

Pós-graduação em Ciência e Tecnologia Ambiental

Ciência Ambiental

Biomas

(Clima e biomas)

Leandro Reverberi Tambosi

Conceitos de bioma

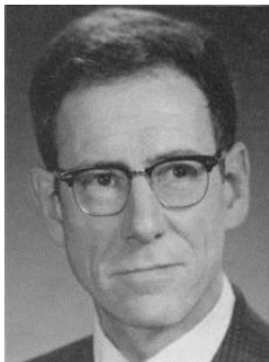


Howard Odum
(1924 – 2002)

Introduz o substrato físico ao conceito

“Regional climates interact with regional biota and **substrate** to produce large, easily recognizable community units, called biomes... In a given biome the life form of the climatic climax **vegetation**...is uniform”

(Odum, 1971)



Robert Whittaker
(1920 – 1980)

Restringe os biomas aos continentes em que se encontram

“A major kind of community, conceived in terms of **physiognomy**, on a given continent, is a biome...we have to use both **structure** and **environment** when we define biomes”

(Whittaker, 1971)

Conceitos de bioma

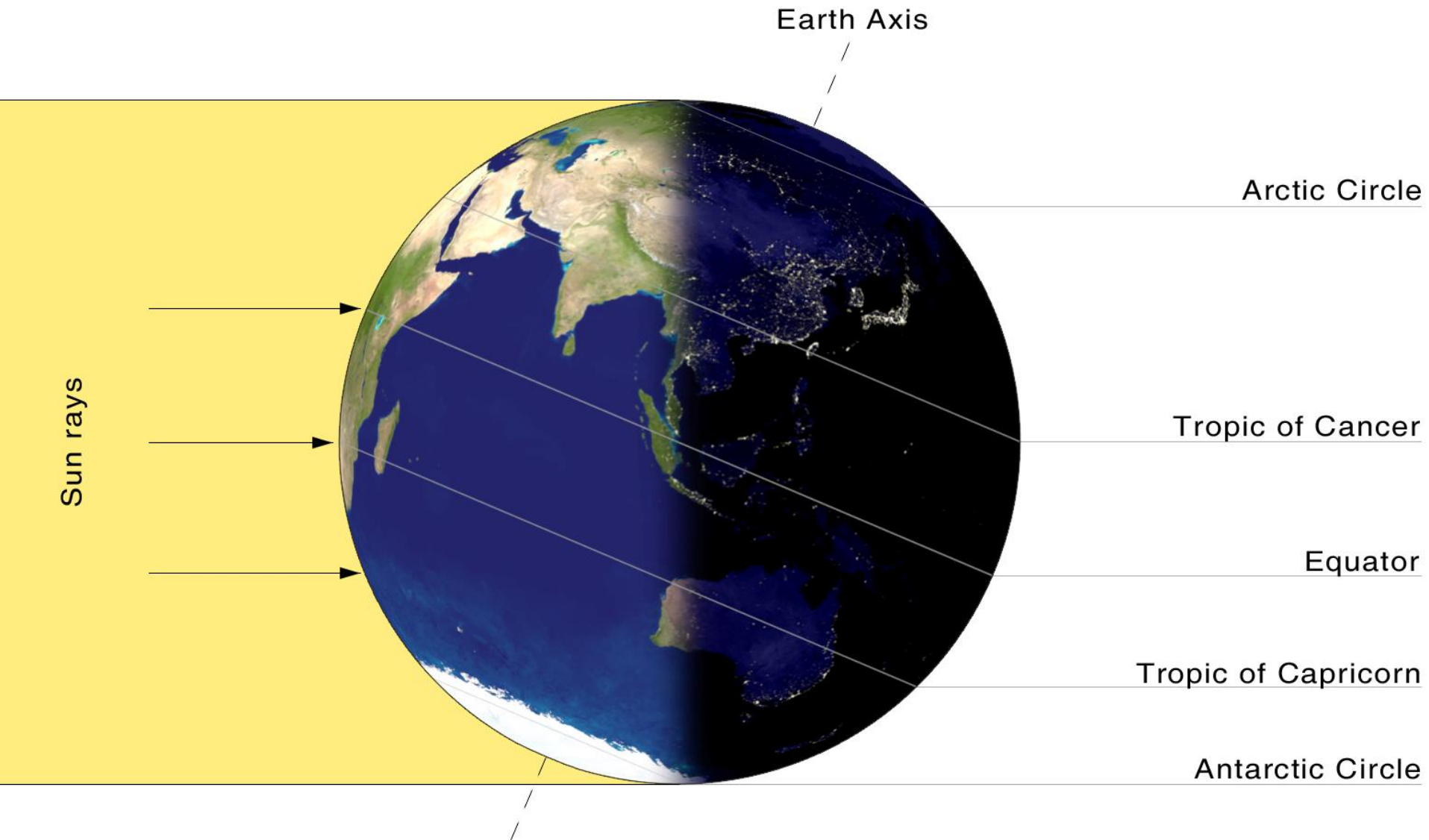
Bioma: conjunto de vida vegetal e animal constituído pelo agrupamento de **tipos de vegetação contíguos** e identificáveis em escala regional, com condições de geologia e clima semelhantes e que, **historicamente, sofreram os mesmos processos de formação da paisagem, resultando em uma diversidade de flora e fauna própria (IBGE).**



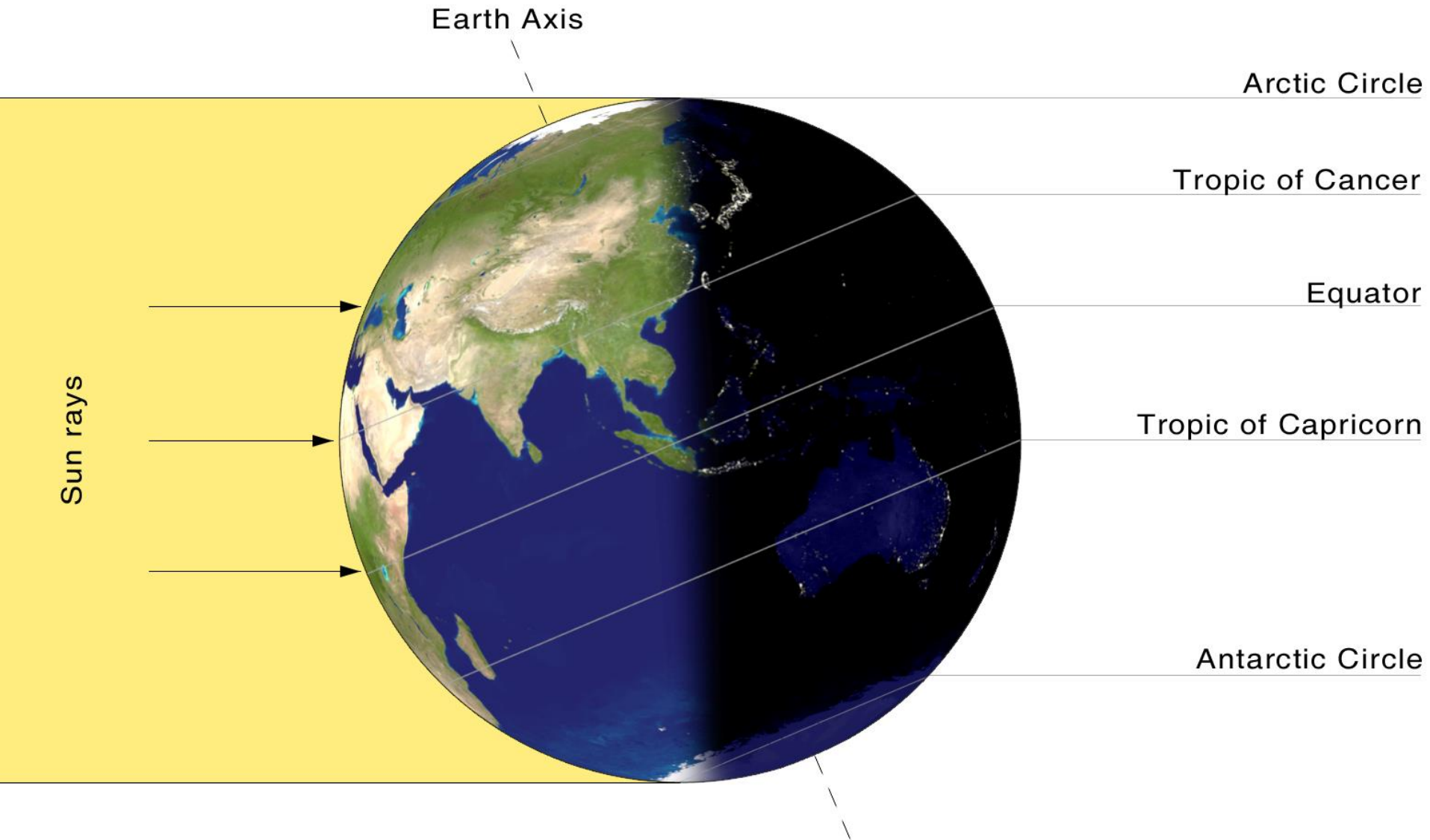
http://lcf.esalq.usp.br/prof/pedro/lib/exe/fetch.php?media=ensino:graduacao:ecossistemas_brasileiros_2012.pdf

Biome: a set of life (vegetal and animal) characterized by a main type of vegetation and by characteristic physiognomy and landscape, where certain climatic conditions predominate, forming a continuous whole, and which has historically undergone the same adaptations of its components (Brazilian Institute of Geography and Statistics).

