Carbon stocks and changes across a network of Atlantic Forest plots

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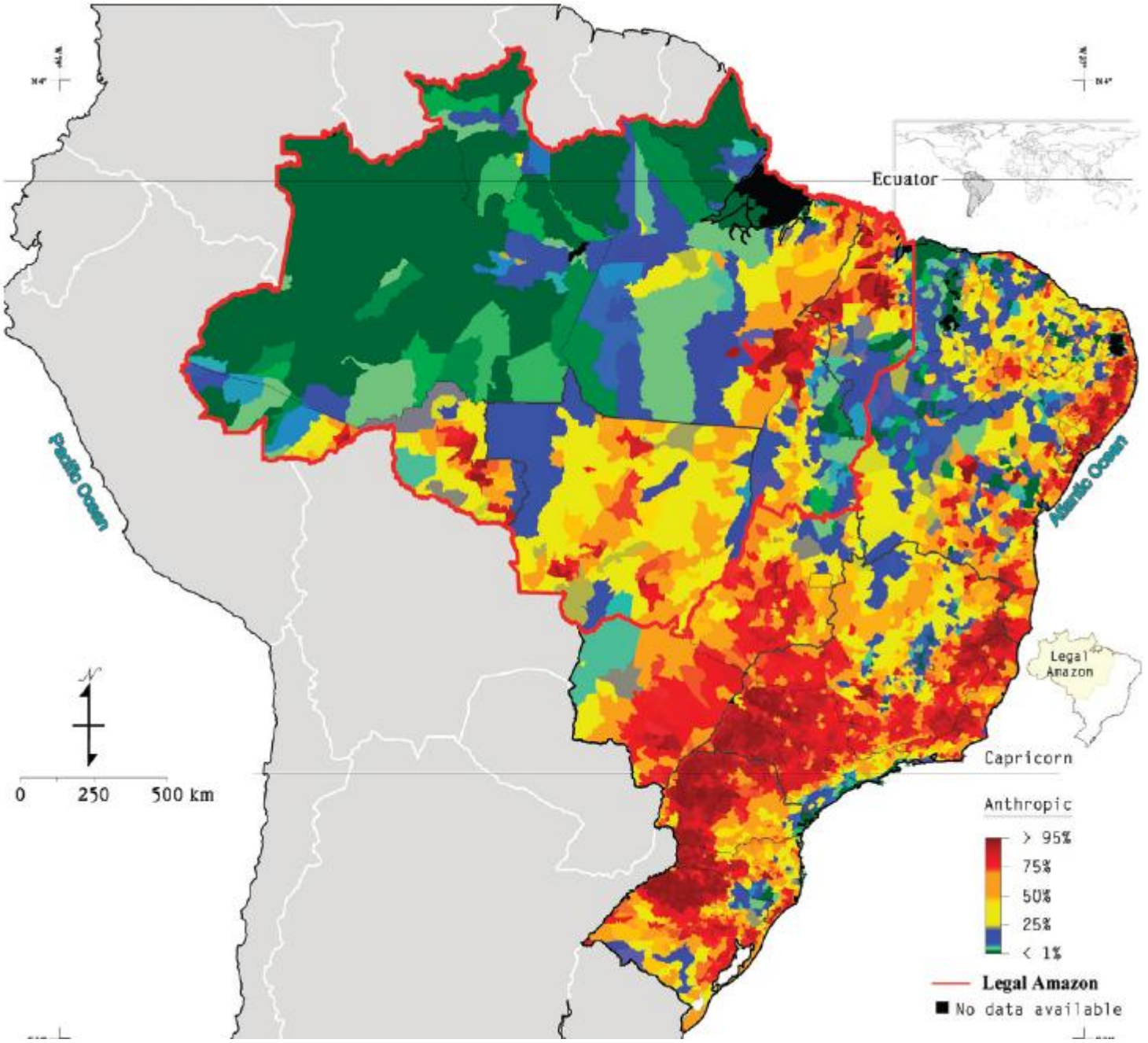
Forest cover South America

- **the greatest concentration of tropical forests in the world**
- **Amazonian region**
- **Extra-Amazonian areas in the Pacific coast of Colombia and Ecuador and the Atlantic coast and Iguaçu and Paraná River valleys**

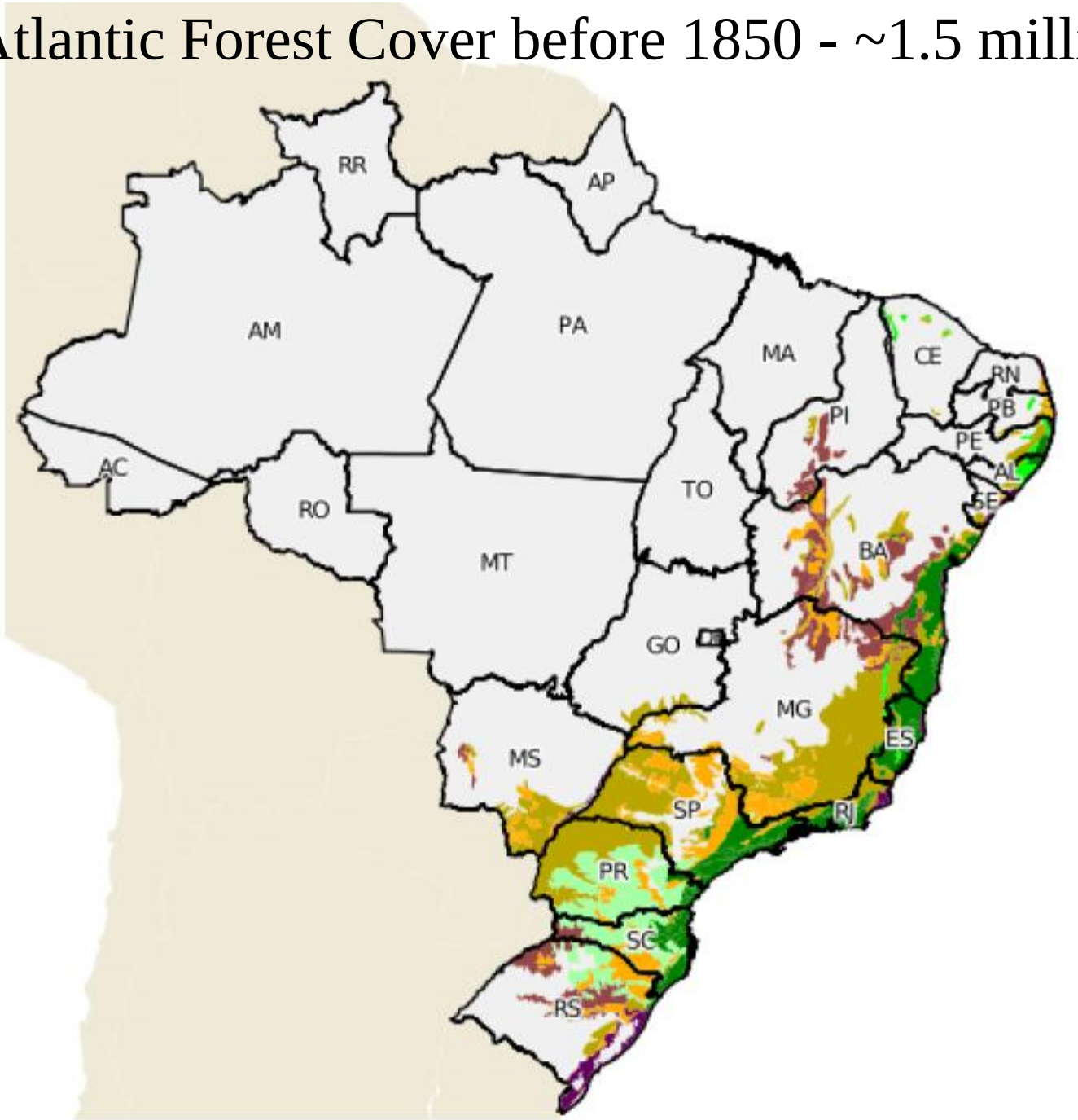
FAO

(2000)



