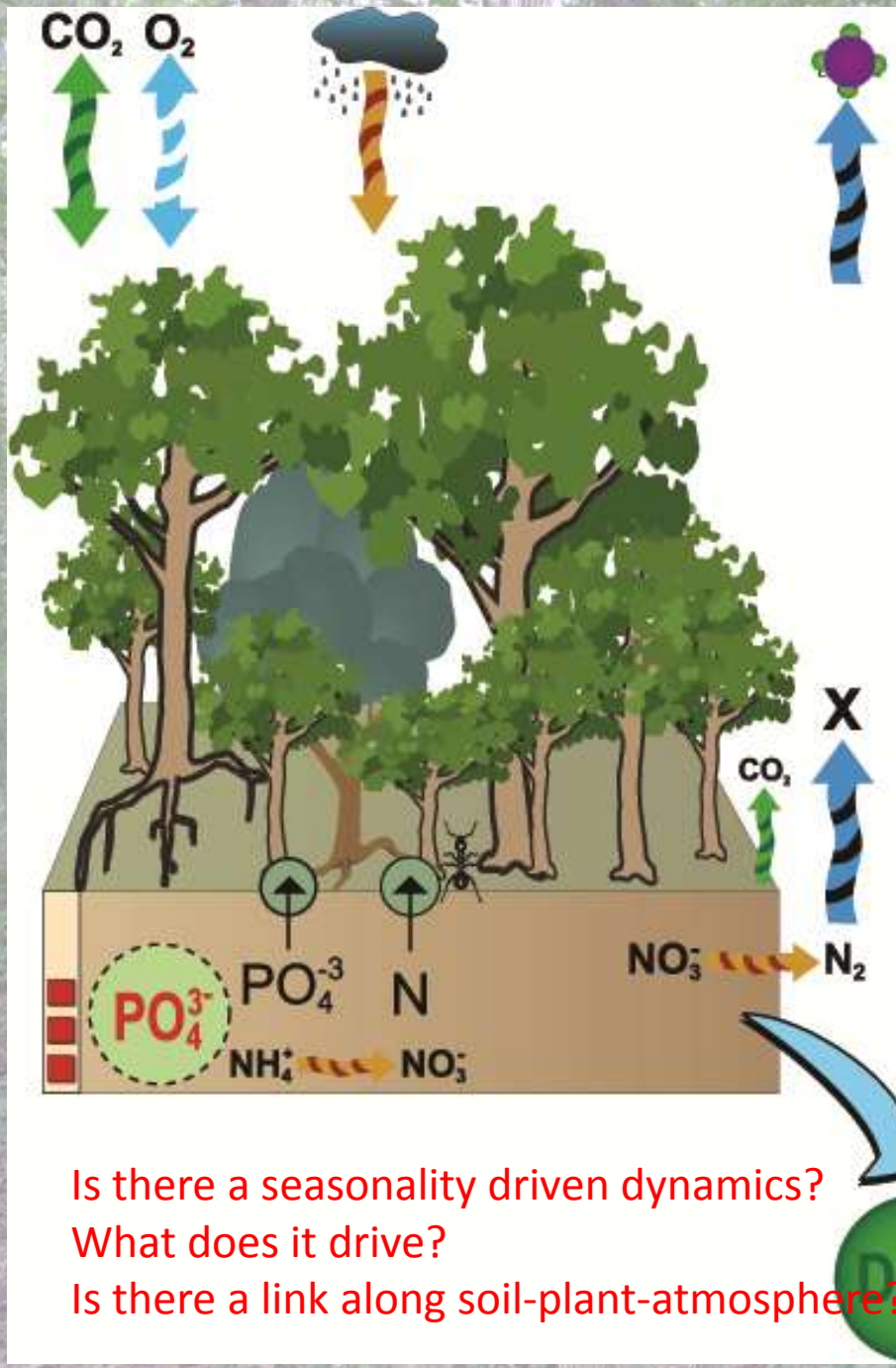
Land use: change in species





Land use change

- Change in species / functional type (plant & microbe)
- The rate and magnitude of change in ecosystem biogeochemistry (primary forest vs. secondary succcession)
  - soil and plant C, N
  - above-ground vs. below-ground production
  - C and N pools vs. N mineralization, NOx flux, soil respiration, and BVOC emissions