Fatores que influenciam na formação dos biomas



Fatores que influenciam na formação dos biomas



Fatores que influenciam na formação dos biomas

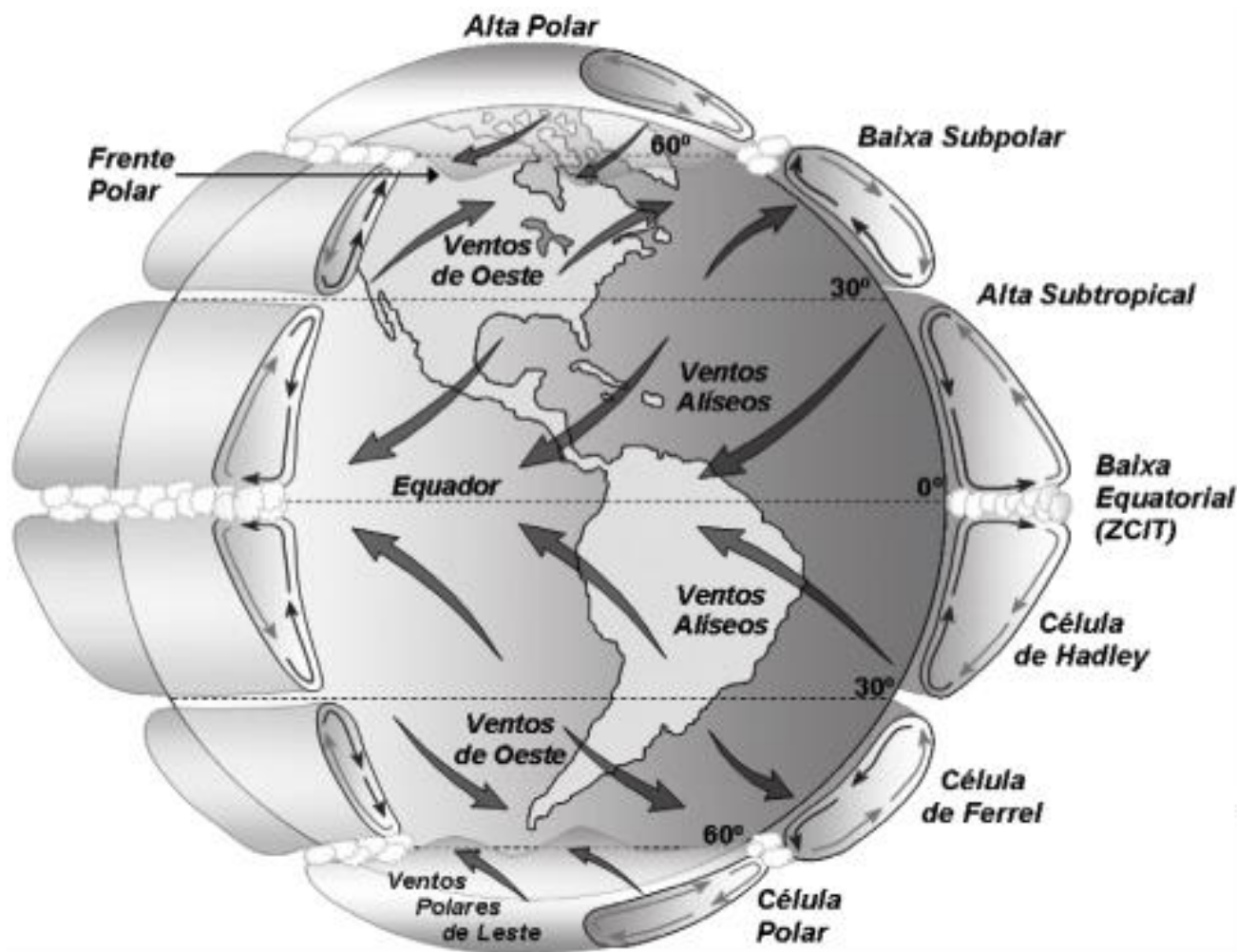
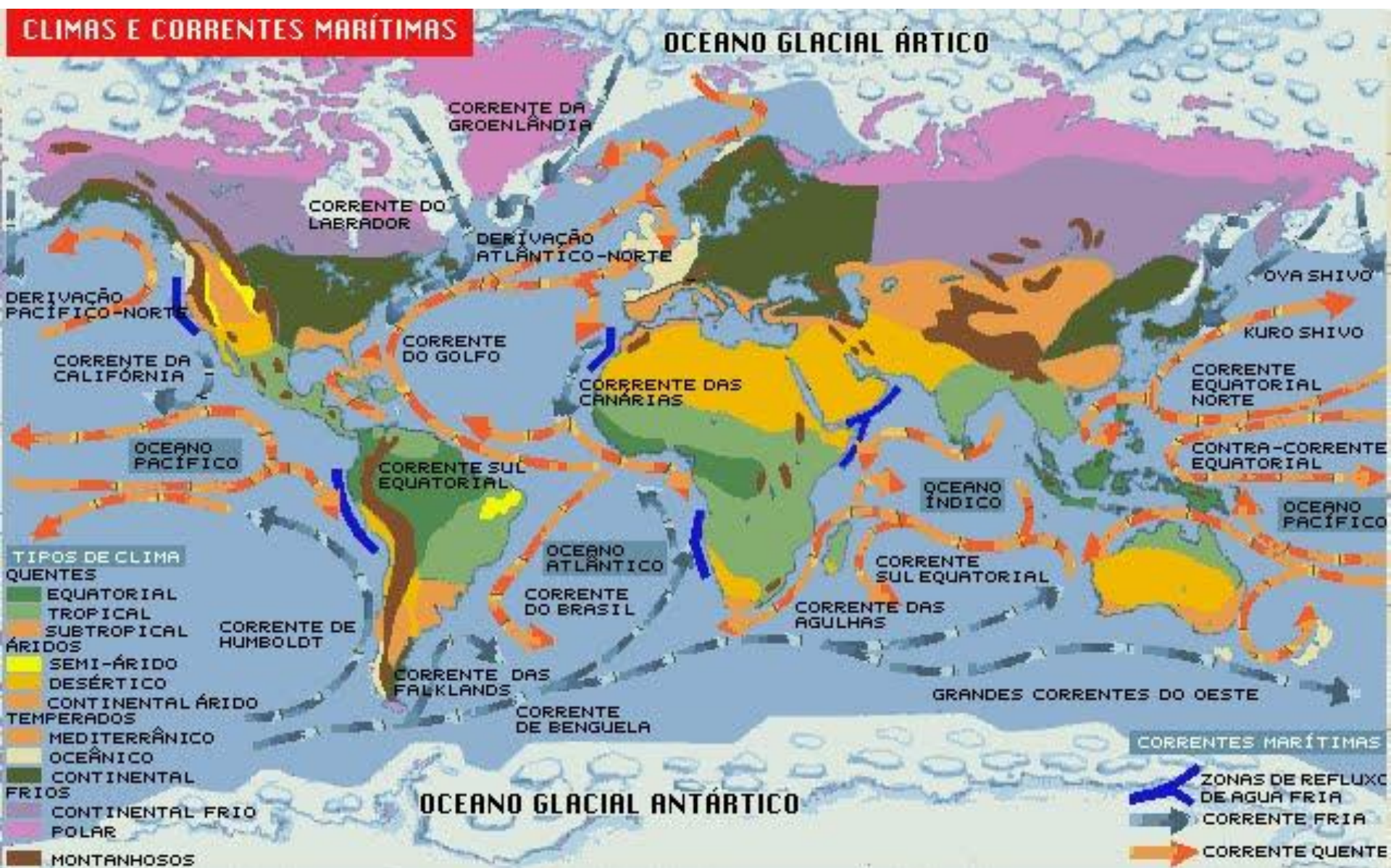
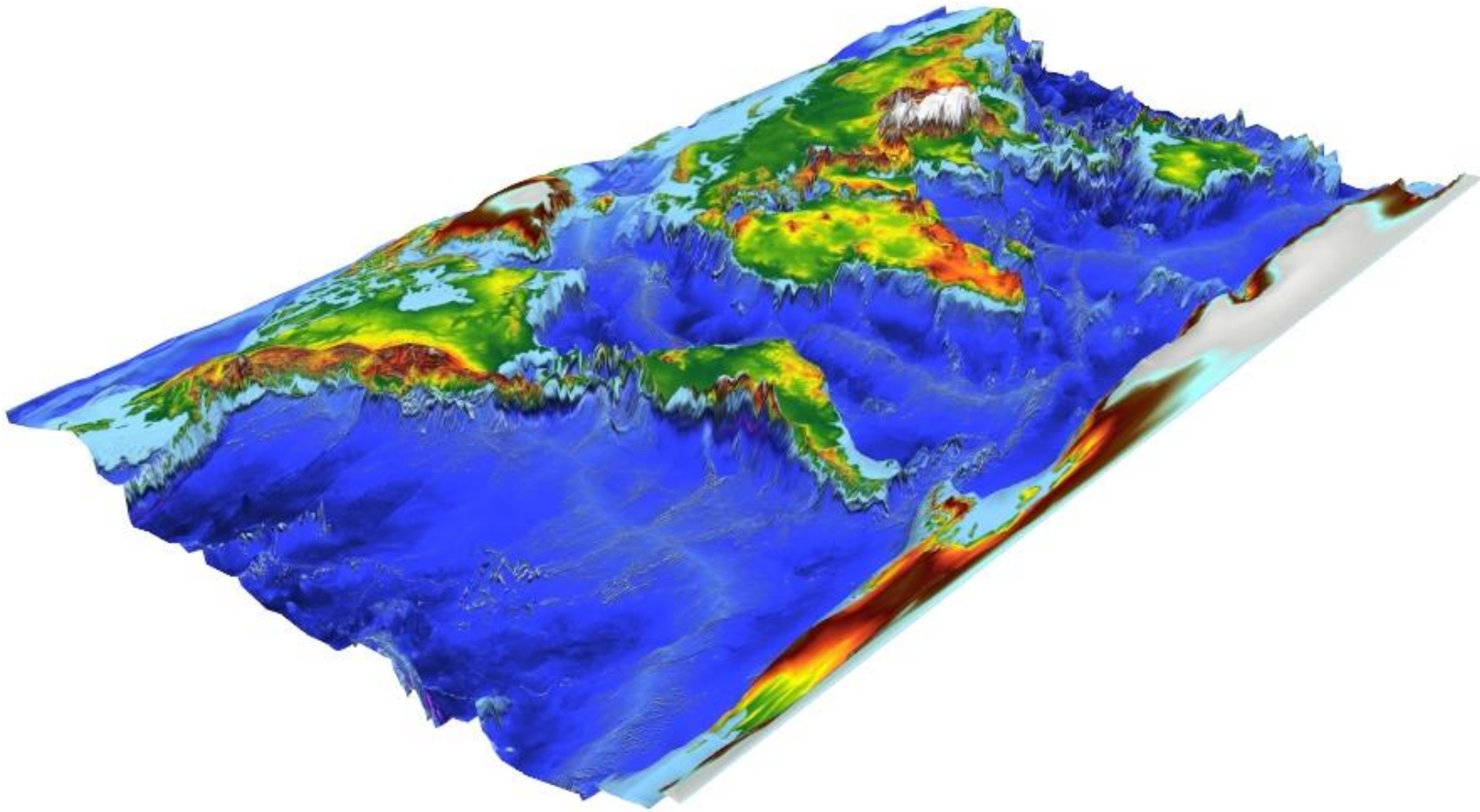


Figura 7 - Modelo conceitual da circulação global atmosférica, indicando as células meridionais e as direções dos ventos próximos à superfície. Também são indicadas as latitudes típicas de baixas e altas pressões. Adaptado da Ref. [20].