Sparovek et al. 2010

The Atlantic Forest Cover before 1850 - ~1.5 million km^2



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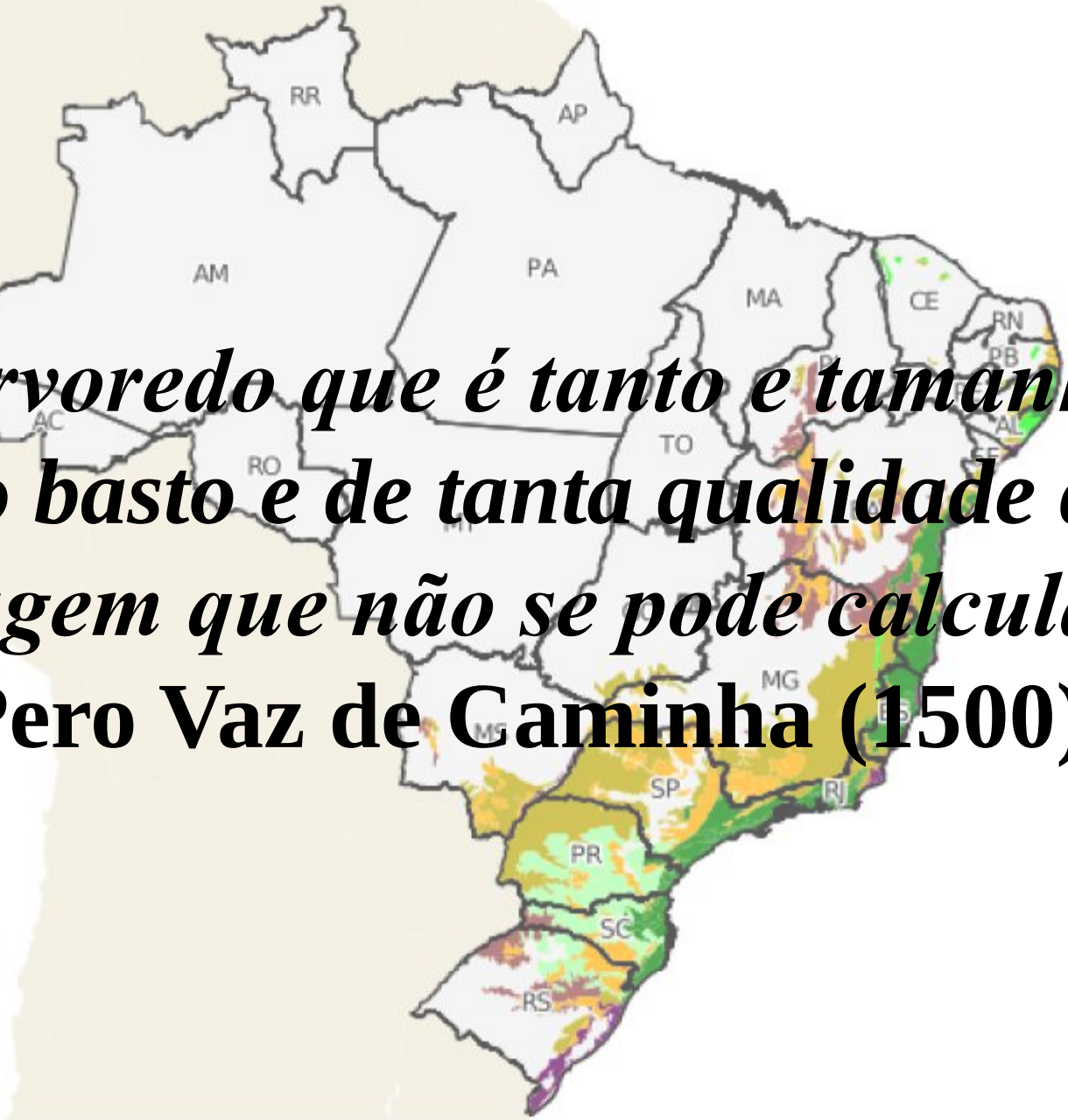
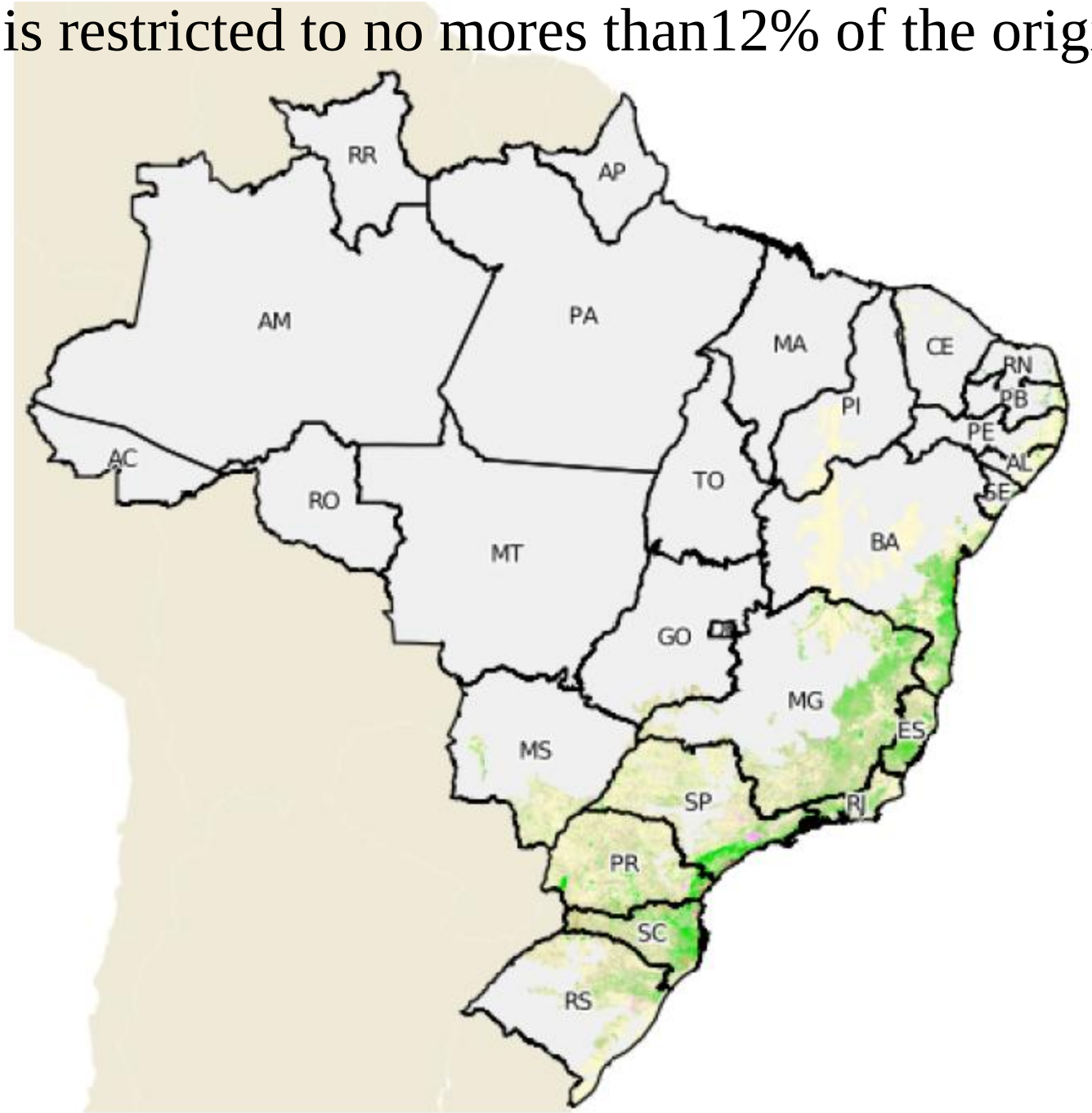
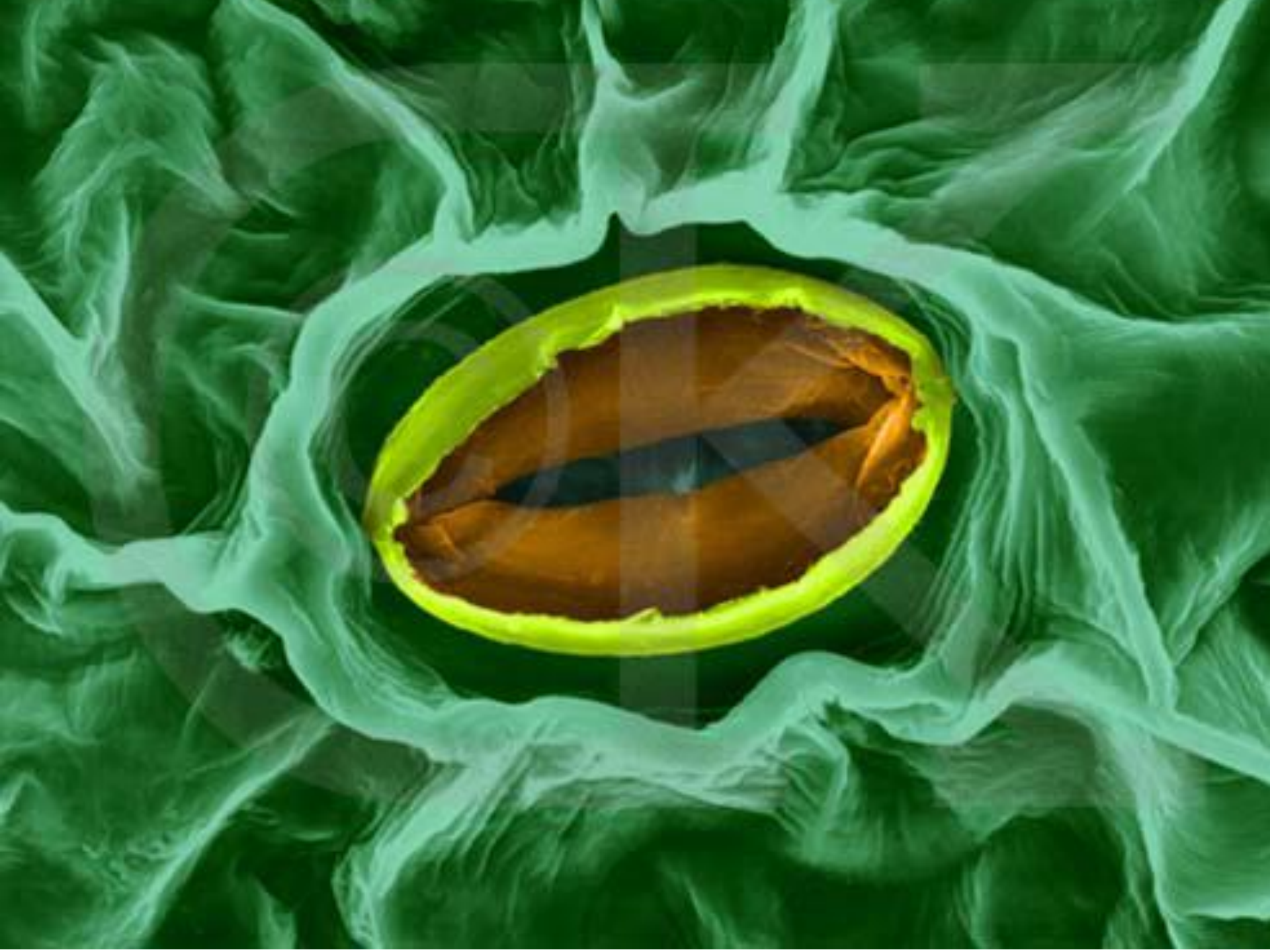


"...arvoredo que é tanto e tamanho e tão basto e de tanta qualidade de folhagem que não se pode calcular."-

Pero Vaz de Caminha (1500)