Exchange with atmosphere:
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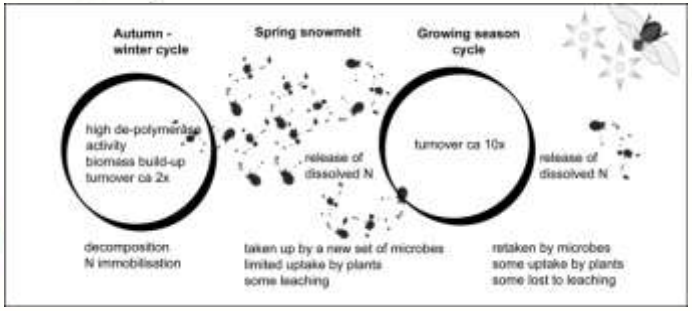
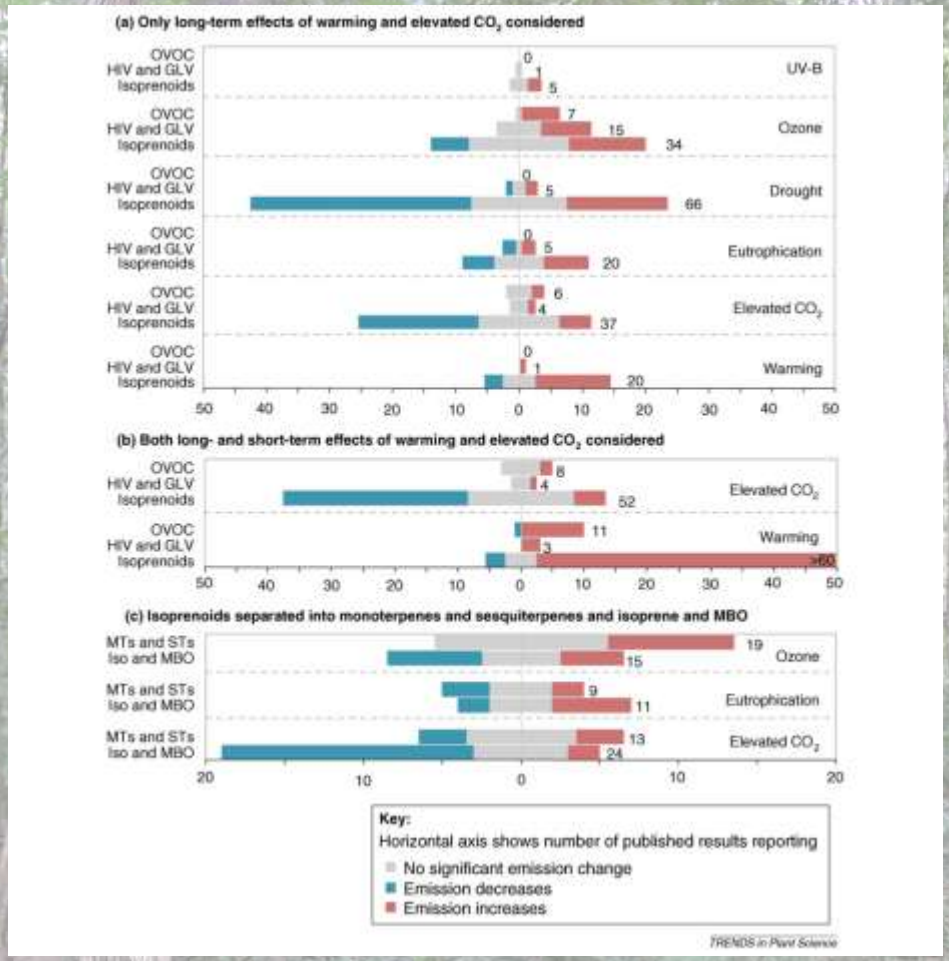
litterfall, root turnover, root exudates, canopy leaching

Litter:
fragmentation, mixing, microbial decomposition, humus formation (+/-)