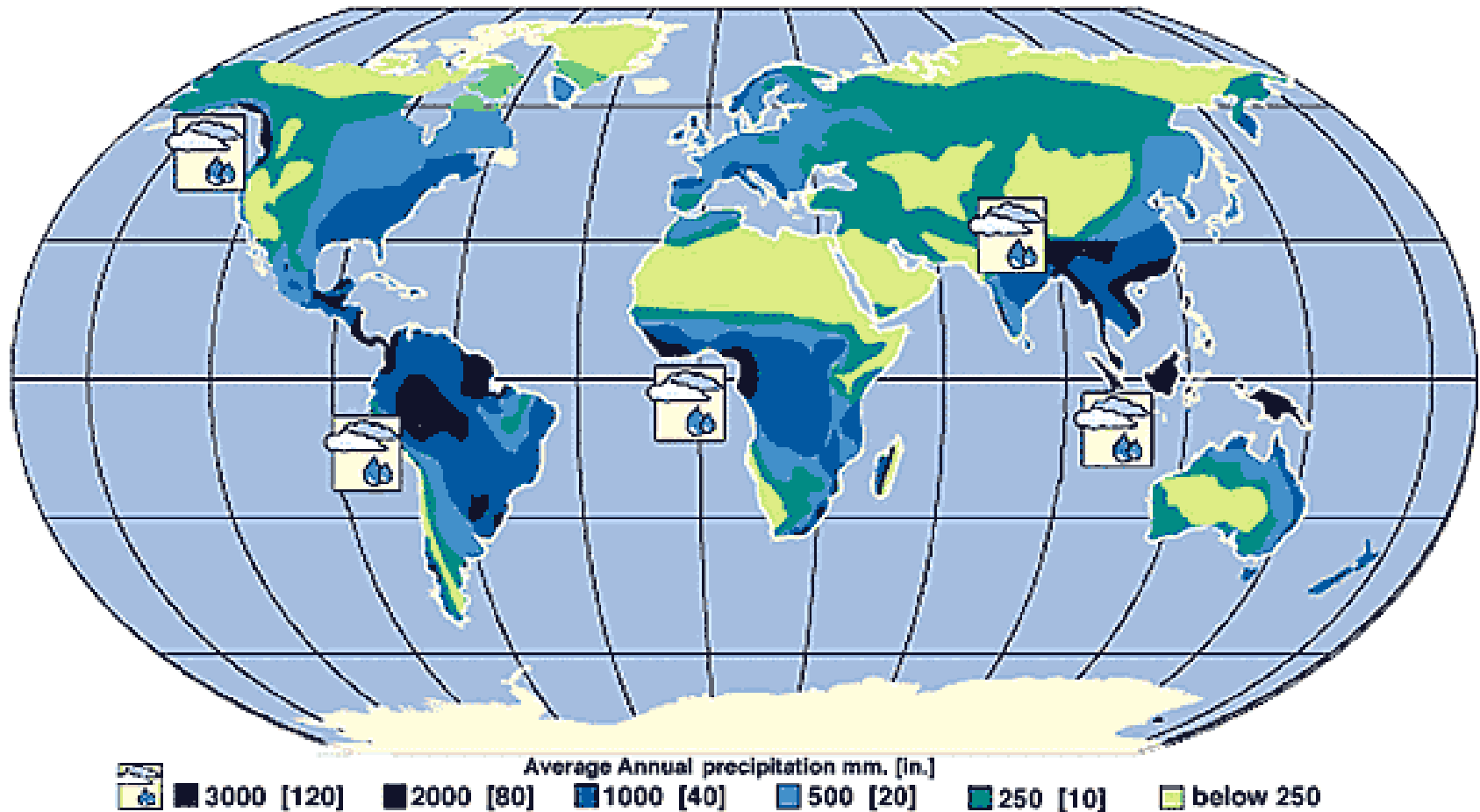
Fatores que influenciam na formação dos biomas



Fatores que influenciam na formação dos biomas



Fatores que influenciam na formação dos biomas



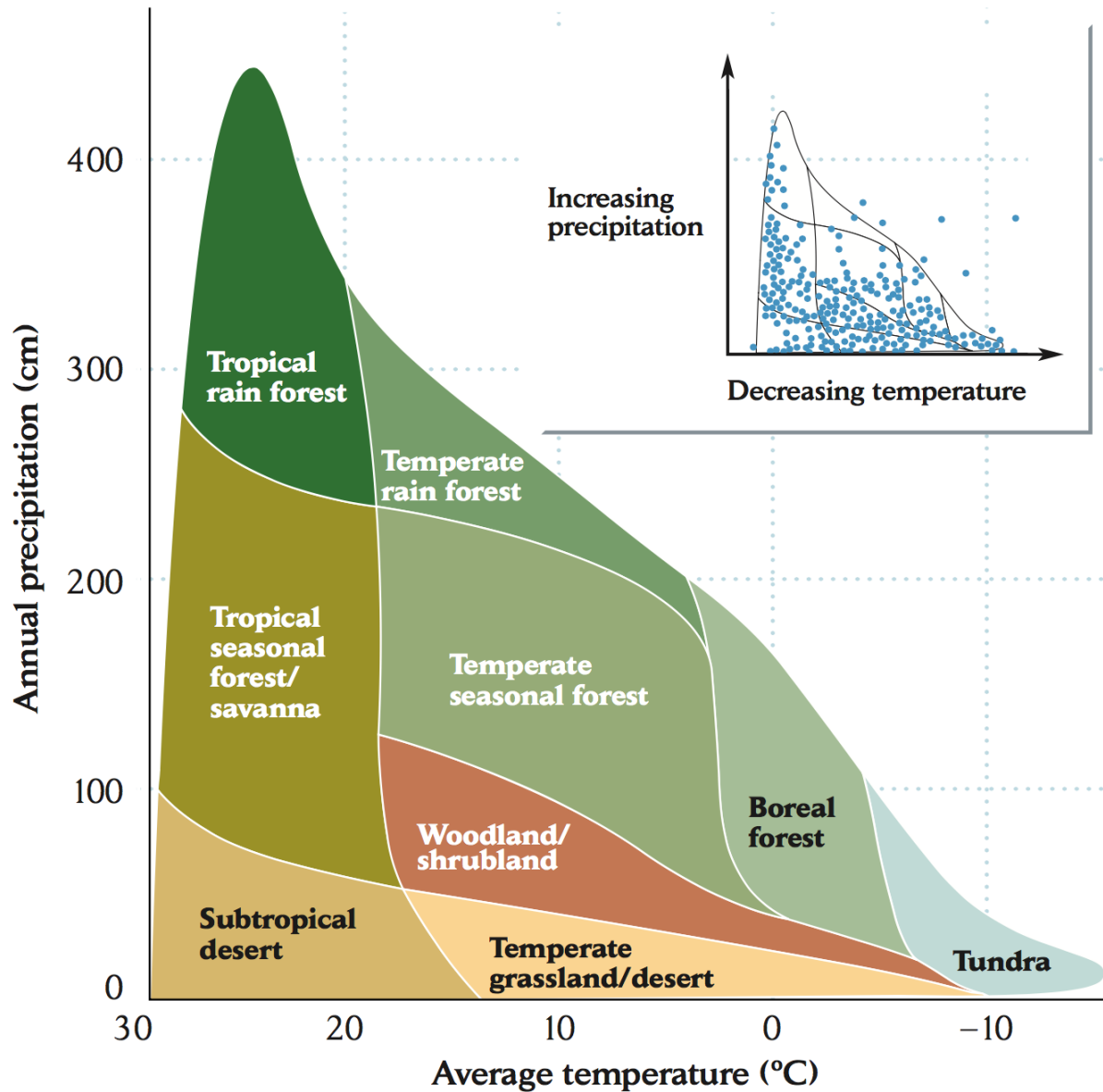
Credit: Earth Forum, Houston Museum of Natural Science