Actually is restricted to no mores than12% of the original area



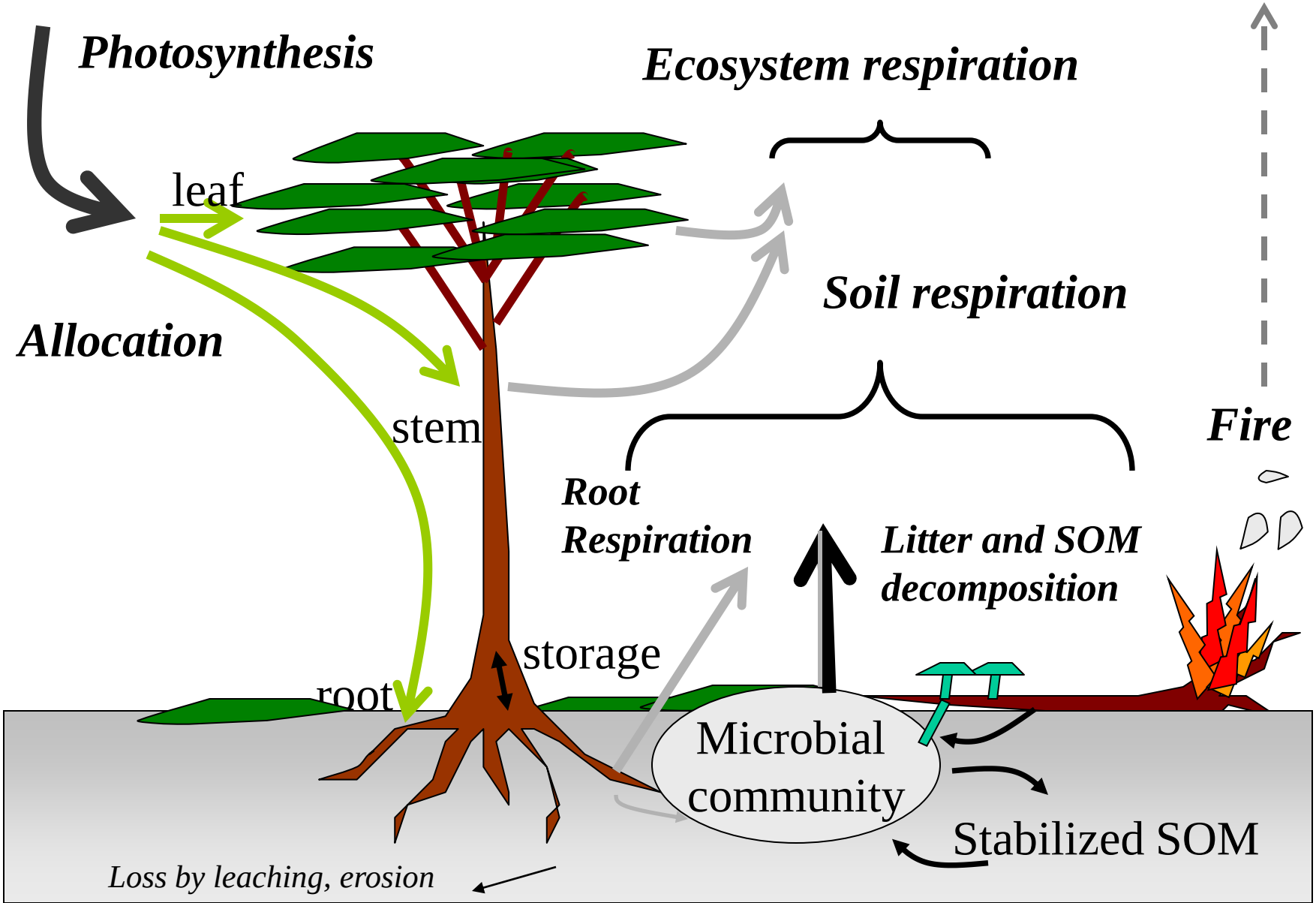


Photosynthesis ➔
➔ Respiration

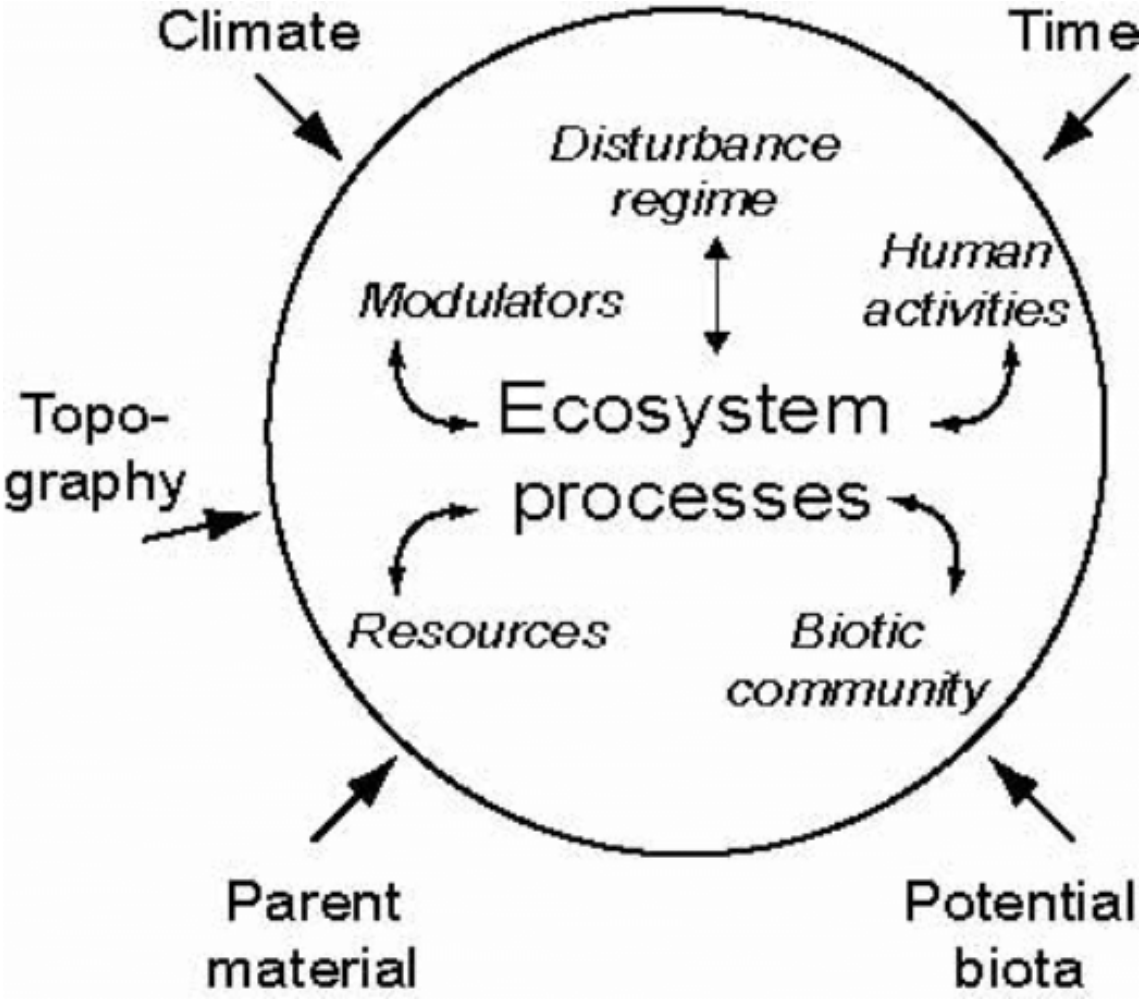
CO_2 + H_2O + Energy ➔ CH_2O + O_2
Carbon dioxide + Water + (sunlight) ➔ Glucose (SUGAR) + Oxygen gas

If Photosynthesis exceeds Respiration,
Carbon dioxide will decrease and carbon is stored in the ecosystem

Carbon fixed by photosynthesis allocated to growth can store C for varying periods of time

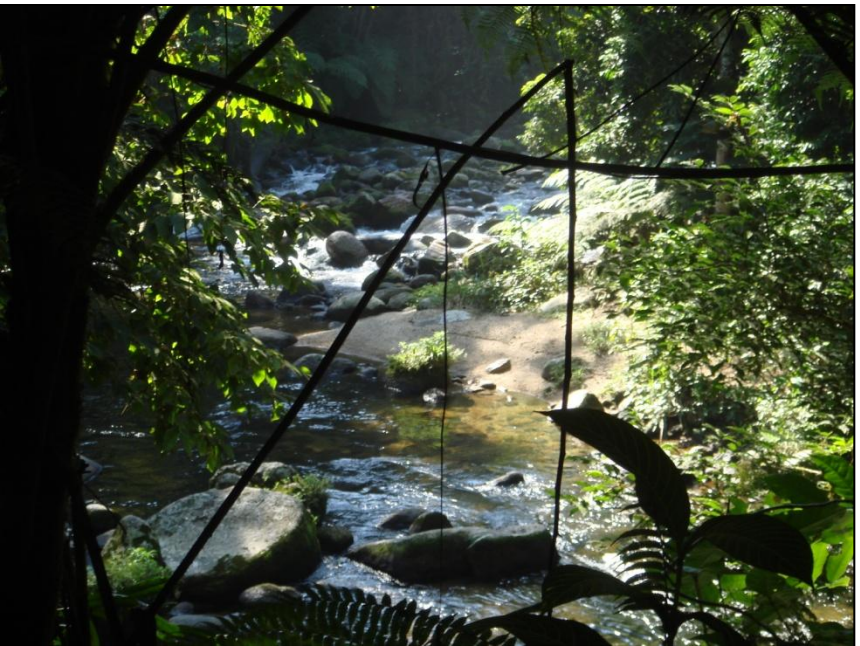


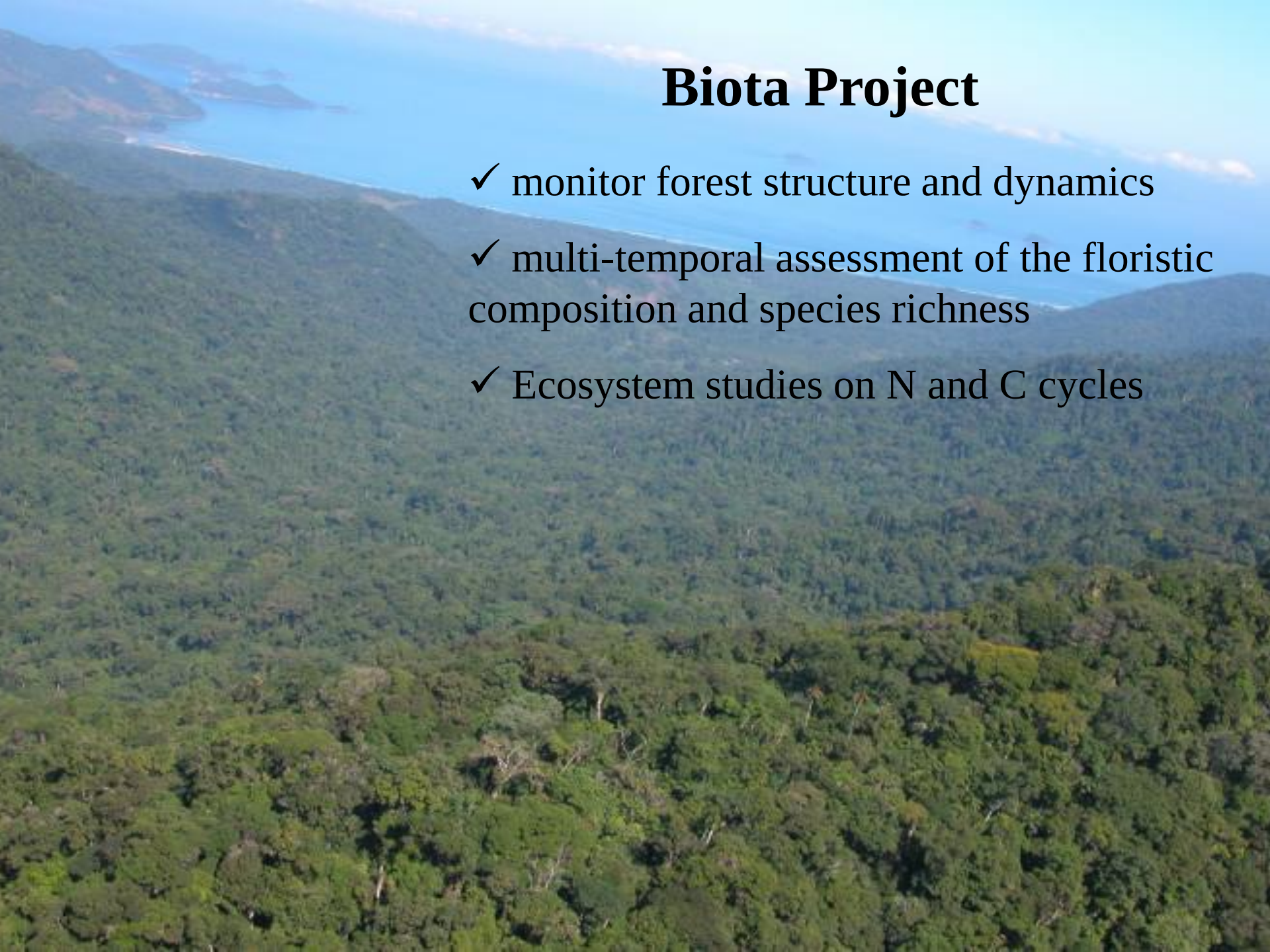
Controls over ecosystem processes: state factors, interactive controls, and feedbacks



Research questions –

What is the capacity for these forests to store C?
Where could it be stored and for how long?
What is their potential to respond to global and local climate change?