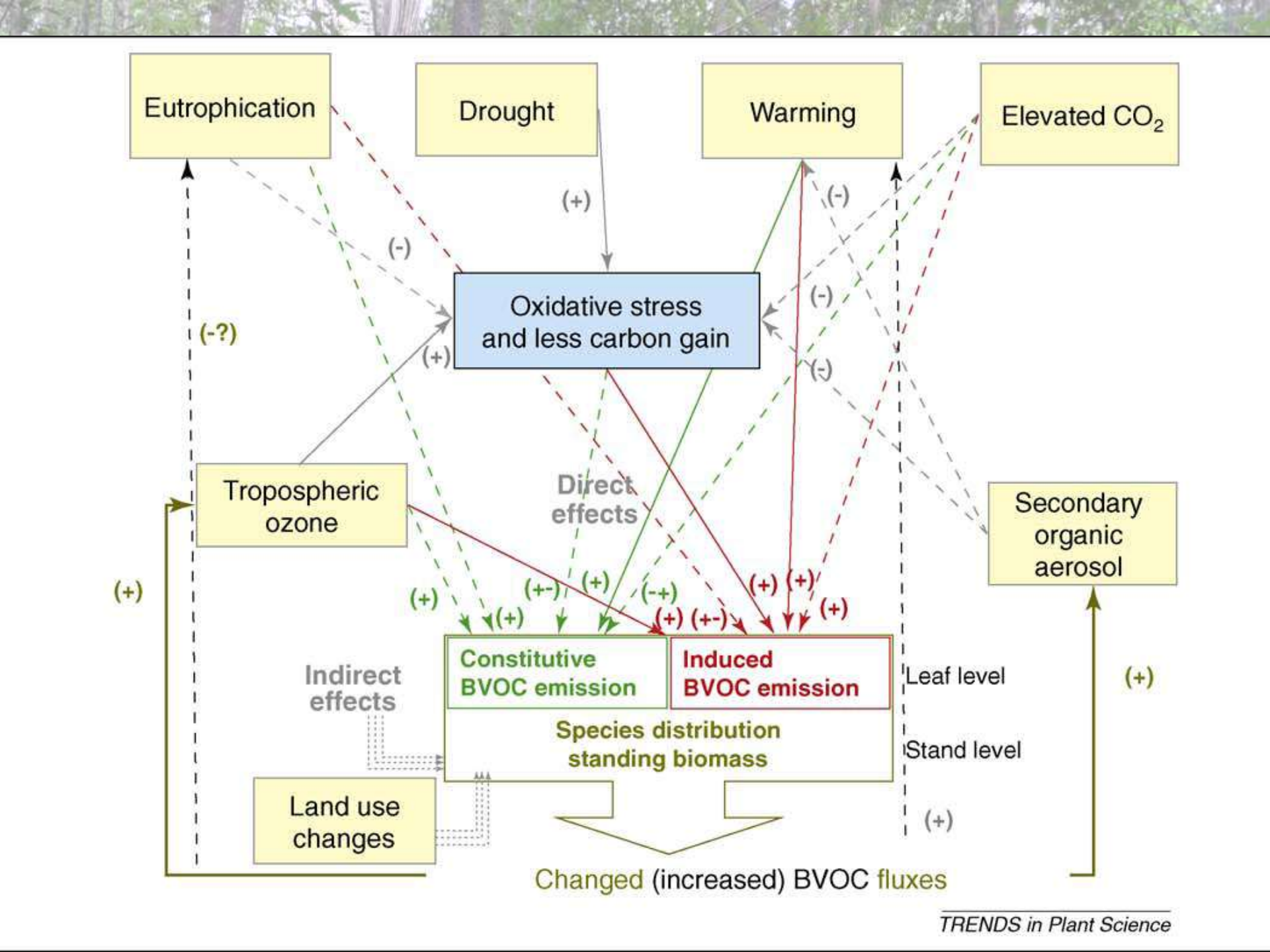
Soil:
mineralisation, (im)mobilisation, ion exchange, adsorption

Is there a seasonality driven dynamics?
What does it drive?
Is there a link along soil-plant-atmosphere?





Penuelas & Staudt (2012)
Induced biogenic volatile organic compounds from plants
BVOCs and global change. Trends in Plant Science 15: 133-144.