Zonobiomas - *Zonobiomes*

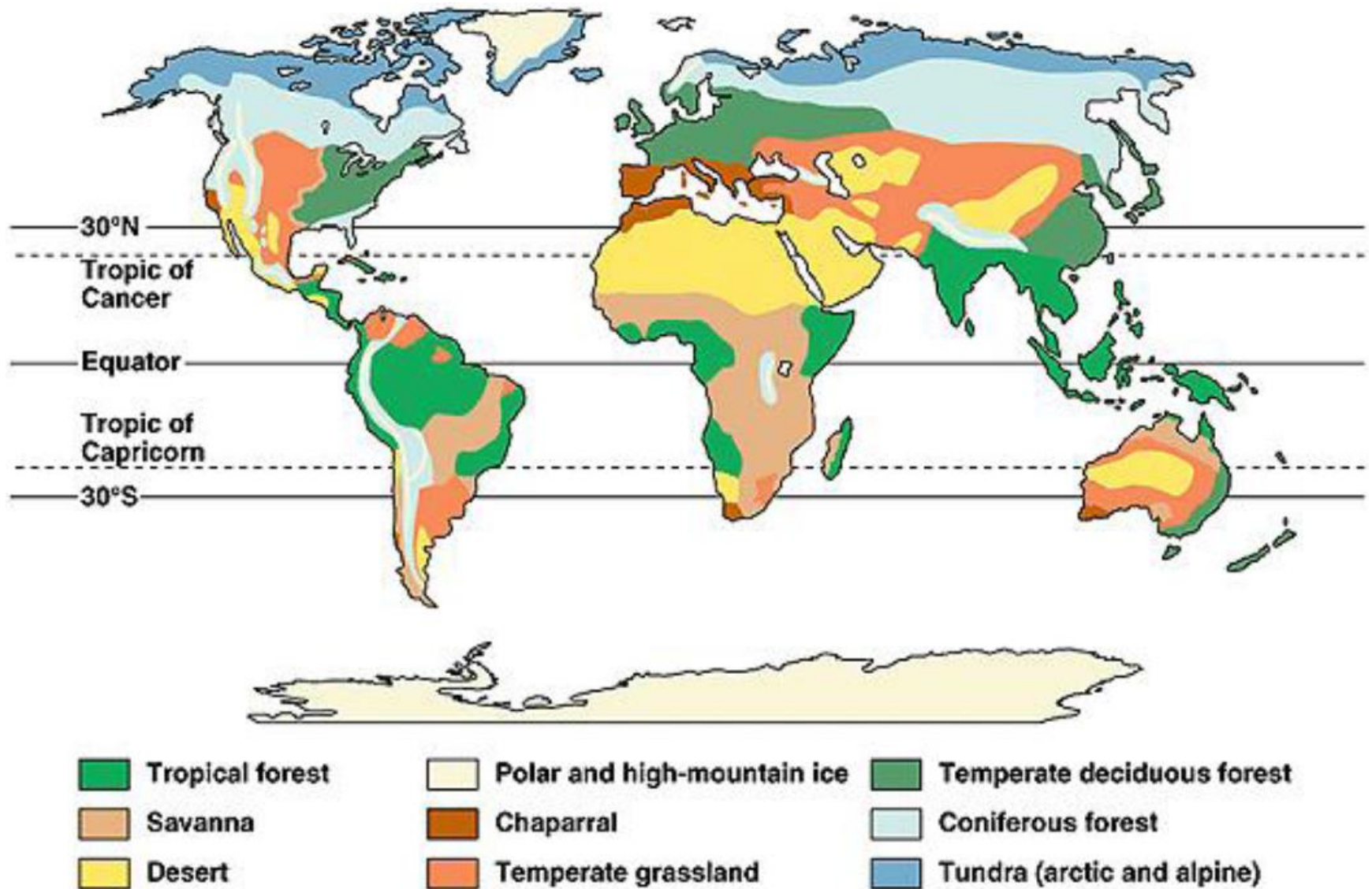
Divisão do planeta em faixas de condições climáticas/ambientais (temperatura e precipitação) a partir da qual se pode prever o tipo de bioma que pode ser encontrado!

Division of the planet into zones of climatic/environmental conditions (temperature, precipitation) from which one can predict the type of biome that can be found!