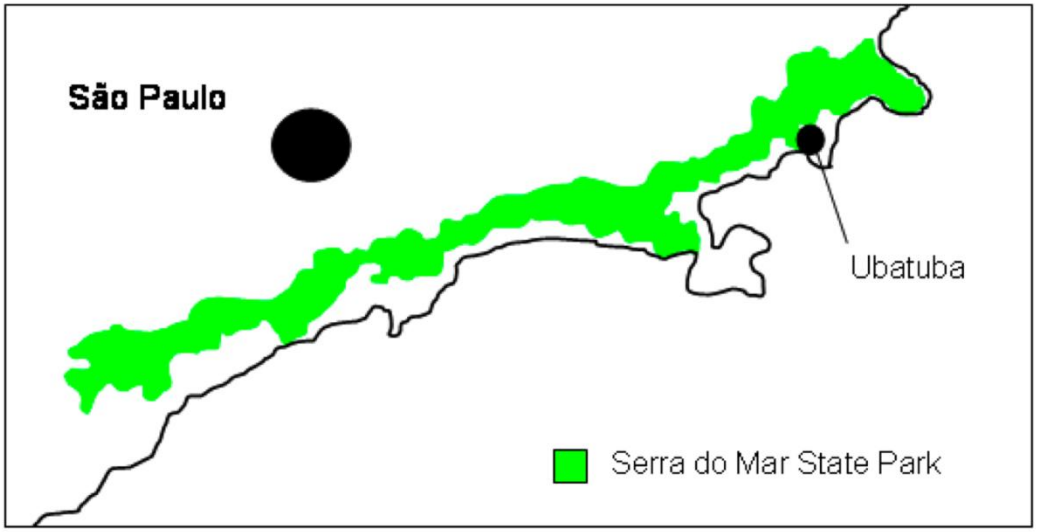
Biota Project

✓ monitor forest structure and dynamics

✓ multi-temporal assessment of the floristic composition and species richness

✓ Ecosystem studies on N and C cycles

ATLANTIC FOREST



Tropical Moist Forest

Climate: tropical (3 months < 100mm)

Temperature: 22-24ºC

Precipitation: 2500 mm

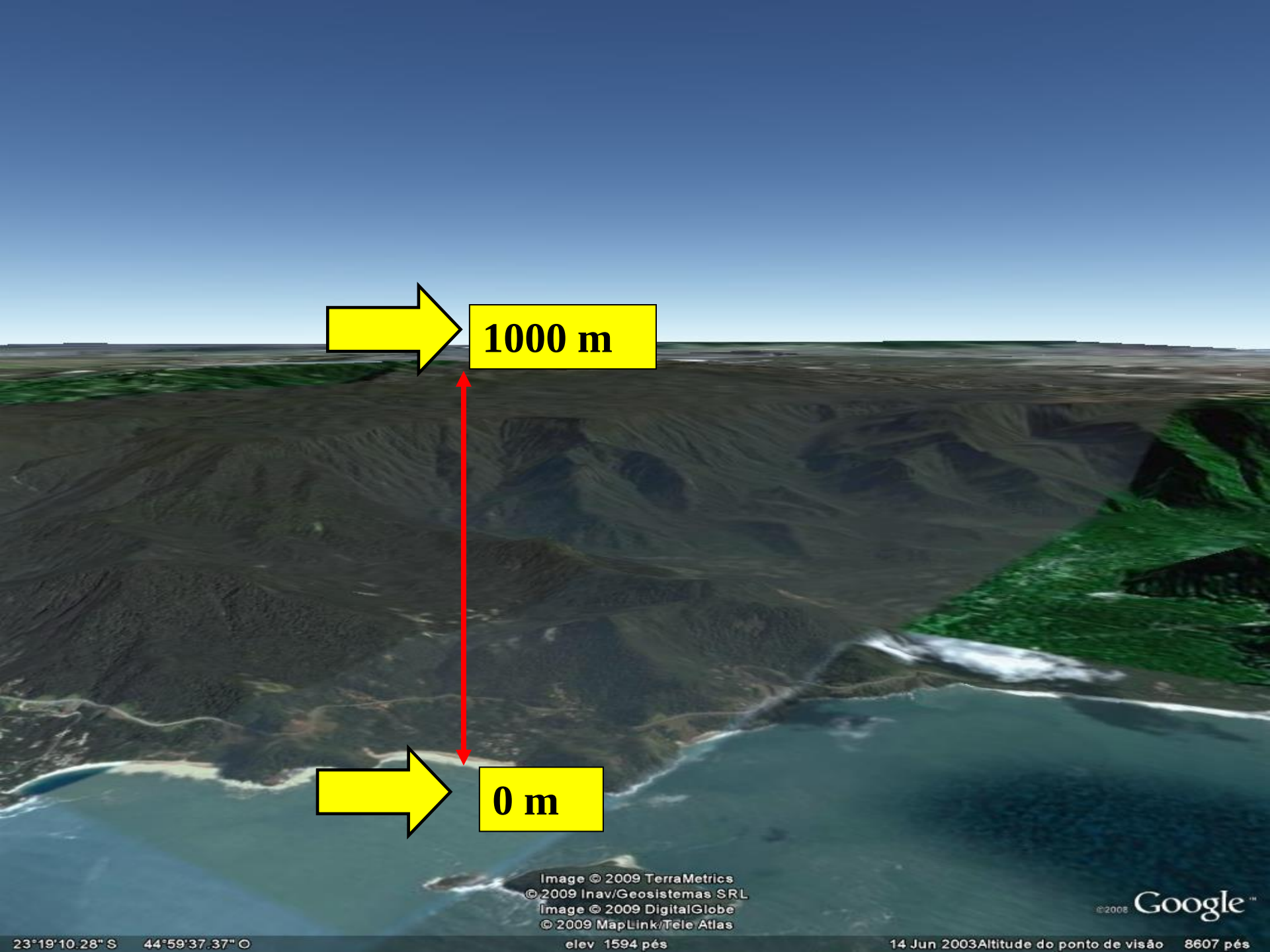

1000 m
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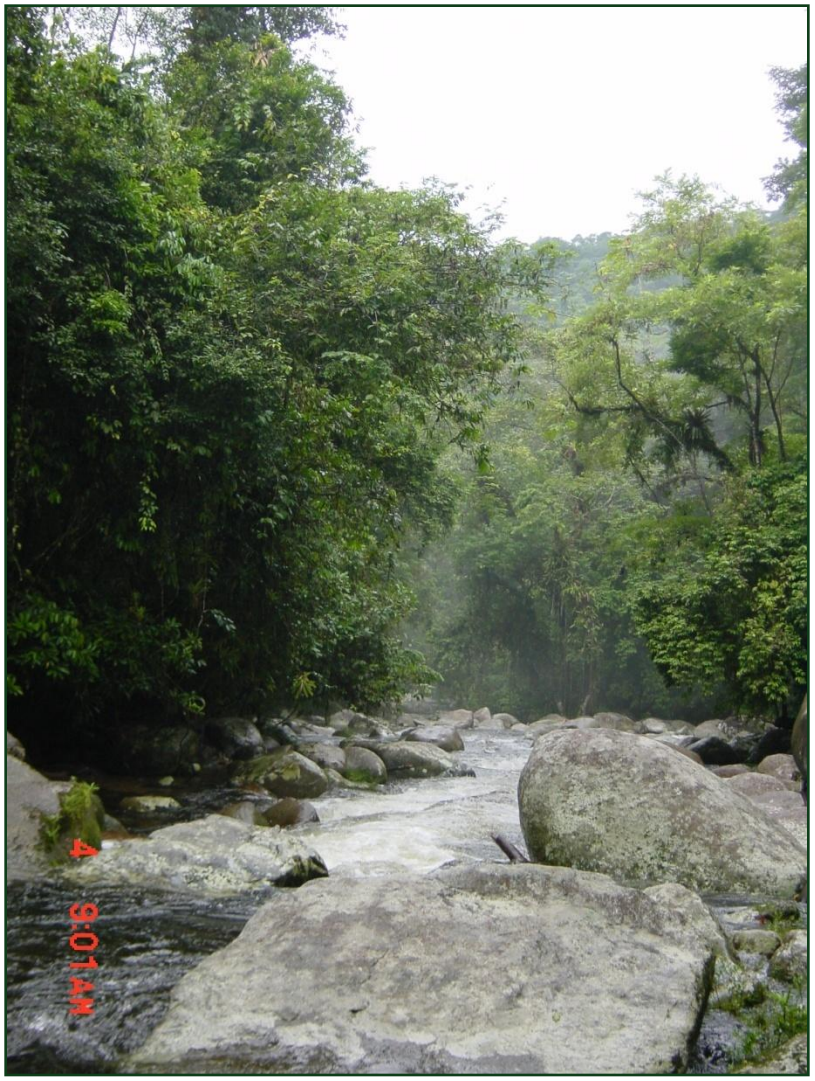
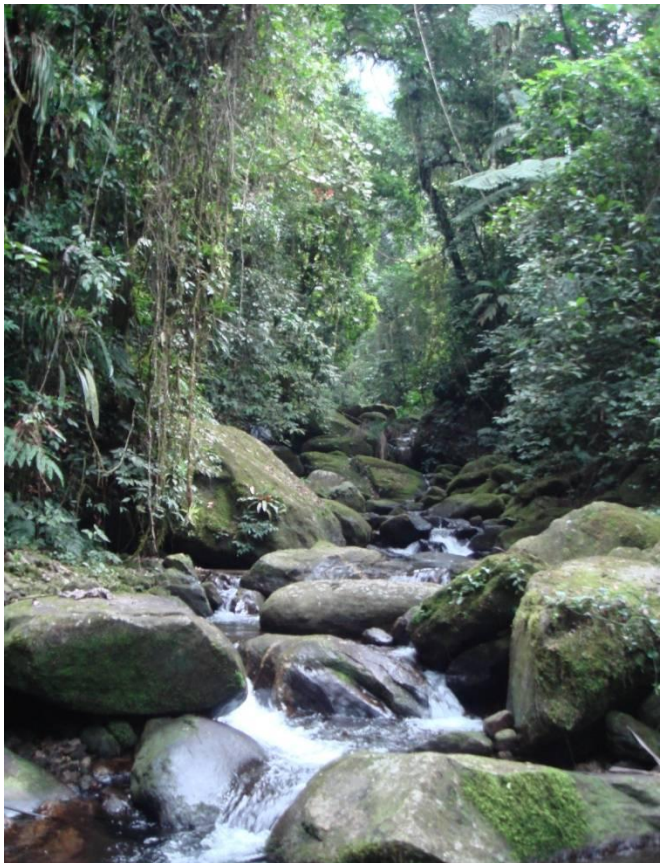
Image © 2009 TerraMetrics
© 2009 Inav/Geosistemas SRL
Image © 2009 DigitalGlobe
© 2009 MapLink/Tele Atlas
©2008 Google
23°19'10.28" S 44°59'37.37" O
elev 1594 pés
14 Jun 2003Altitude do ponto de visão 8607 pés