Eutrophication
Drought
Warming
Elevated CO_2
(+)
(-)
(-)
(-)
(-)
(-?)
(+)
Oxidative stress
and less carbon gain
Tropospheric
ozone
Direct
effects
Secondary
organic
aerosol
(+)
(+)
(+-)
(+)
(-+)
(+) (+)
(+)
(+)
(+) (+-)
(+)
Constitutive
BVOC emission
Induced
BVOC emission
Leaf level
(+)
Indirect
effects
Species distribution
standing biomass
Stand level
Land use
changes
(+)
Changed (increased) BVOC fluxes
TRENDS in Plant Science

Plant protection against stress

Thermotolerance

Oxidative stress tolerance

Photoprotection

Plant reproduction

Pollination

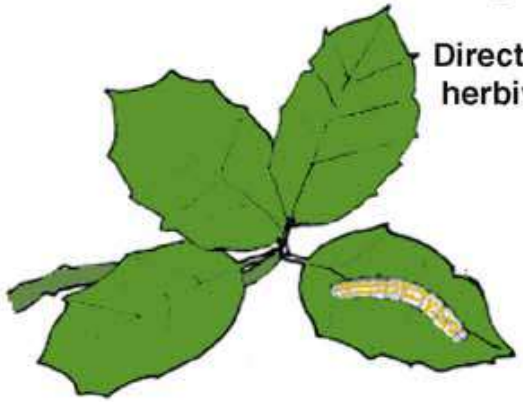
Fruit and Seed dispersal