Zonobiomas

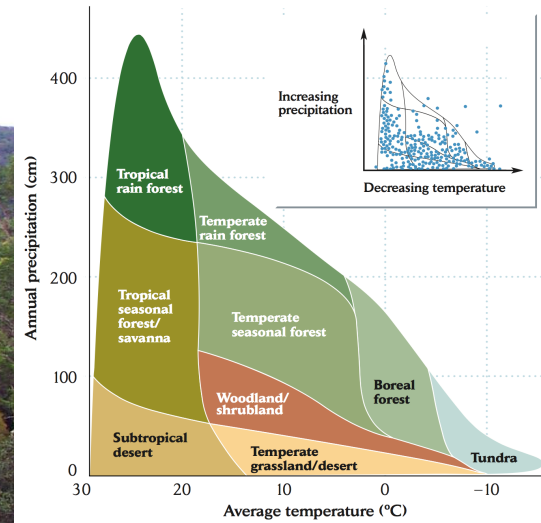


Zonobiomas



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

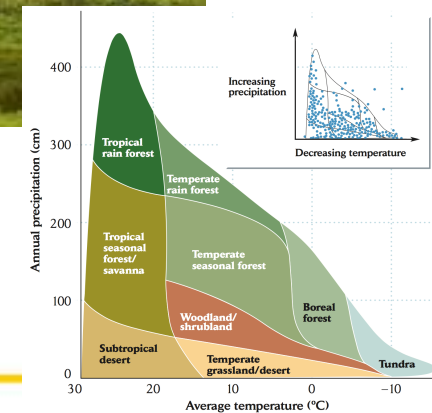
Florestas Tropicais



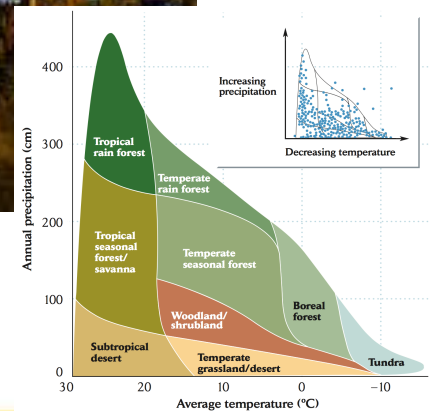
Florestas tropicais



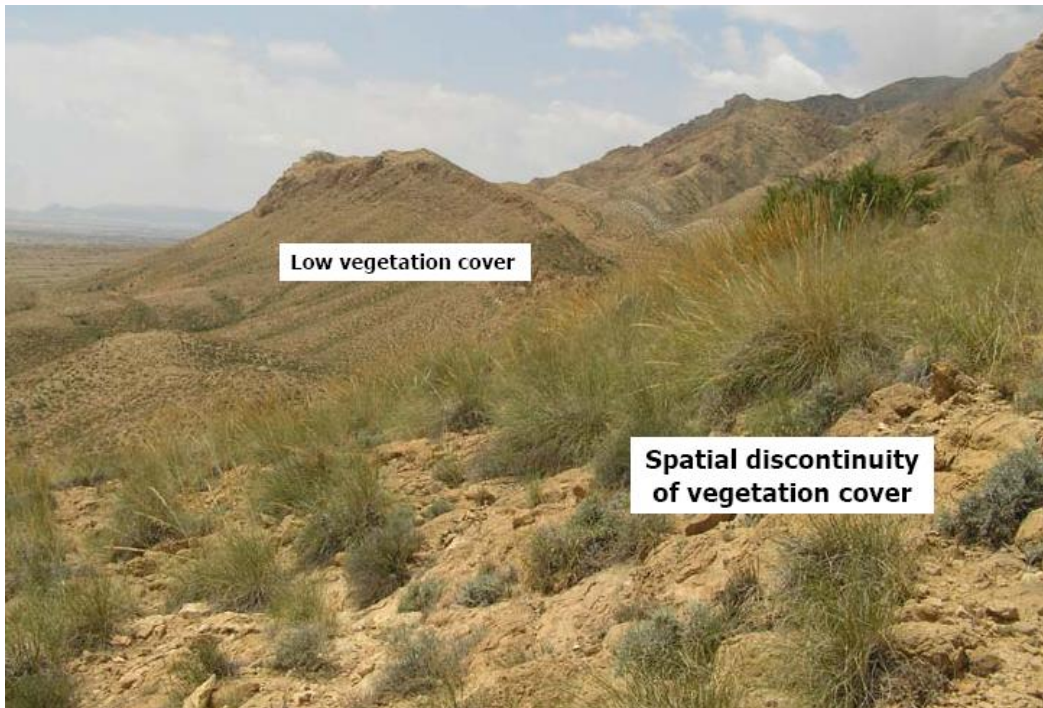
Florestas temperadas e boreais



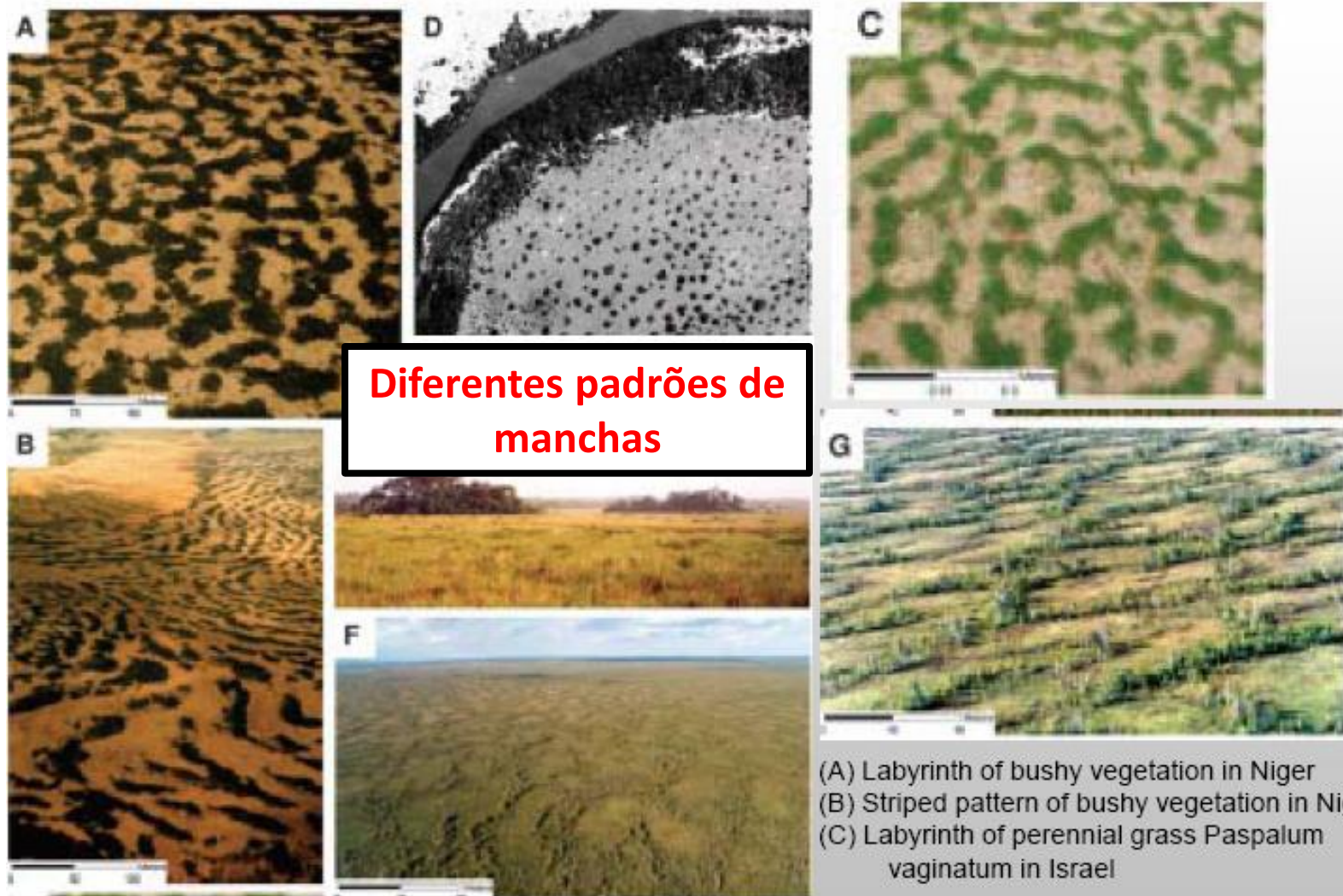
Savanas



Chaparral e desertos



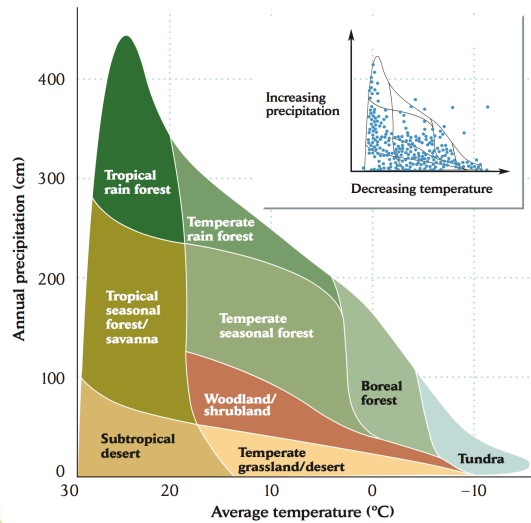
Chaparral e desertos



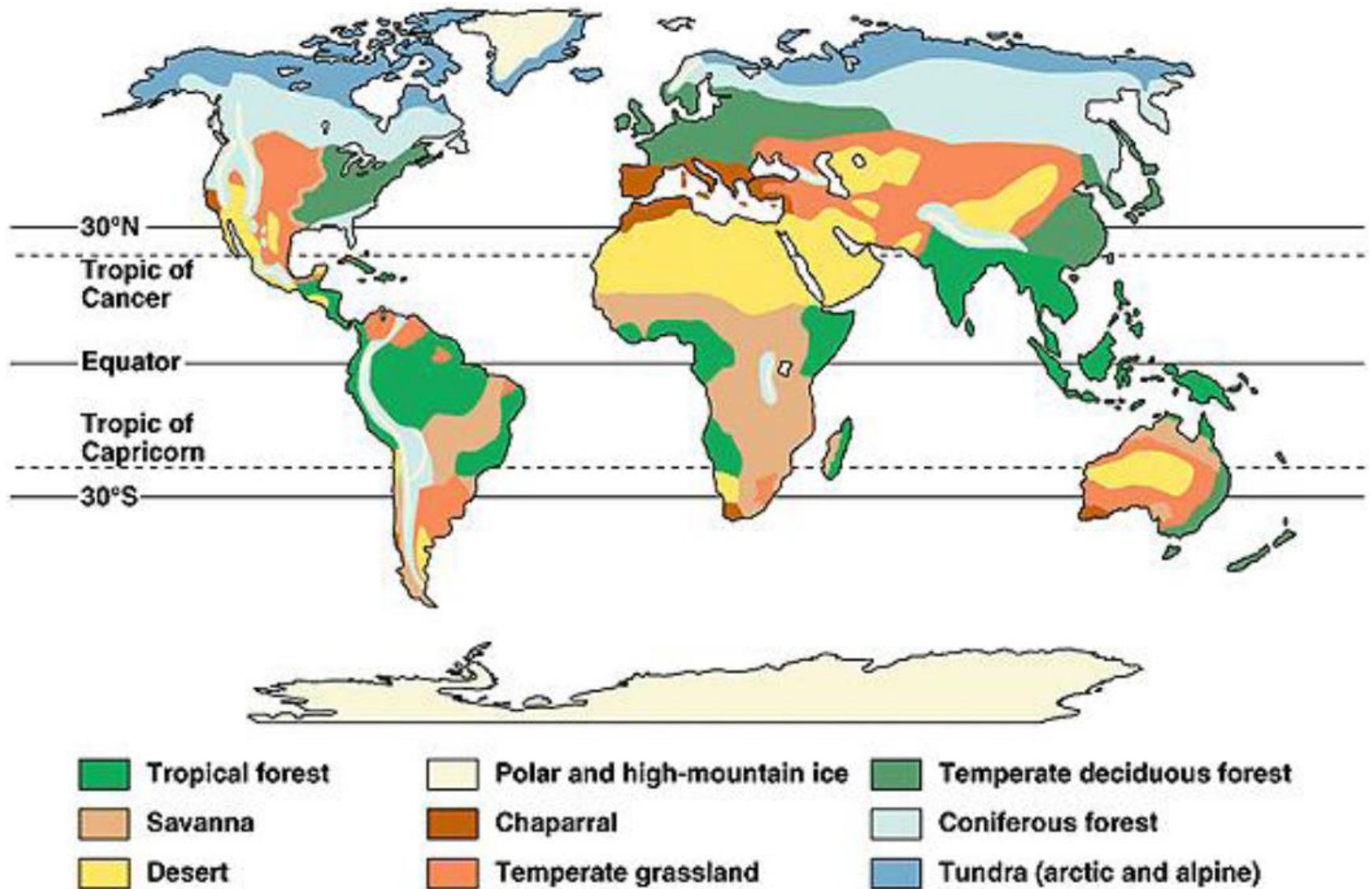
(A) Labyrinth of bushy vegetation in Niger
(B) Striped pattern of bushy vegetation in Niger
(C) Labyrinth of perennial grass *Paspalum vaginatum* in Israel

(D and E) Savanna ecosystems: Aerial and ground photographs of tree patches in Ivory Coast and French Guiana
(F and G) Peatlands: Regular maze patterns of shrubs and trees in western Siberia