Restinga
(seasonally flooded)

Lowland tropical moist forest



Submontane tropical moist forest



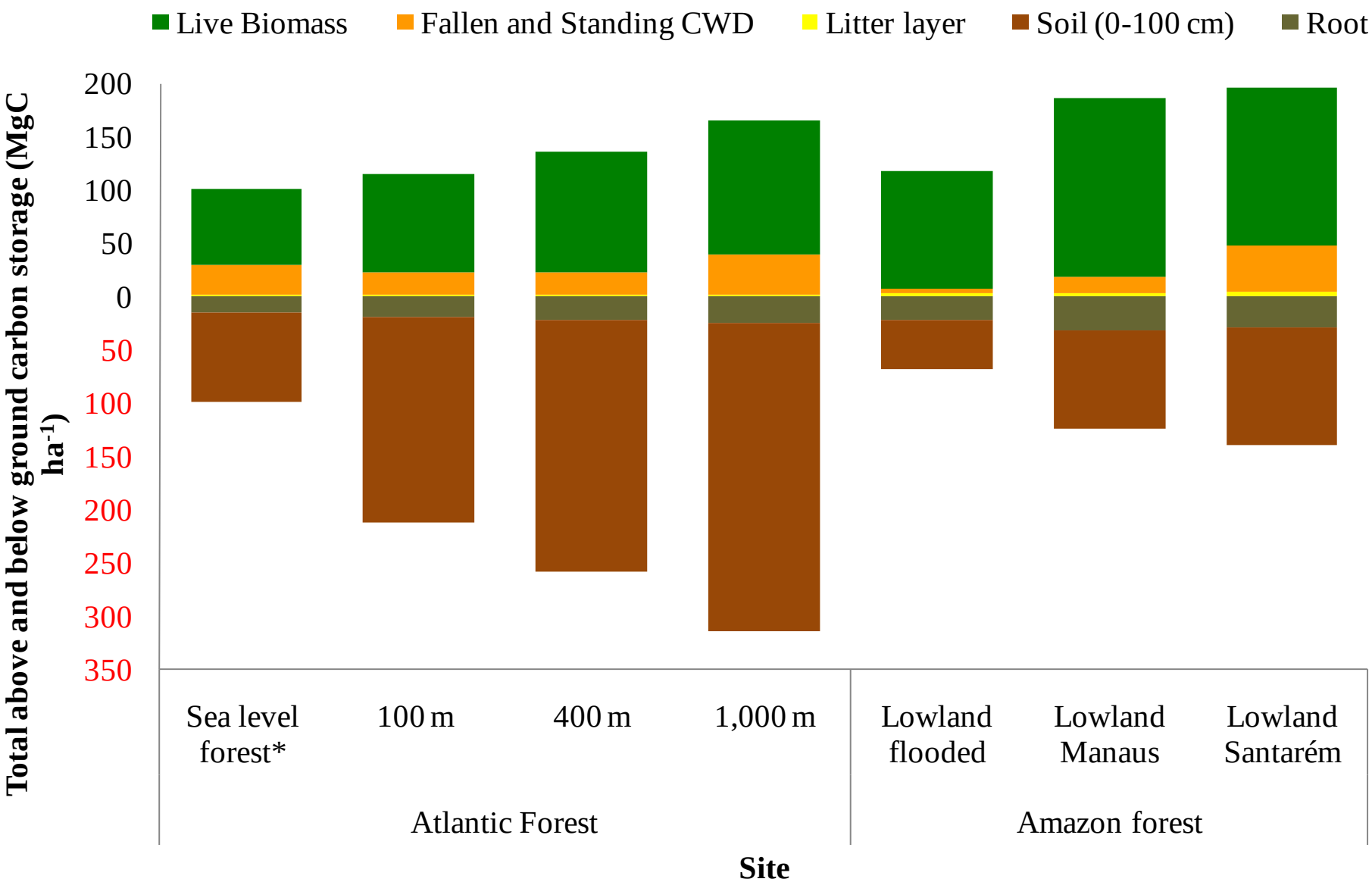
Montane tropical moist forest

Carbon stocks measurements

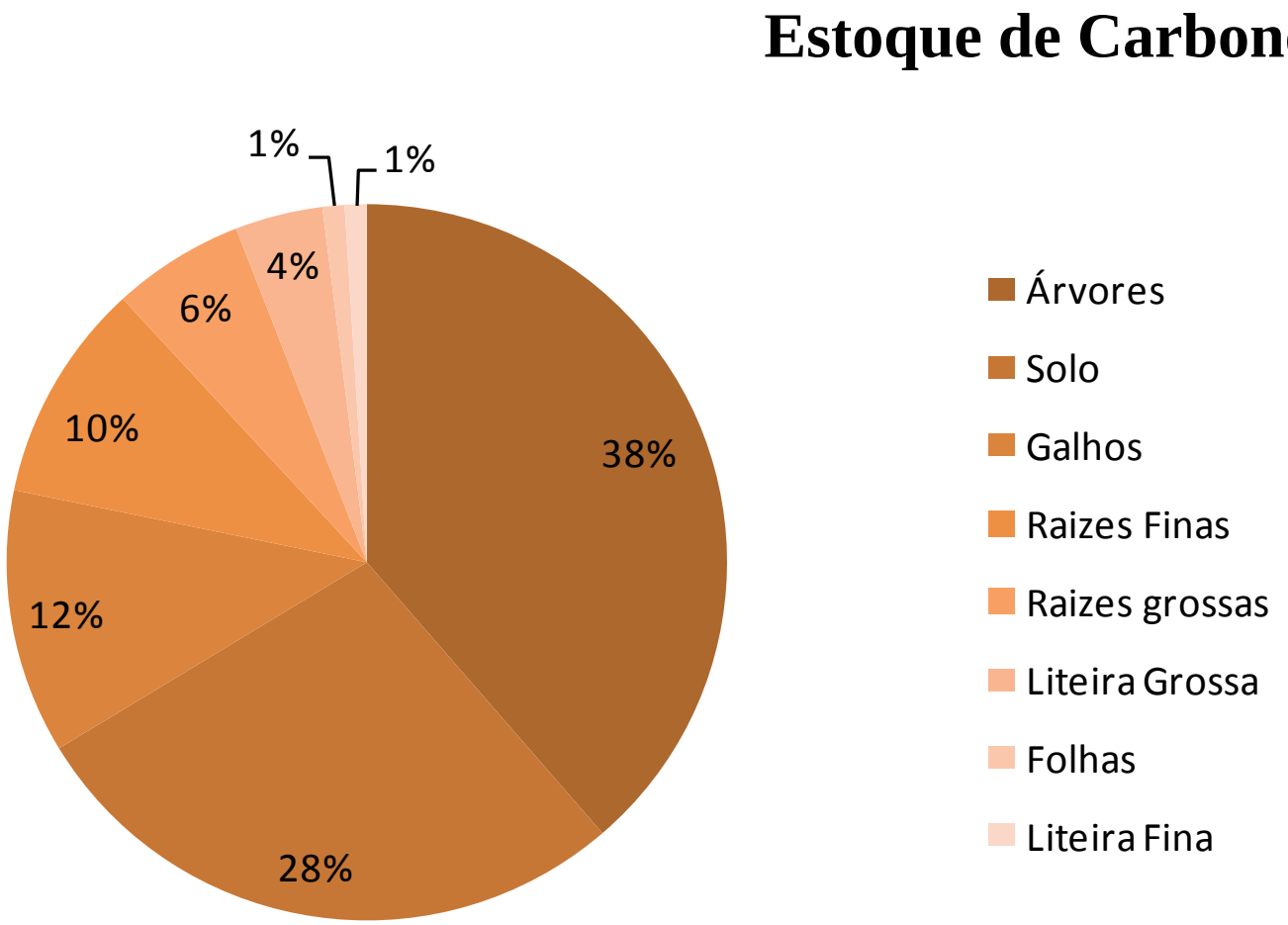
- ✓ Tree – DBH, Height, Species (above and belowground biomass)
- ✓ Coarse woody debris (CWD)
- ✓ Litterlayer
- ✓ Soil

Pantropical allometric equation to estimate biomass (Chave et al. 2005)

Carbon stock above and belowground in a gradient of elevation in Atlantic Fores and in Amazon forest