Plant defense

Indirect defense against herbivores

Direct defense against pathogens

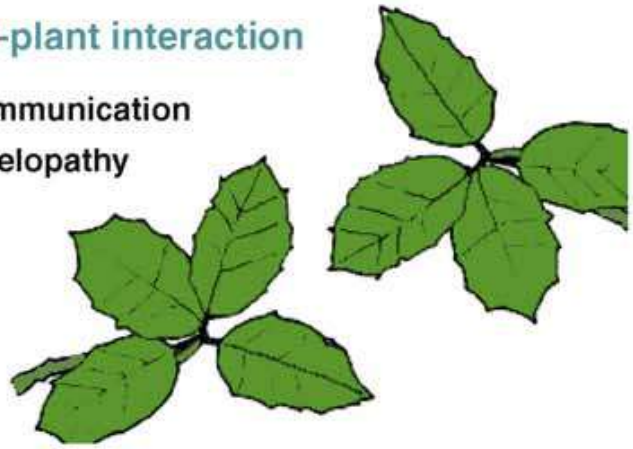
Direct defense against herbivores



Plant-plant interaction

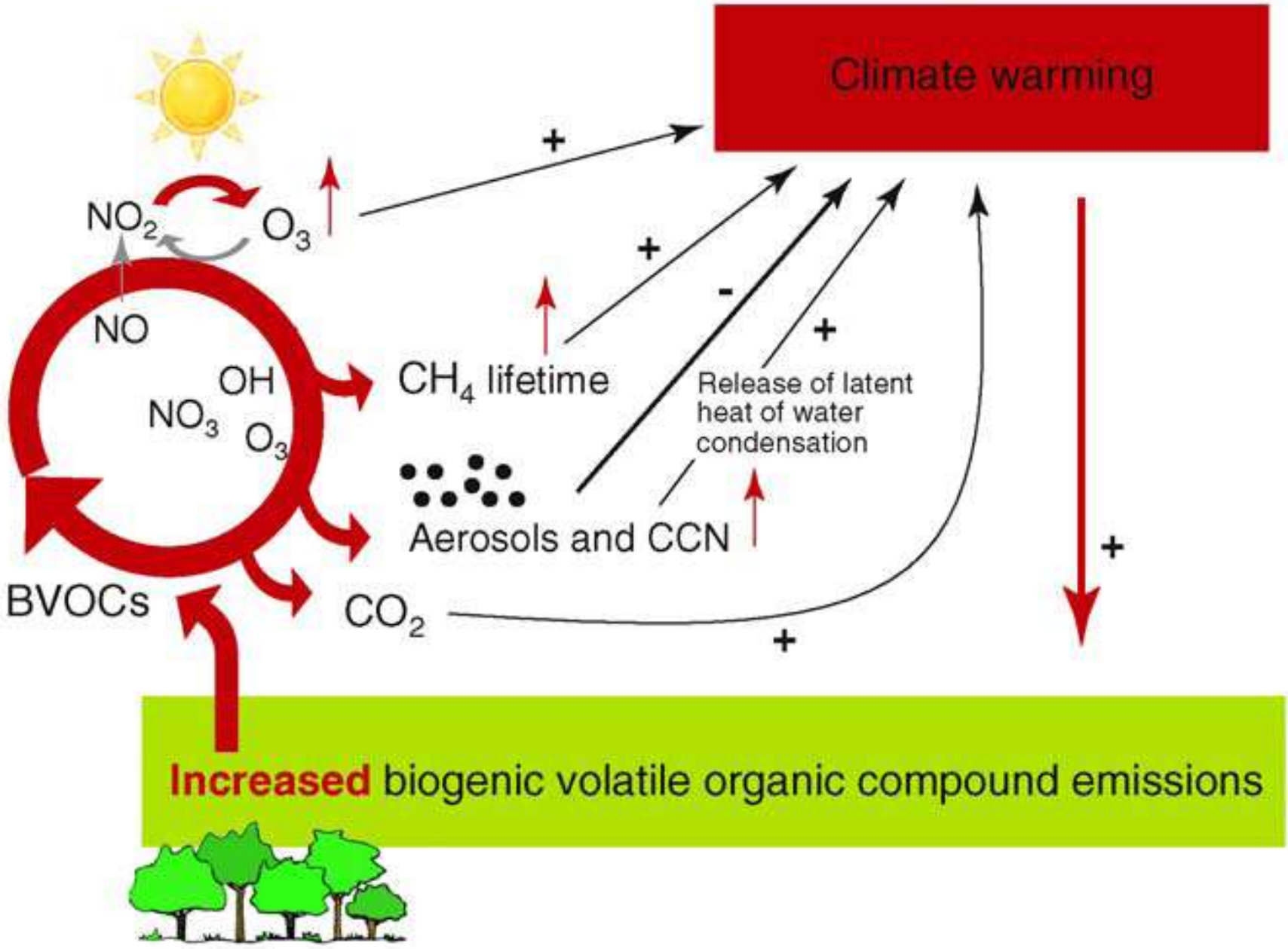
Communication

Allelopathy



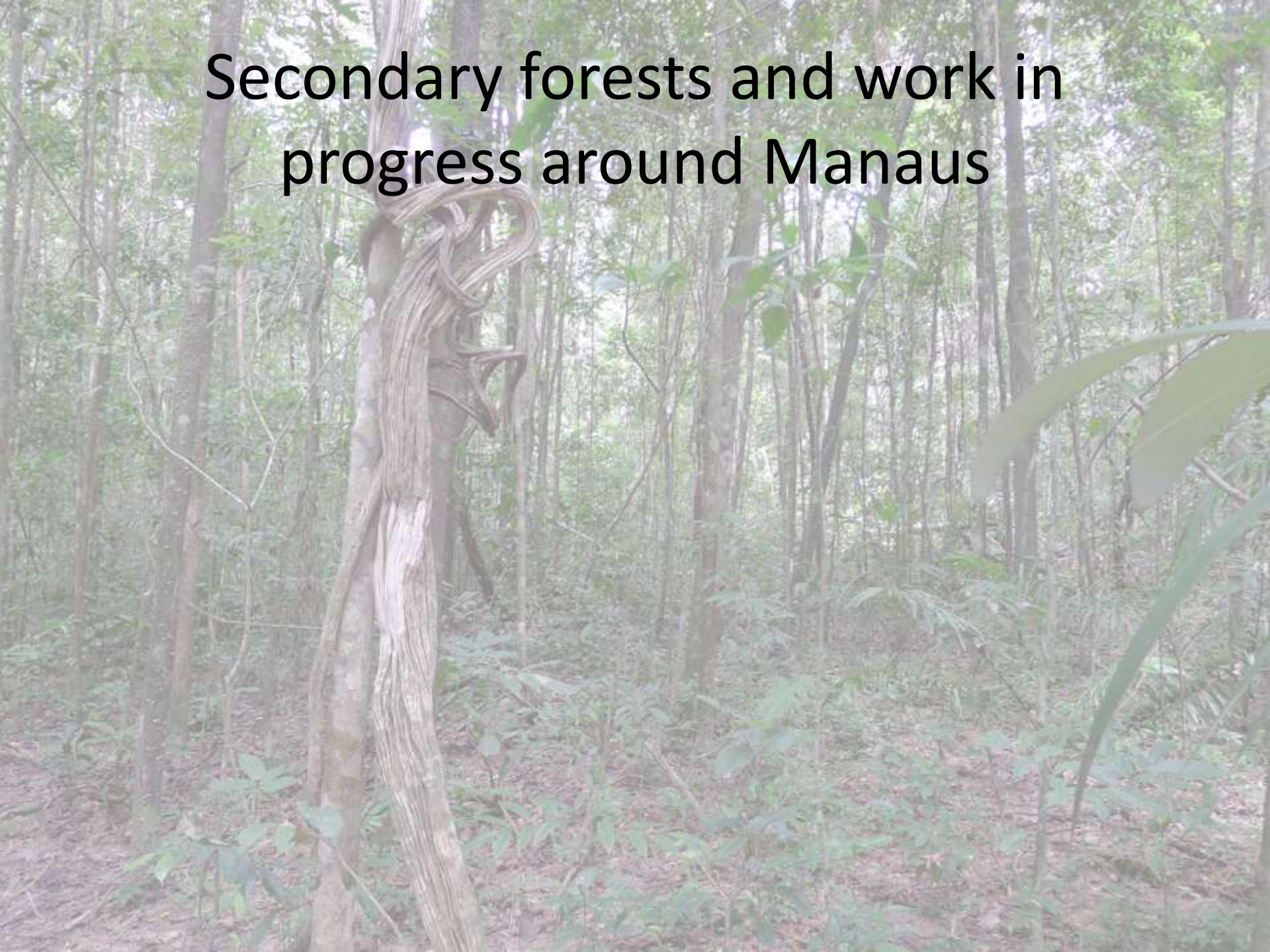
?