Tundra

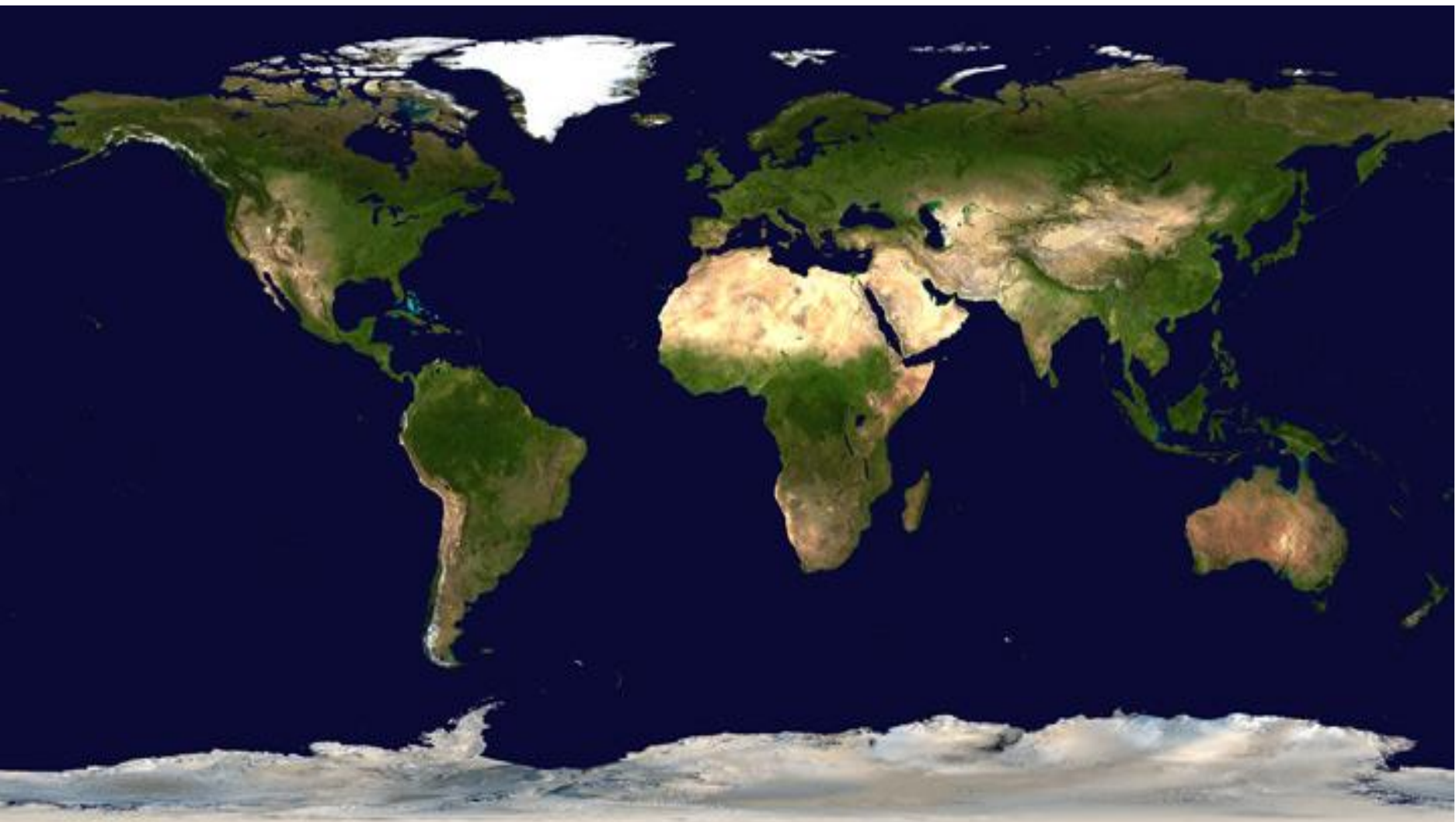


Zonobiomas

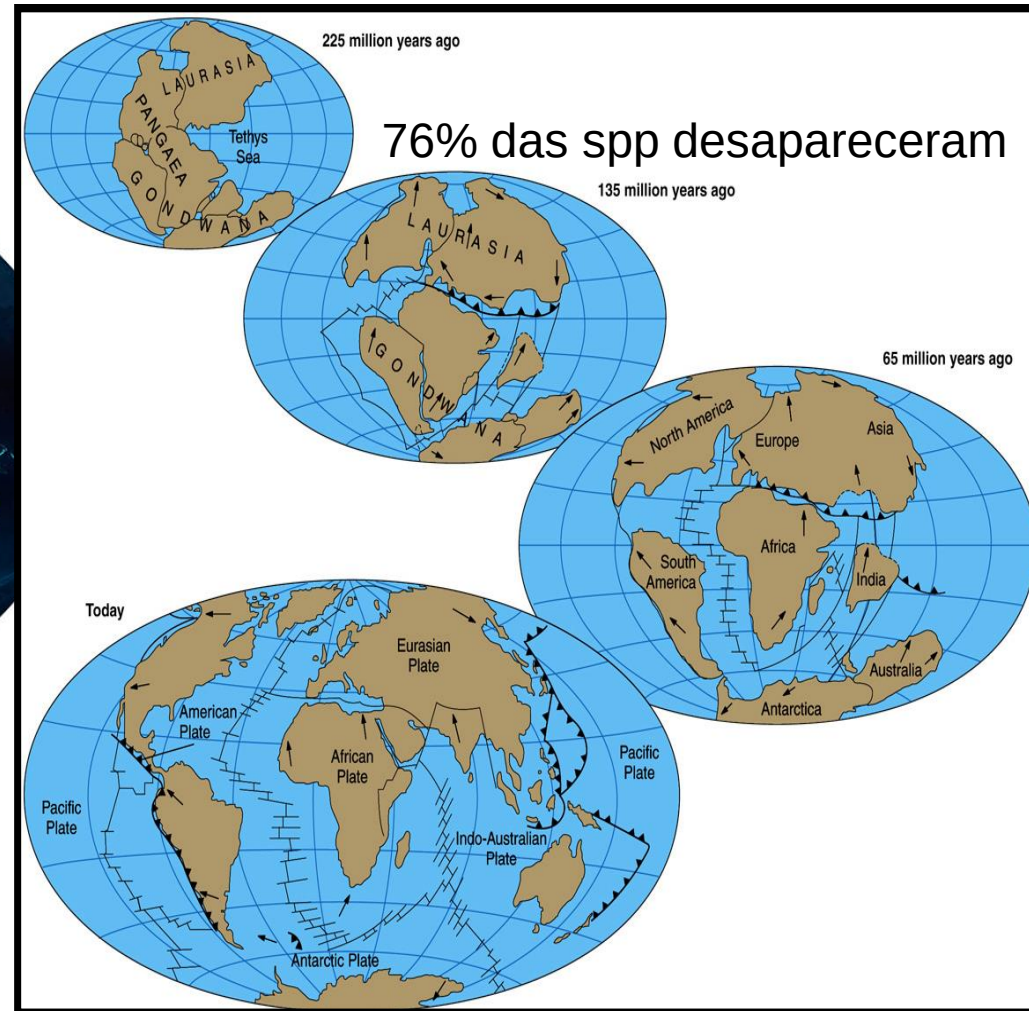
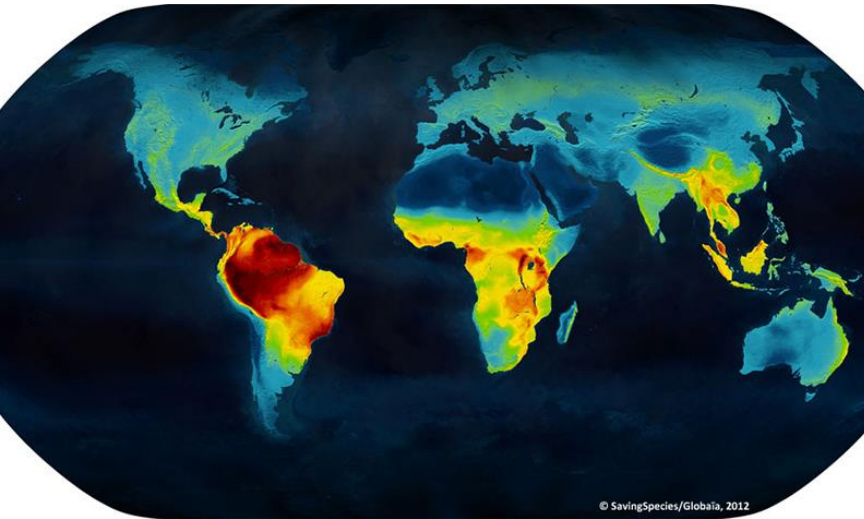


Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

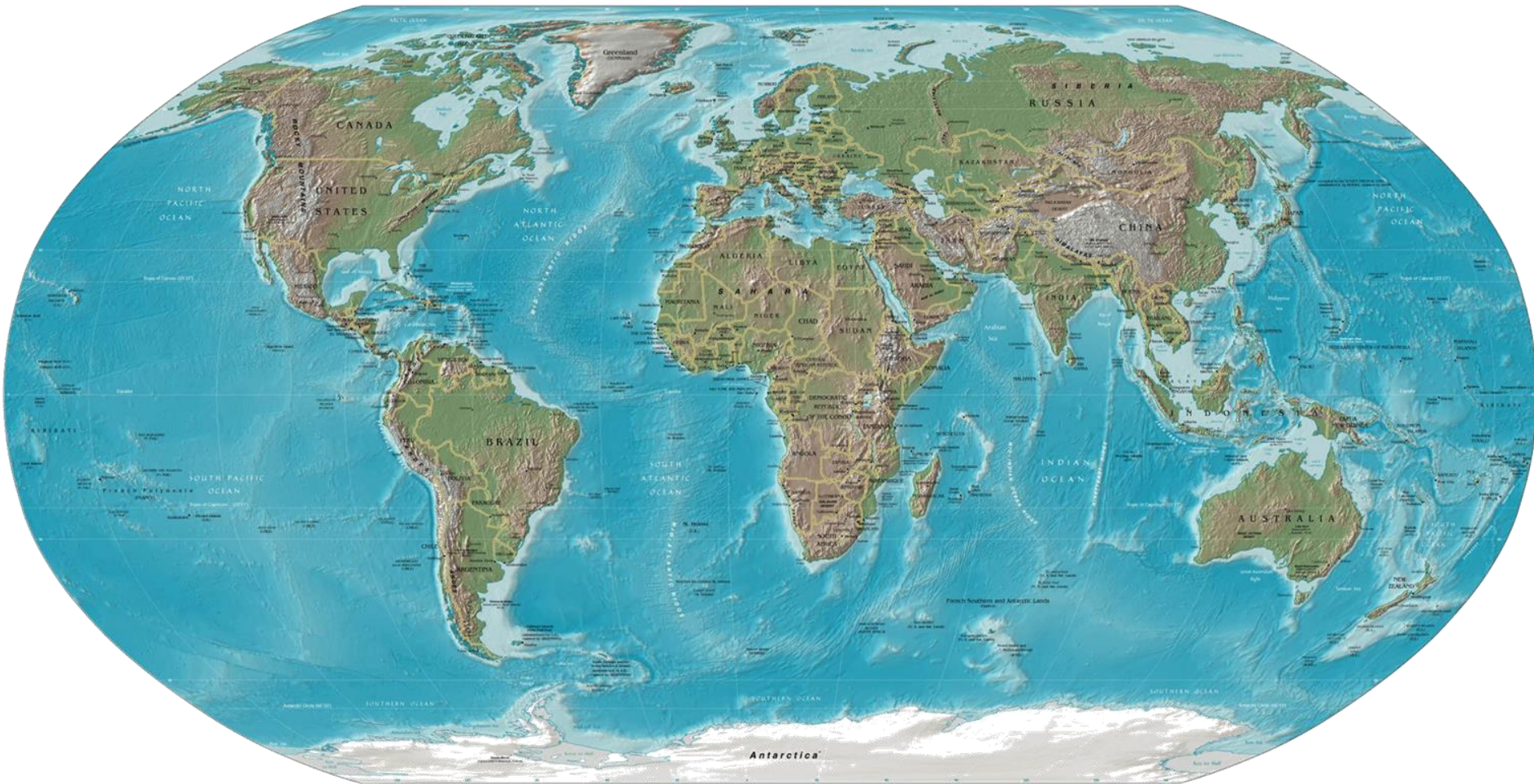
Os zonobiomas são homogêneos?