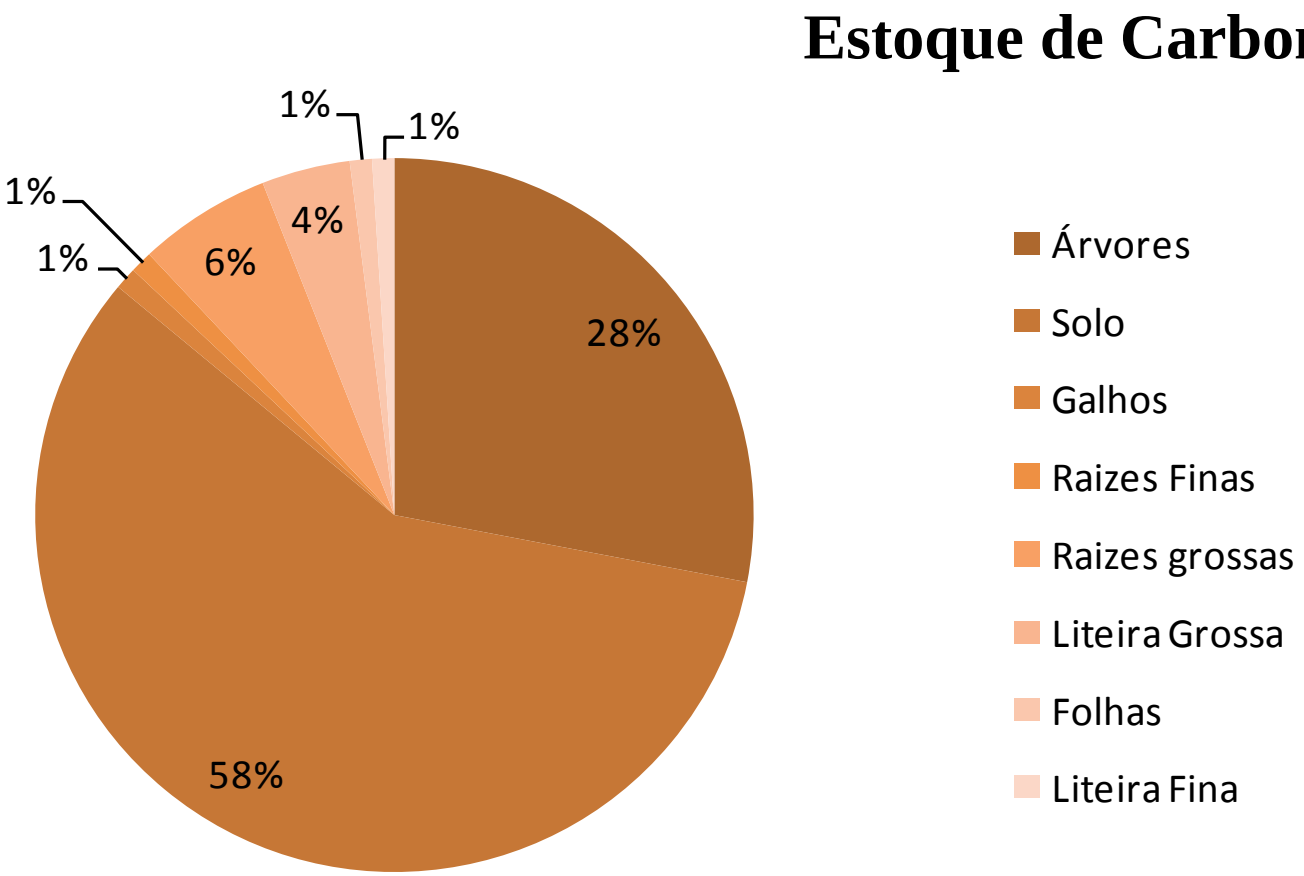
Reservatórios de Carbono na Amazonia Central



A maior parte do carbono esta estocado nos troncos grossos e no solo

Chambers et al. 2004

Reservatórios de Carbono na Mata Atlântica Litorânea



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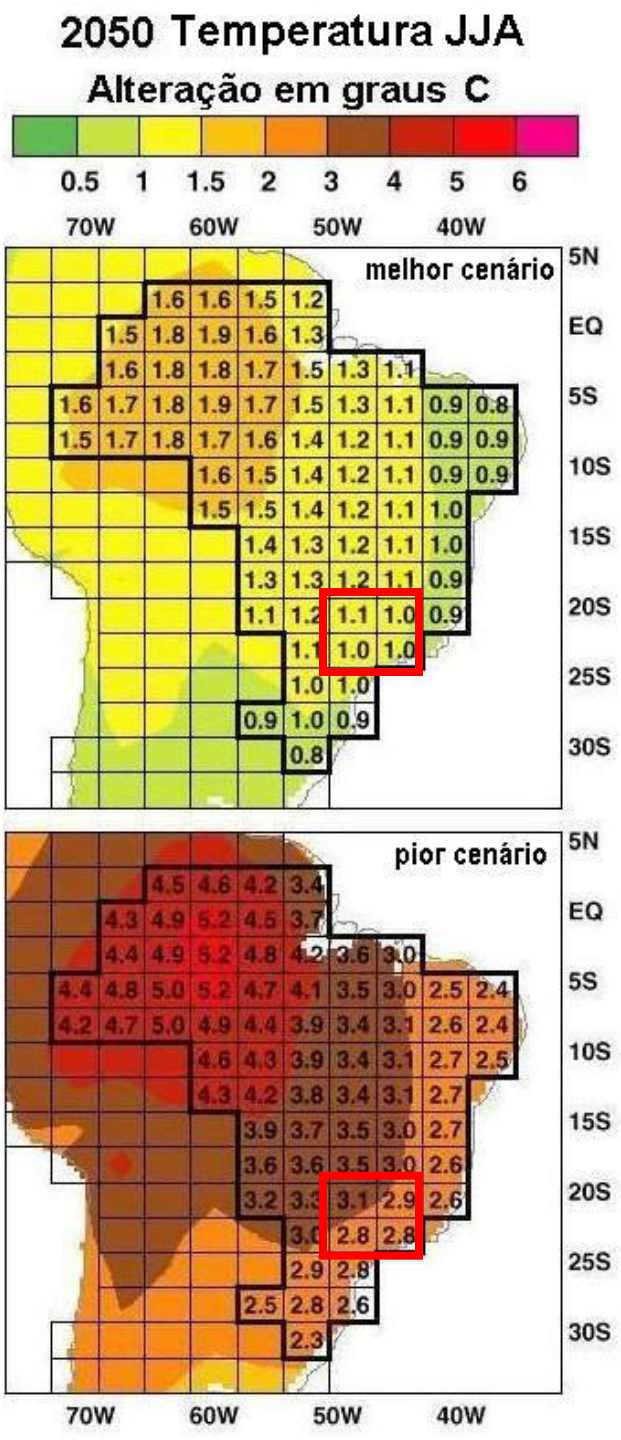
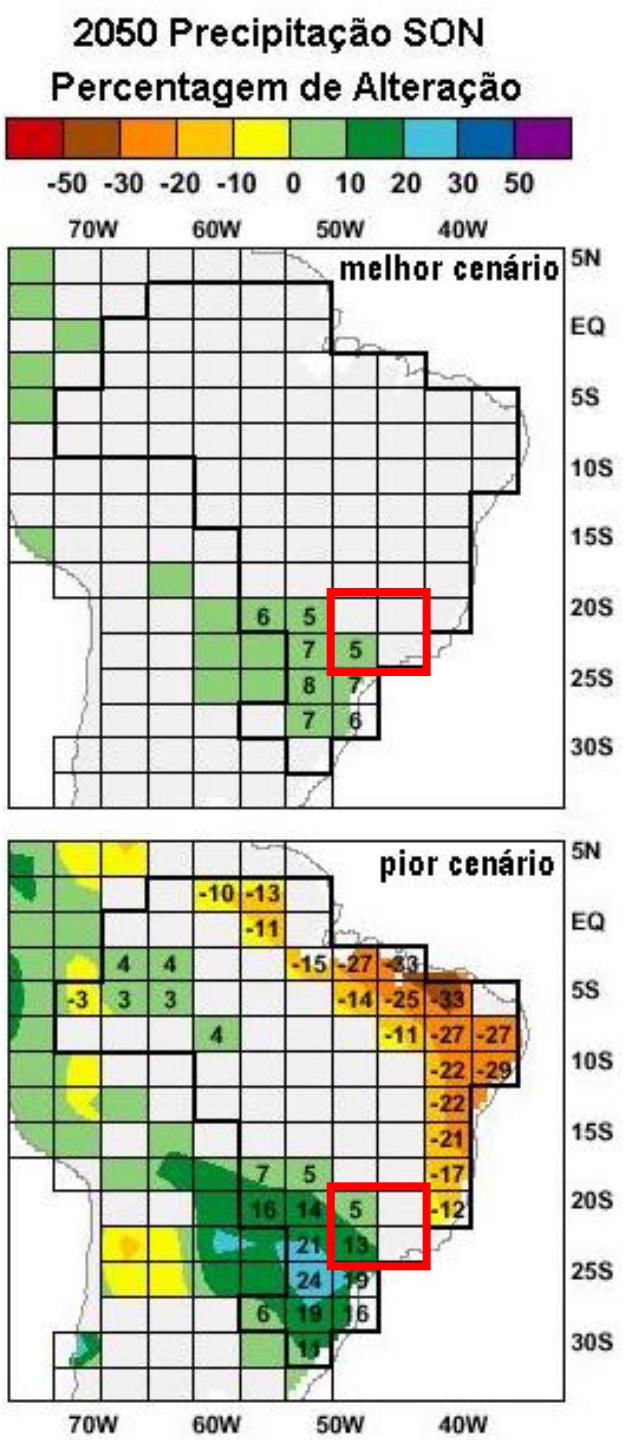
Projeto BIOTA - Ubatuba

CENÁRIOS CLIMÁTICOS PARA O BRASIL





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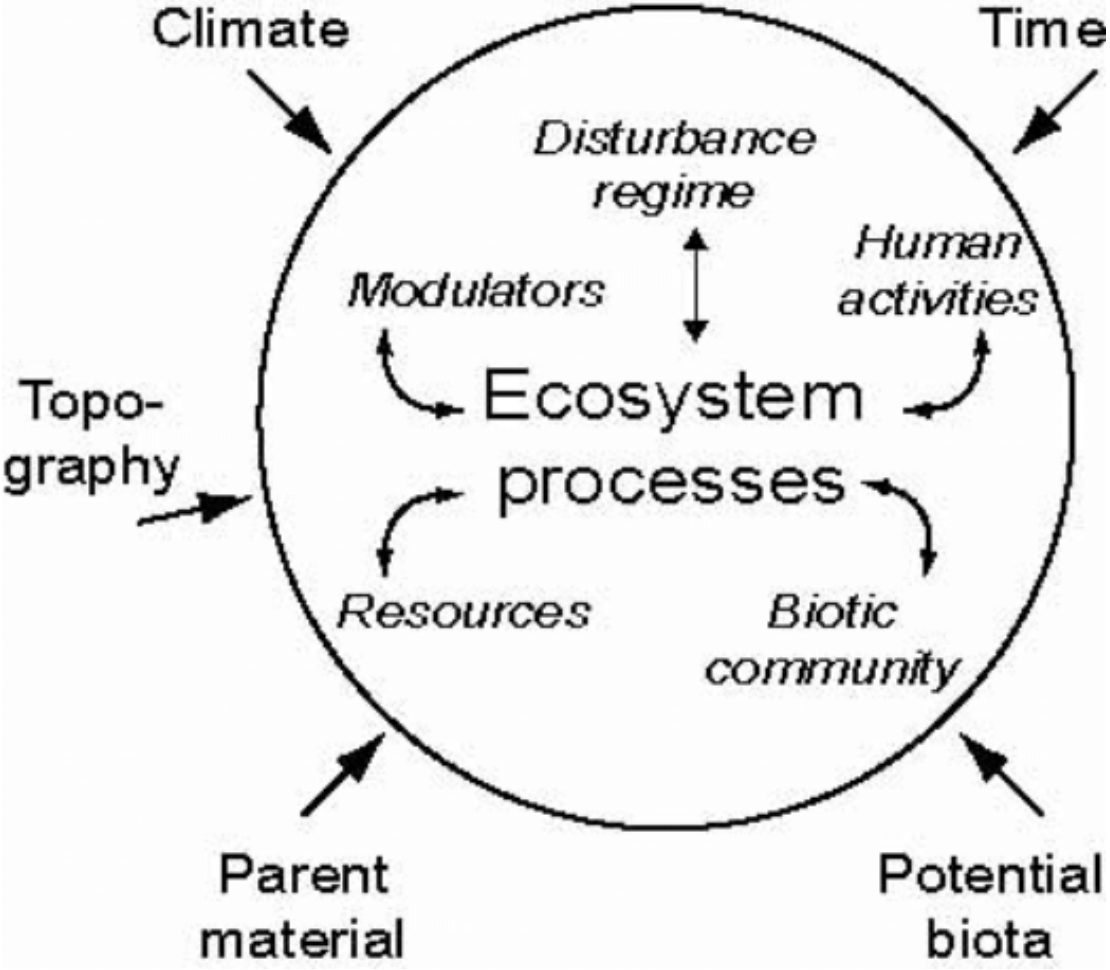