Increased biogenic volatile organic compounds



TRENDS in Plant Science

Secondary forests and work in progress around Manaus

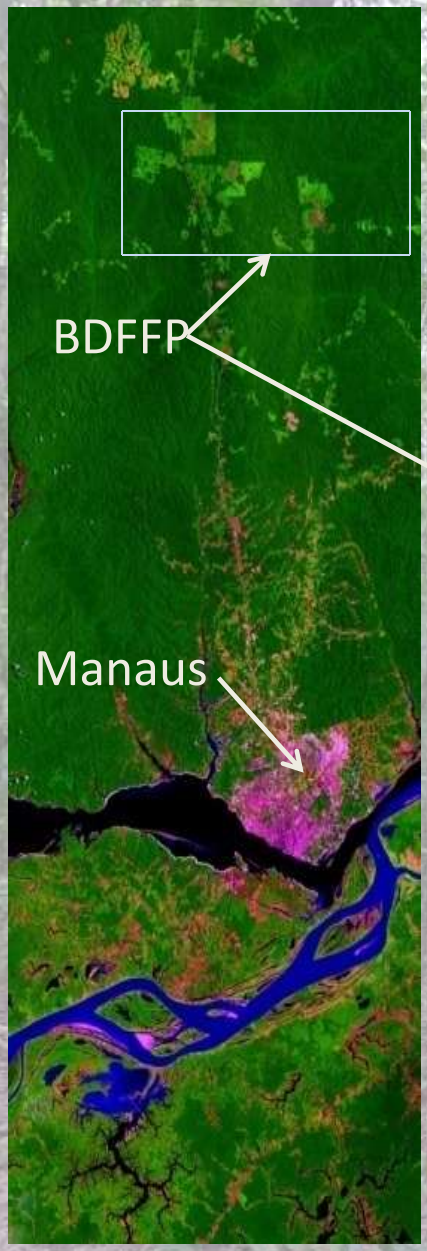


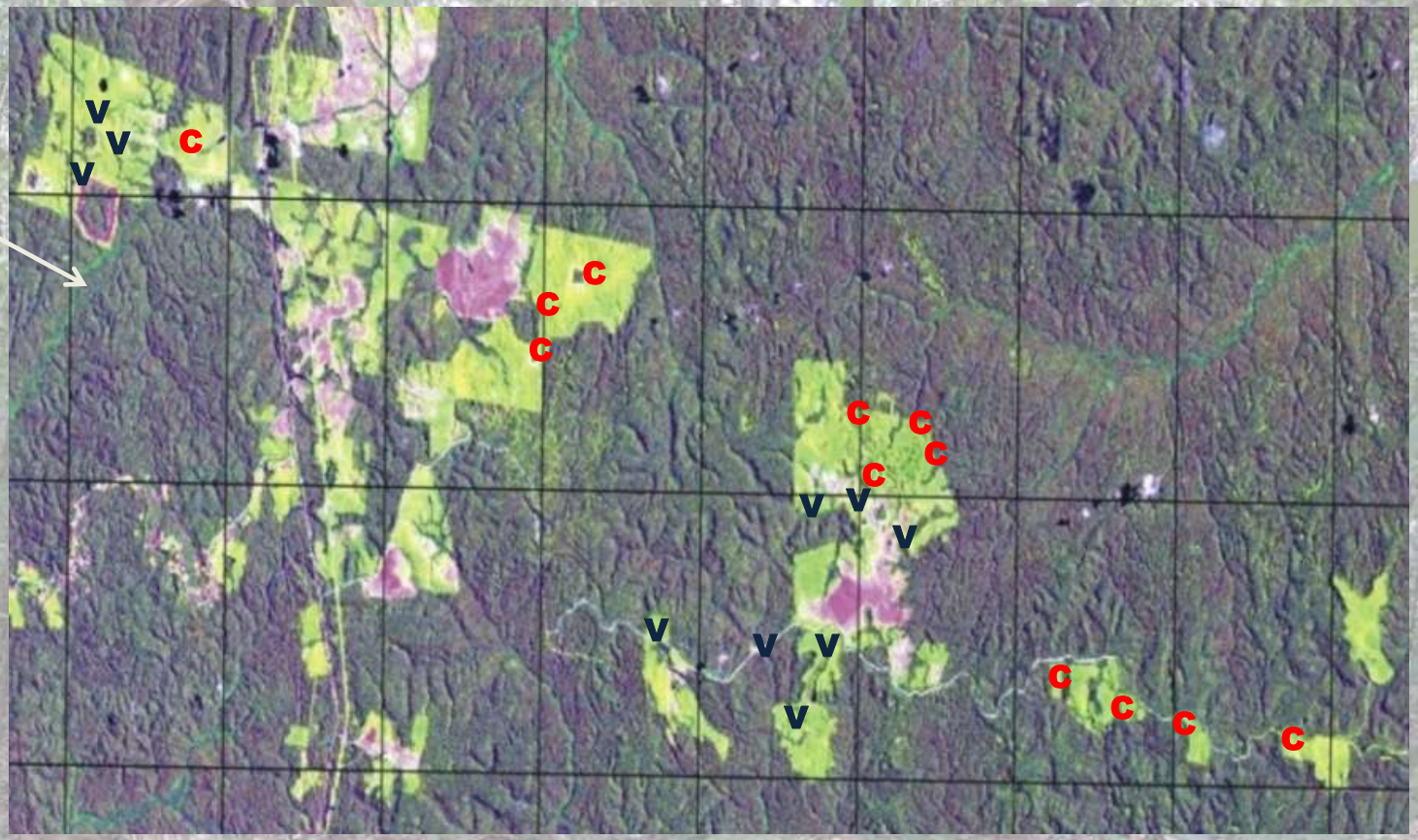
Convergence and divergence of alternative successional pathways in the Central Amazon

Bruce Williamson[12], Rita Mesquita[2] ,
Benjy Longworth[1] and Tony Bentos[2]

1 – Louisiana State University
2- INPA (Insituto Nacional de Pesquisas Amazonicas)