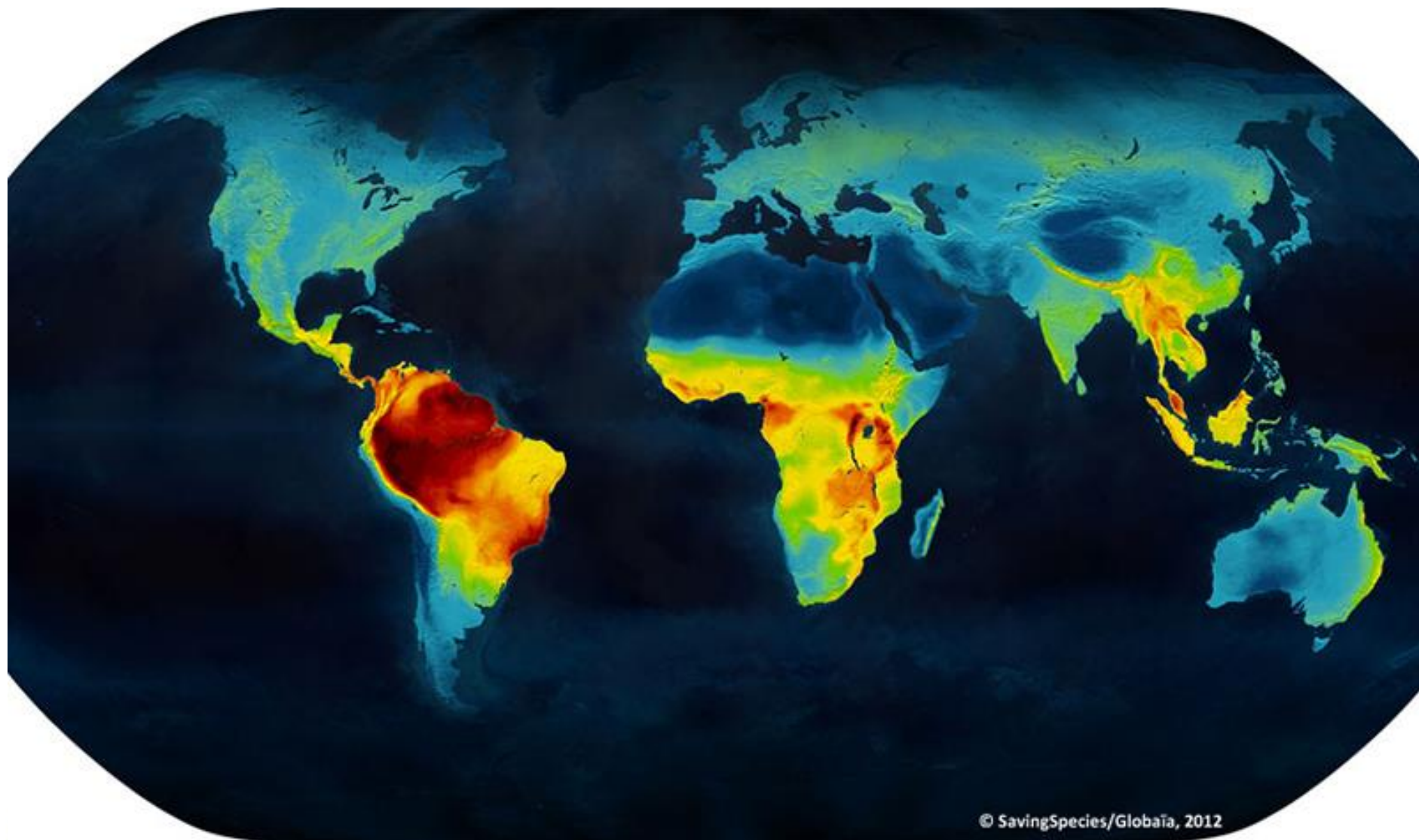
Por que os continentes não apresentam diversidade homogênea?



Configuração atual dos continentes

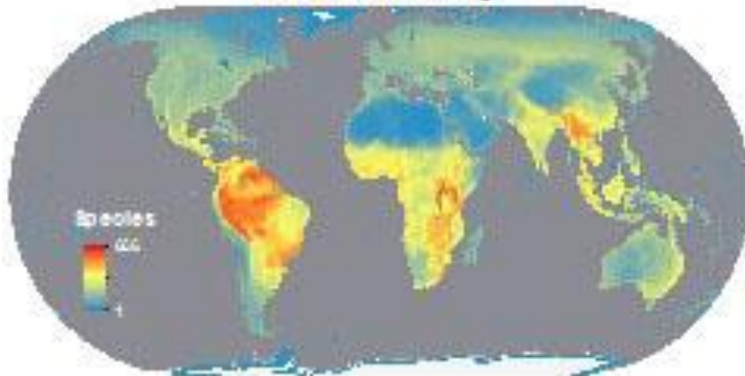


Biodiversidade global



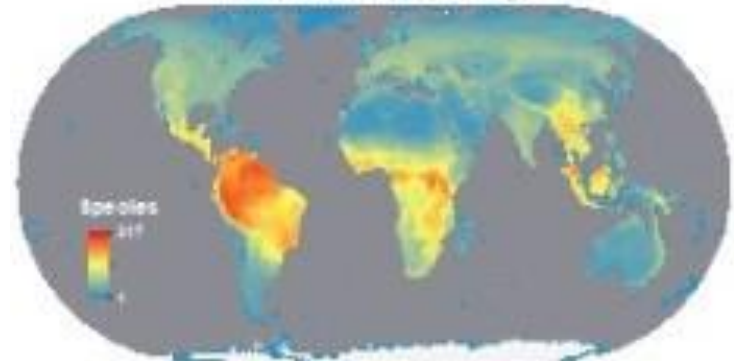
Biodiversidade global

Bird Diversity



Biodiversitymappin.org

Mammal Diversity



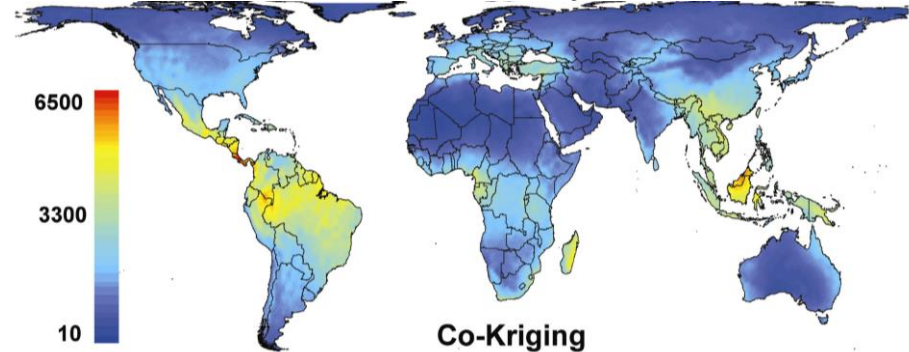
Biodiversitymappin.org

Amphibian Diversity



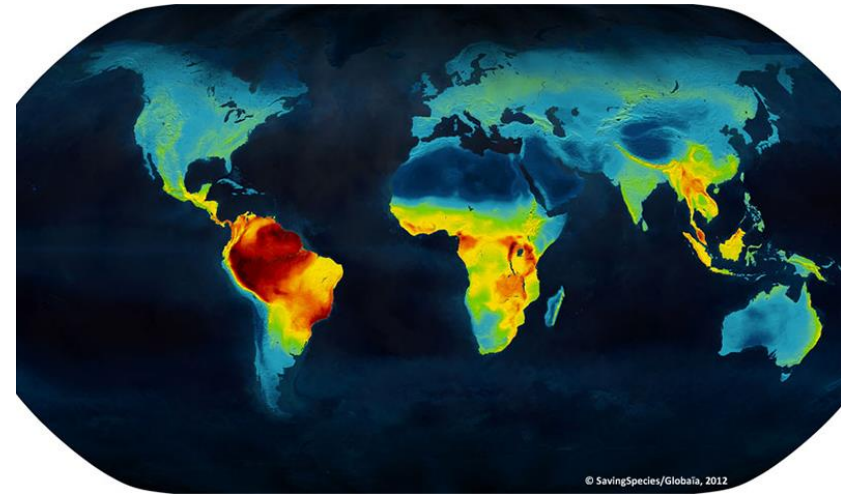
Biodiversitymappin.org

Plant diversity



ucsdnews.ucsd.edu/archive/graphics/images/2007/03-07PlantLarge.jpg

Hypothesis for biodiversity distribution



Larger areas

Time since isolation

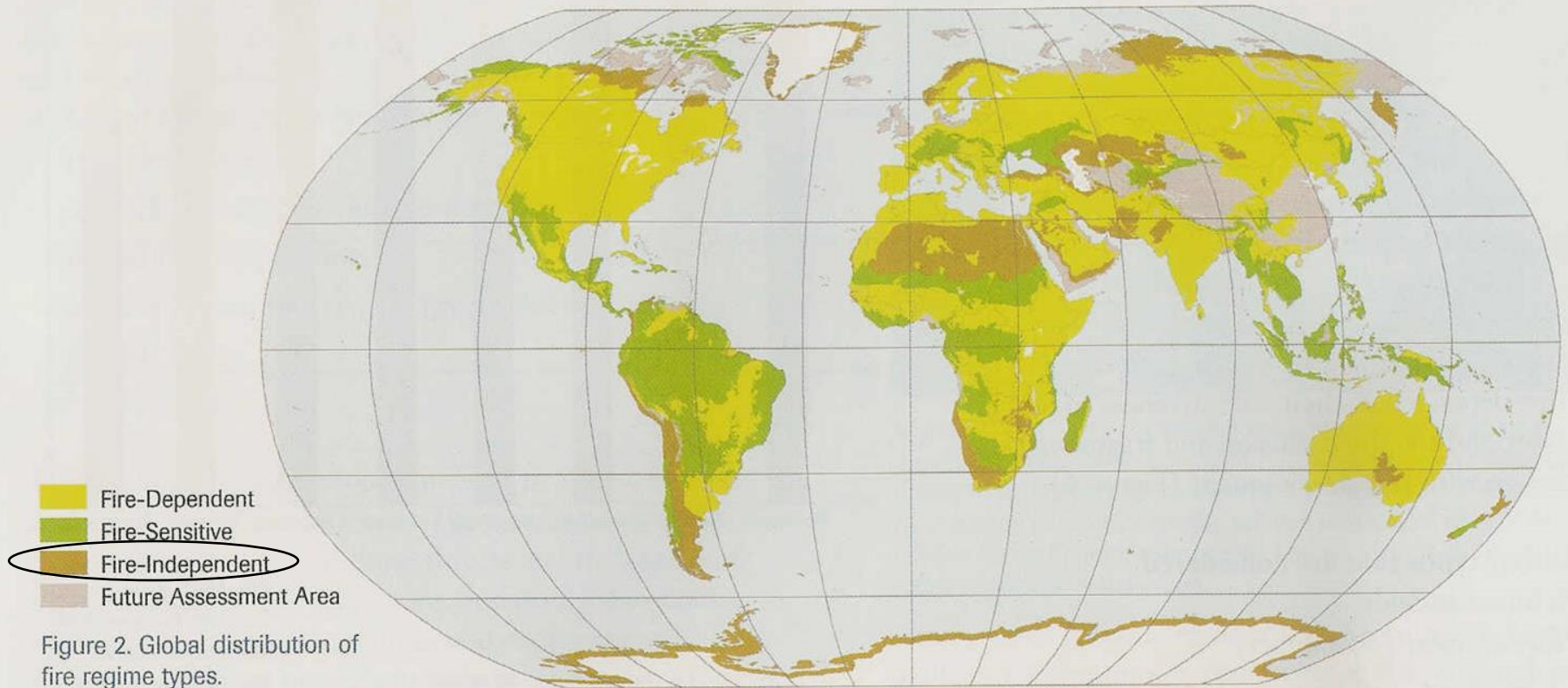
Environmental stability

Primary productivity (energy)