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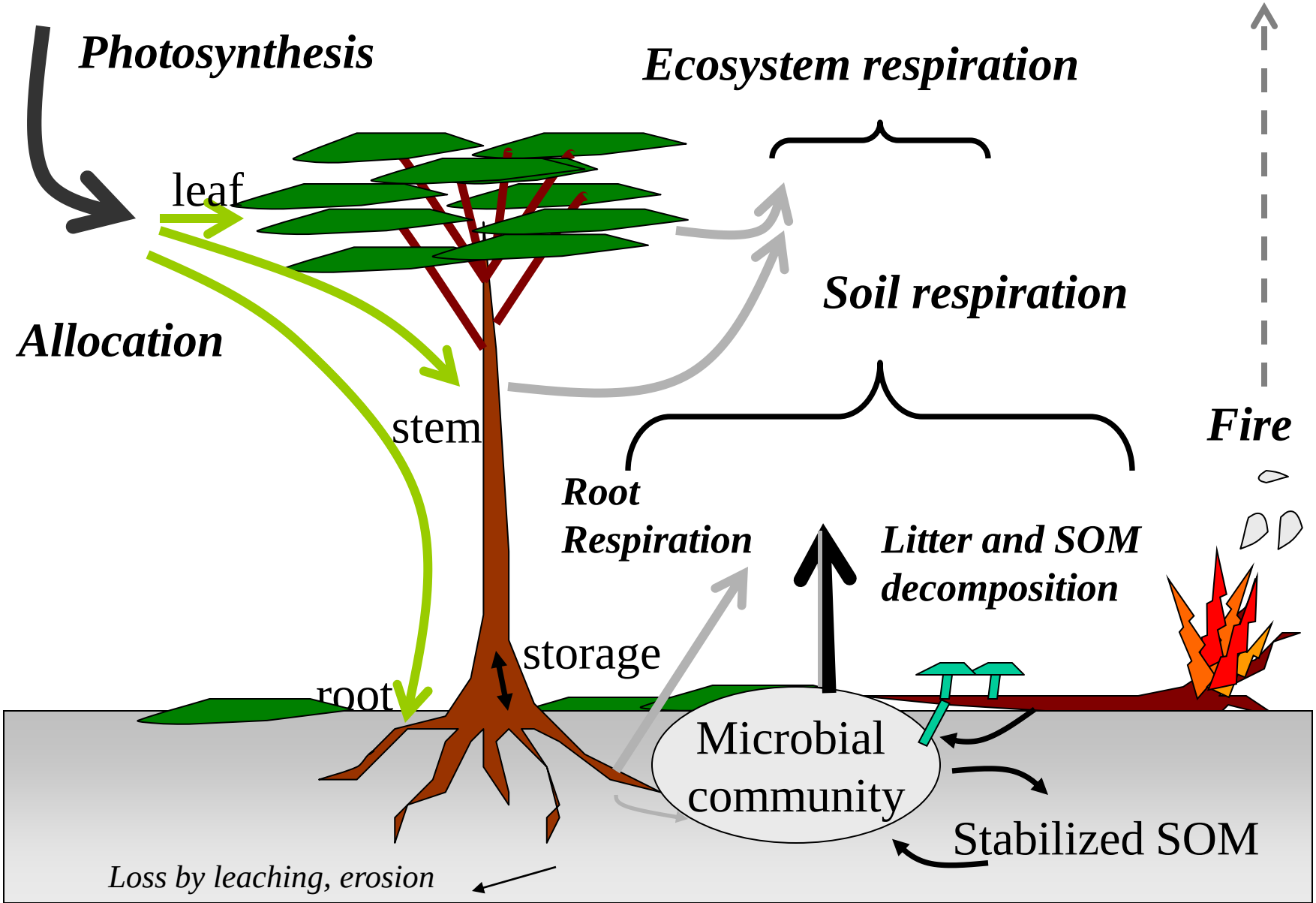

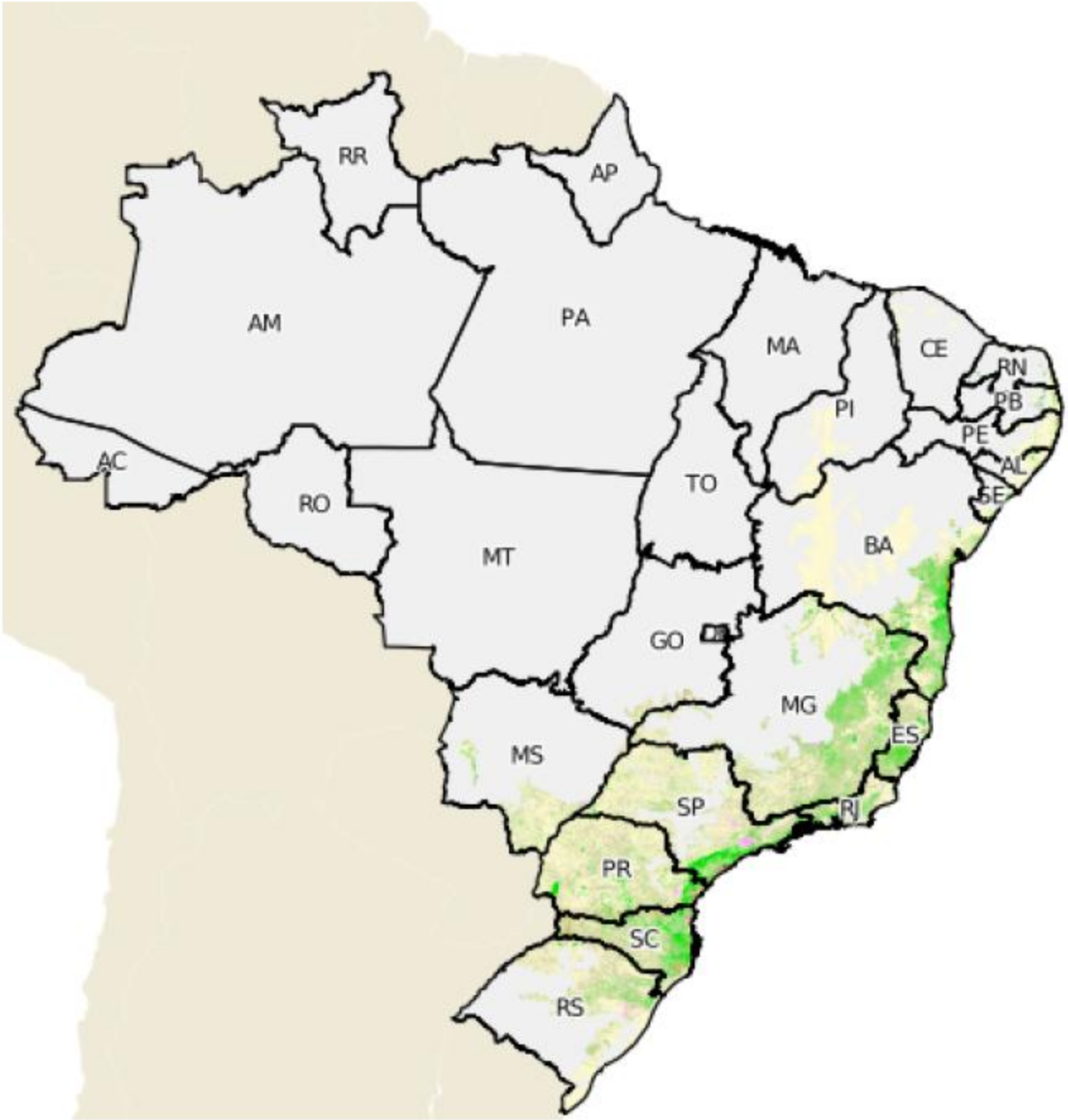
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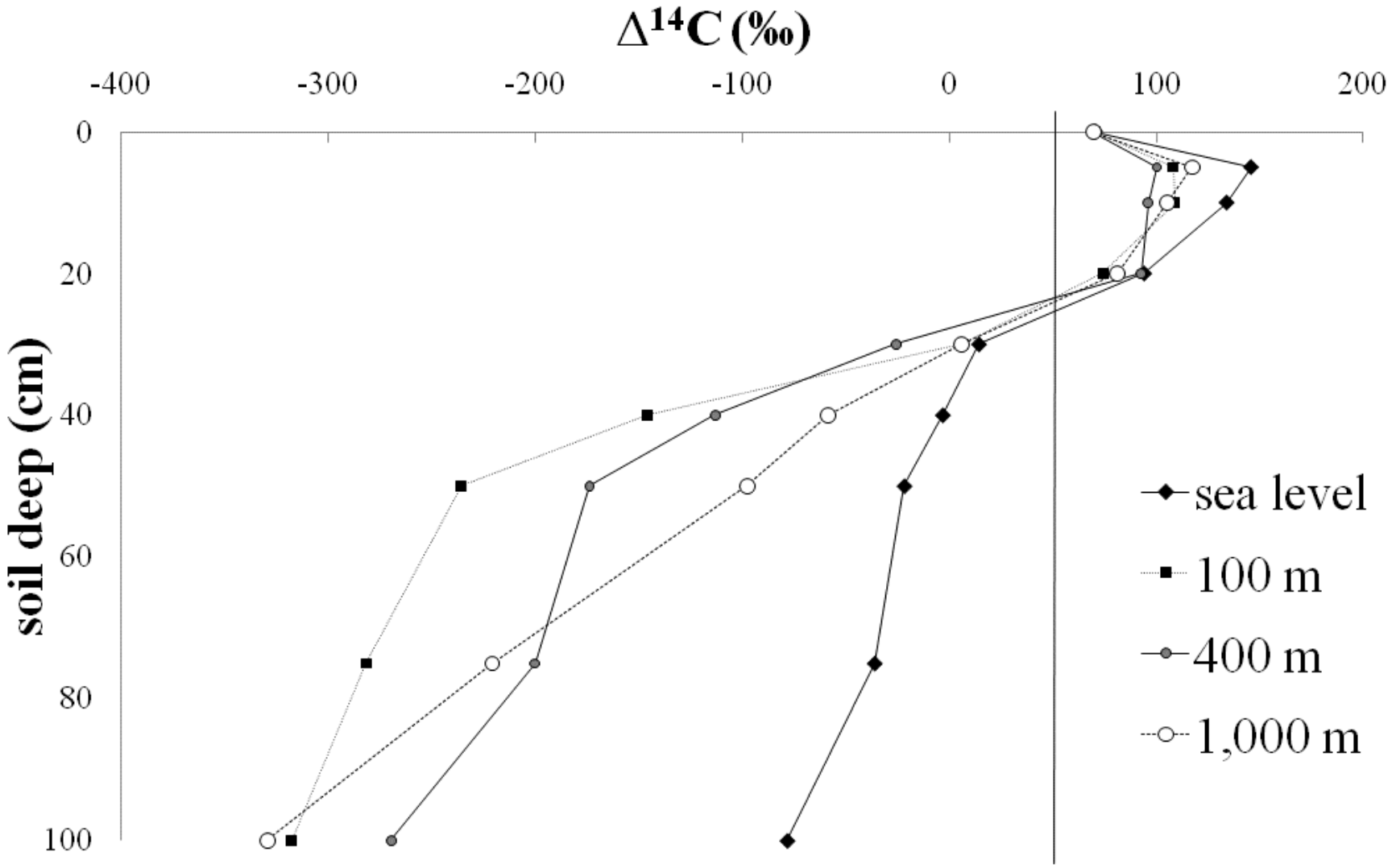
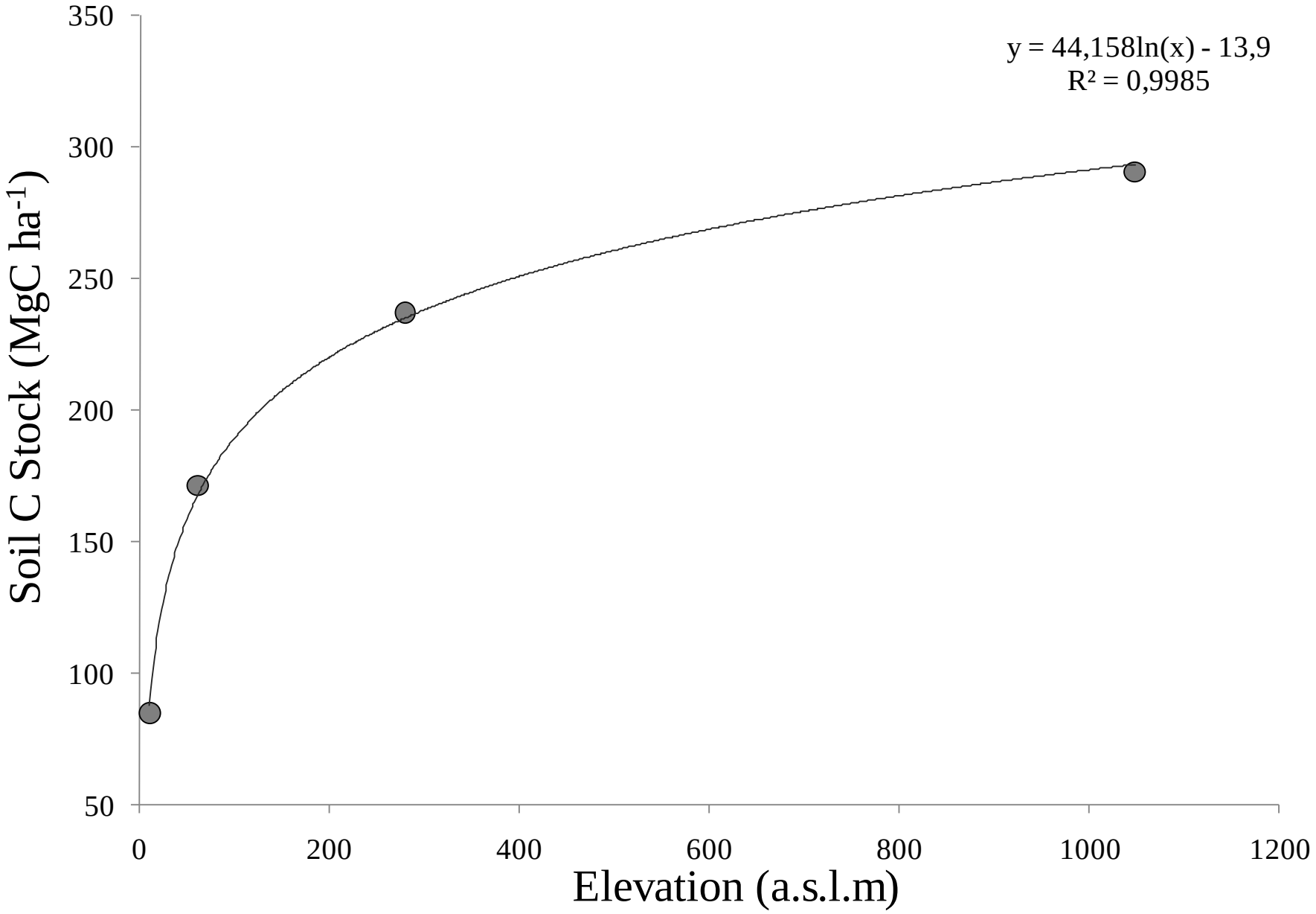
Soil radiocarbon age