12 years of vegetation surveys
12 abandoned clearcuts
10 abandoned pastures

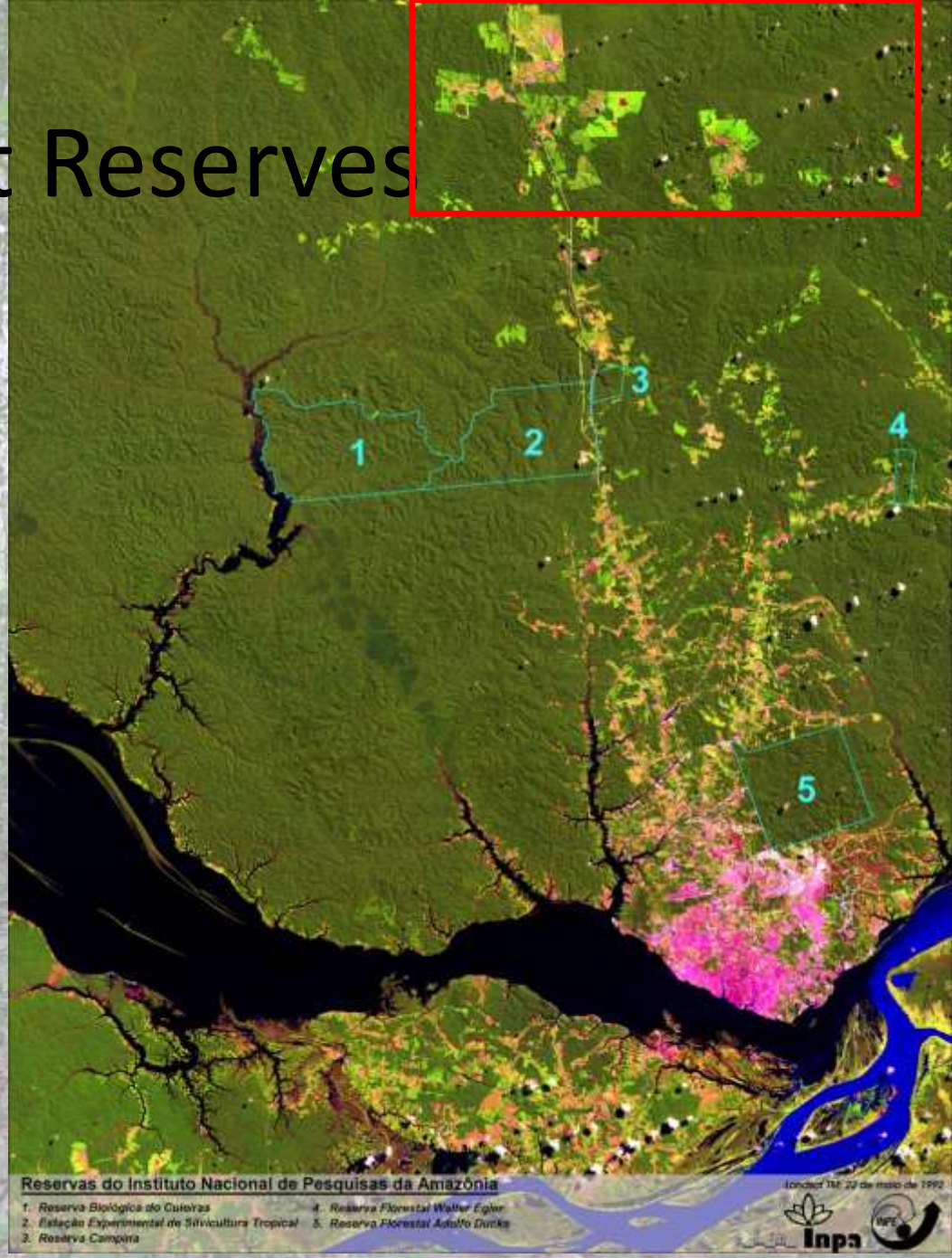




c Cecropia / Clearcuts
v Vismia / Pastures

Forest Reserves

1. Reserva Biologica Cueiras, Manaus, AM
2. Estacao Experimental da Silvicultura Tropical
3. Reserva Biológica de Campina (900 ha)
4. Reserva Florestal Egler (760 ha)
5. Reserva Florestal Adolpho Ducke (10,000 ha)



Alternative Successional Pathways

- Land use ⟶ Pioneer composition

Abandoned clearcuts

No fire

Cecropia

Clearcuts converted to pasture then abandoned

Several Fires

Vismia

Research questions

1. Do stand characteristics (stem density, basal area, species richness) differ between pathways?

2. Do the pathways converge or diverge as succession progresses?

3. Is there convergence of stands with the same land use history?

Summary

- Differences in stem density and basal area diminish during first 20 years

- Difference in species richness is more persistent

- Within each pathway, we only found convergence in stem density and basal area of pastures (between 10 to 20 years)

Environmental services in secondary forests in Amazonia

- Link to pdf presentation

Summary

- Biodiversity linked to biogeochemical cycling (within natural forest types; between primary and human modified)
- Include extreme types of natural forest for scaling (1) the degree of natural variation and (2) estimate the impact of conversion (spatially explicit models)