Soil C stocks and changes across a network of Atlantic Forest plots



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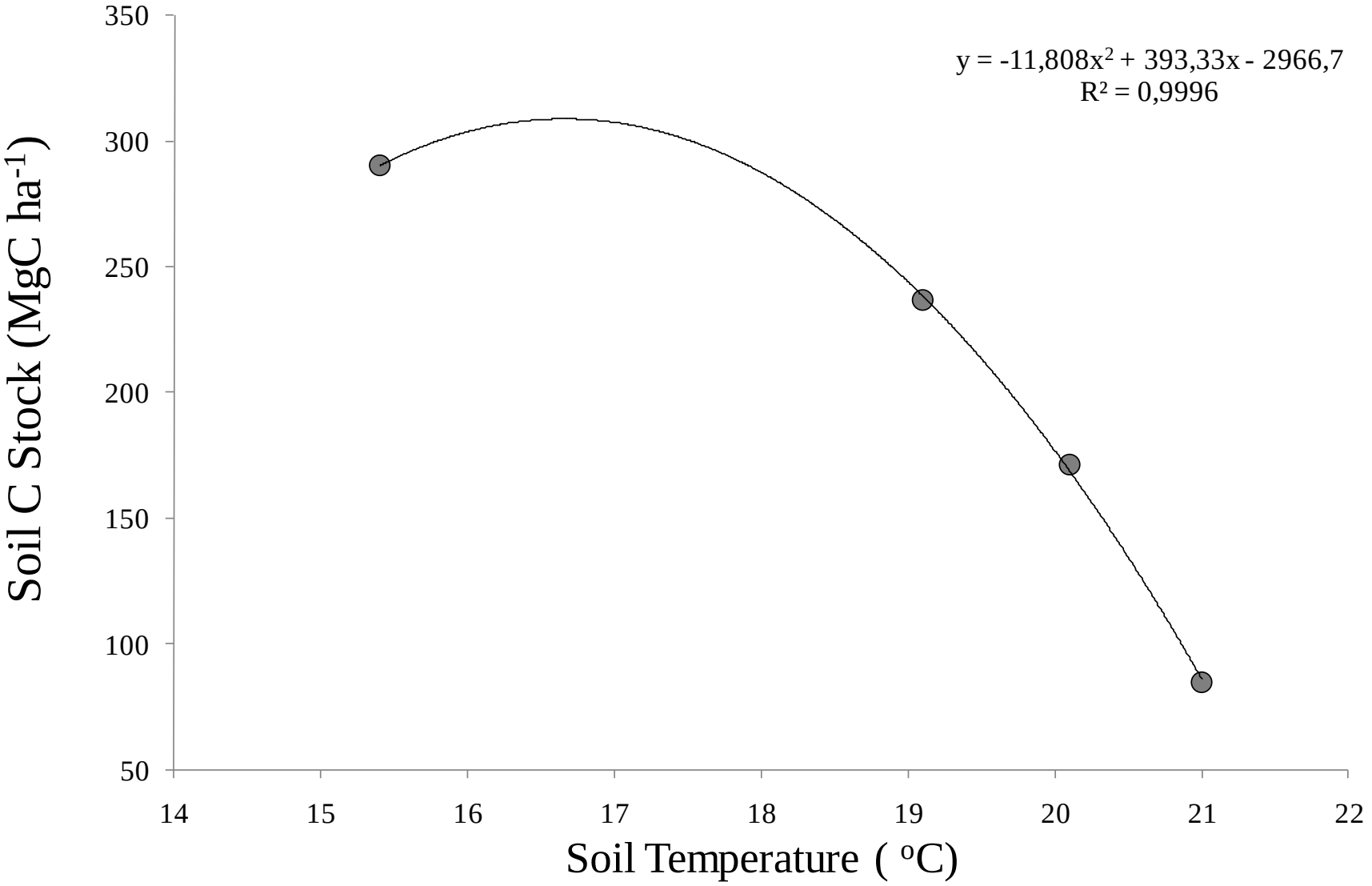

Conclusion

- The Tropical Atlantic Forest can be considered an important reservoir of carbon, which can store between 189-466 MgC ha^{-1}
- The global model predict there will have no change on total precipitaion
- Temperature may increase (~4^{o}C –worst scenario)
- The increase of the temperature will direct affect total carbon stock in Atlantic forest, especially soil carbon stock
- By increasing temperature, carbon in “fast” and “slow” pools will also be affected

Thank you!

Table 1
Stand site and physical–chemical characterization of the surface soil layer (0–5 cm) sampled at four sites along the elevational gradient of tropical moist forest (Atlantic forest, Brazil). Mean values (±standard errors; $n = 32$). Adapted from Martins et al. (in review).

Site parameter	Forest type			
	Restinga (seasonally flooded forest)	Lowland	Submontane	Montane
Plot code	A	B, C, D, E	G, H, I, J	K, L, M, N
Plots (1 ha)	1	4	4	4
Elevation (m a.s.l.)	0–50	50–100	100–500	500–1200
Topography	Flat (0–10°)	Gentle (10–30°)	Steep (>30°)	Steep (>30°)
Soil type	Quartzipsamment	Inceptisols	Inceptisols	Inceptisols
Soil texture (%)	88.1% sandy 6.1% clay	60.4% sandy 31.5% clay	66.7% sandy 16.4% clay	57.4% sandy 20.3% clay
Soil pH[a]	3.4	3.6	3.6	3.5
CEC ($mmol_c\ kg^{-1}$)	111.6	138.4	193.2	163.0
P ($mg\ kg^{-1}$)	11.5	17.6	12.9	21.2
SB ($mmol_c\ kg^{-1}$)	4.2	12.9	22.5	15.8

[a] pH expressed in CaCl.

Alves et al. 2010 Forest Ecology and Management "Forest structure and live aboveground biomass variation along an elevational gradient of tropical Atlantic moist forest (Brazil)"