Latitudinal gradient

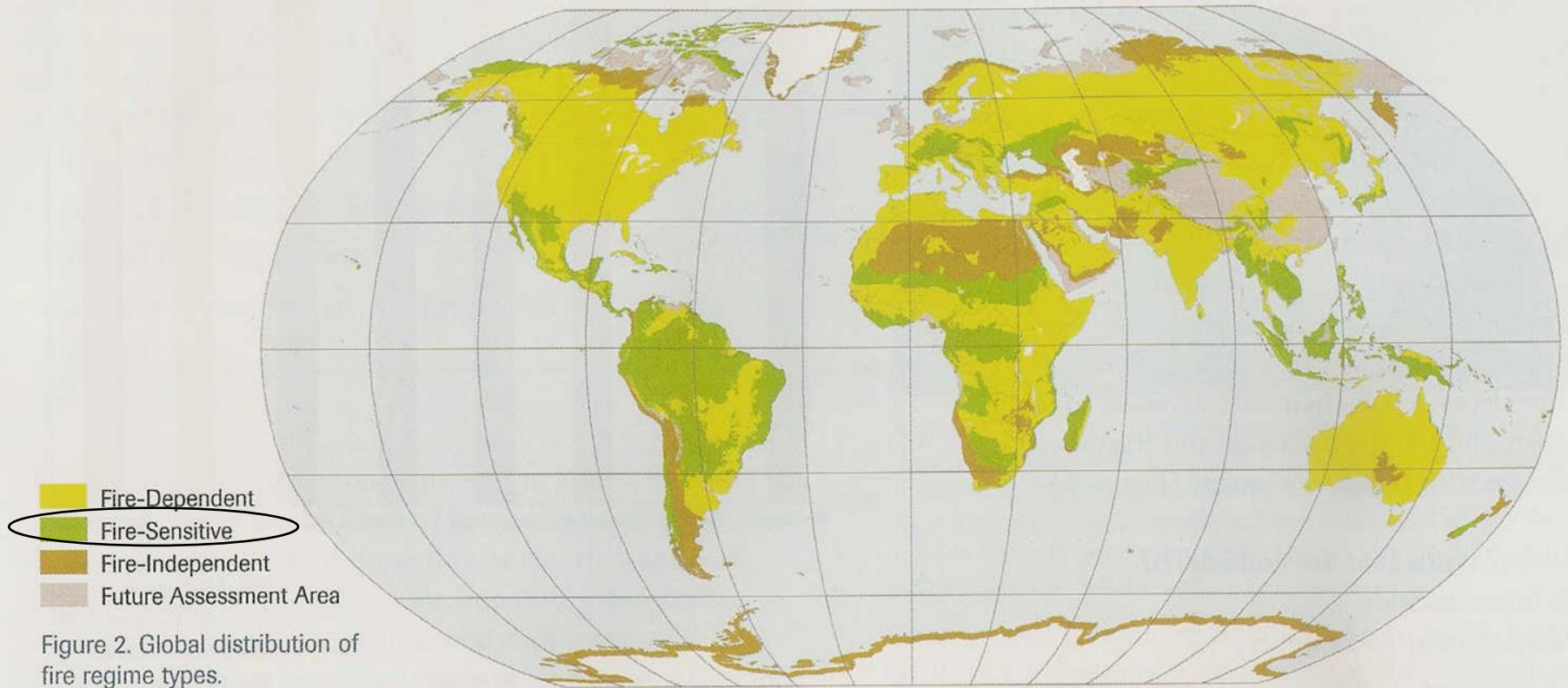
Altitudinal gradient

Fire influence



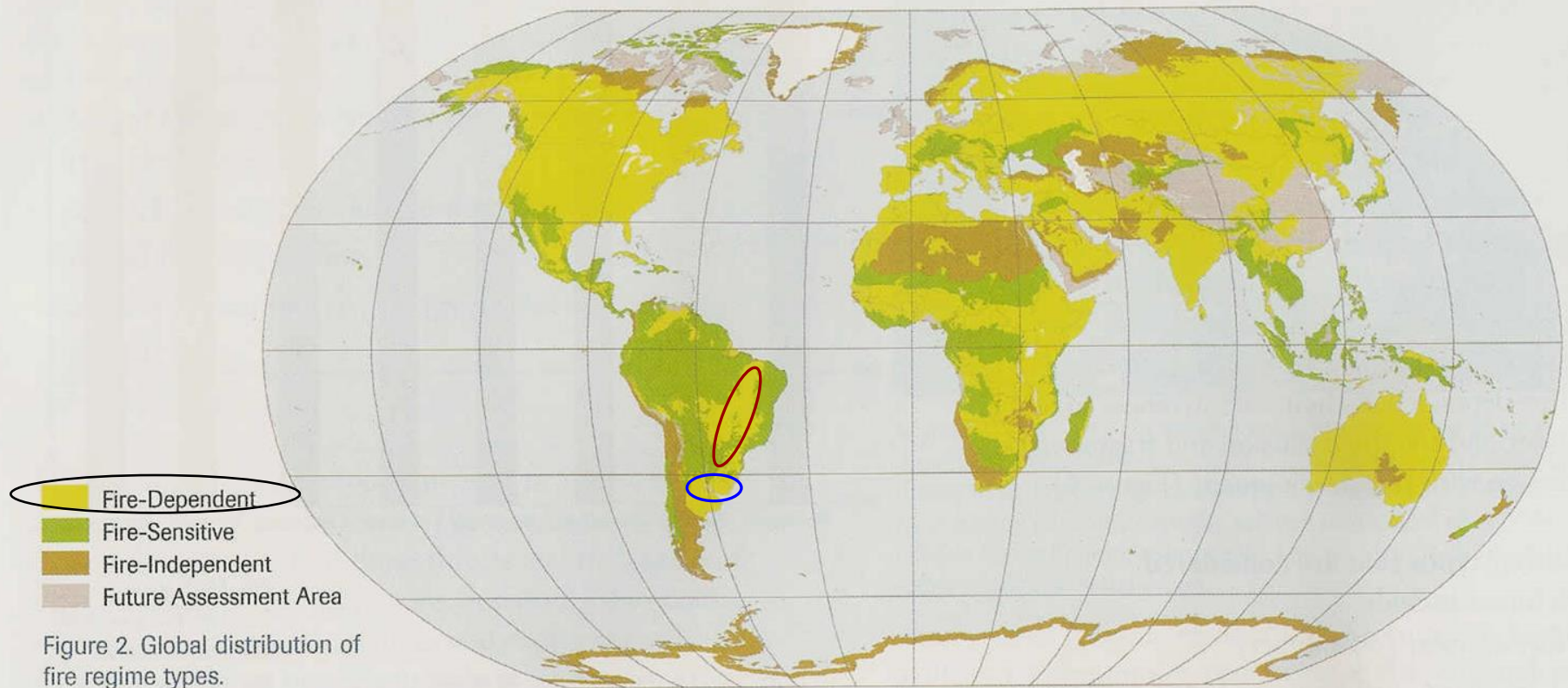
- Fire independent ecosystems: small or no fire presence (very low humidity, very arid or very cold) = 15%

Fire influence



- Fire independent ecosystems: small or no fire influence (very low humidity, very arid or very cold) = 15%
- Fire sensitive ecosystems: fire $\Rightarrow$ death of individuals (all species) and interruption of processes (under natural conditions they are fire independent because fire almost never occurs) = 22%

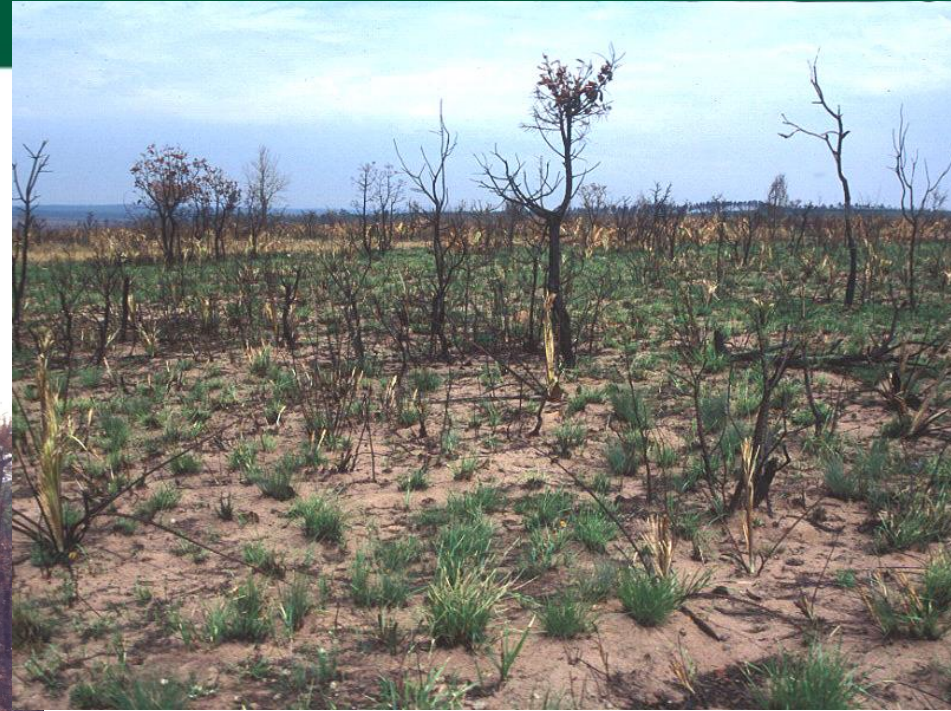
Fire influence



- Fire independent ecosystems: small or no fire influence (very low humidity, very arid or very cold) = 15%
- Fire sensitive ecosystems: fire ~~death~~ of individuals (all species) and interruption of processes (under natural conditions they are fire independent because fire almost never occurs) = 22%
- Fire dependent ecosystems: fire is essential for ecosystem functioning (species are adapted and maintained by fire) = 53%

Cerrado

Adaptation to fire *Rebrotamento (resprout):*



Súber (*bark*):



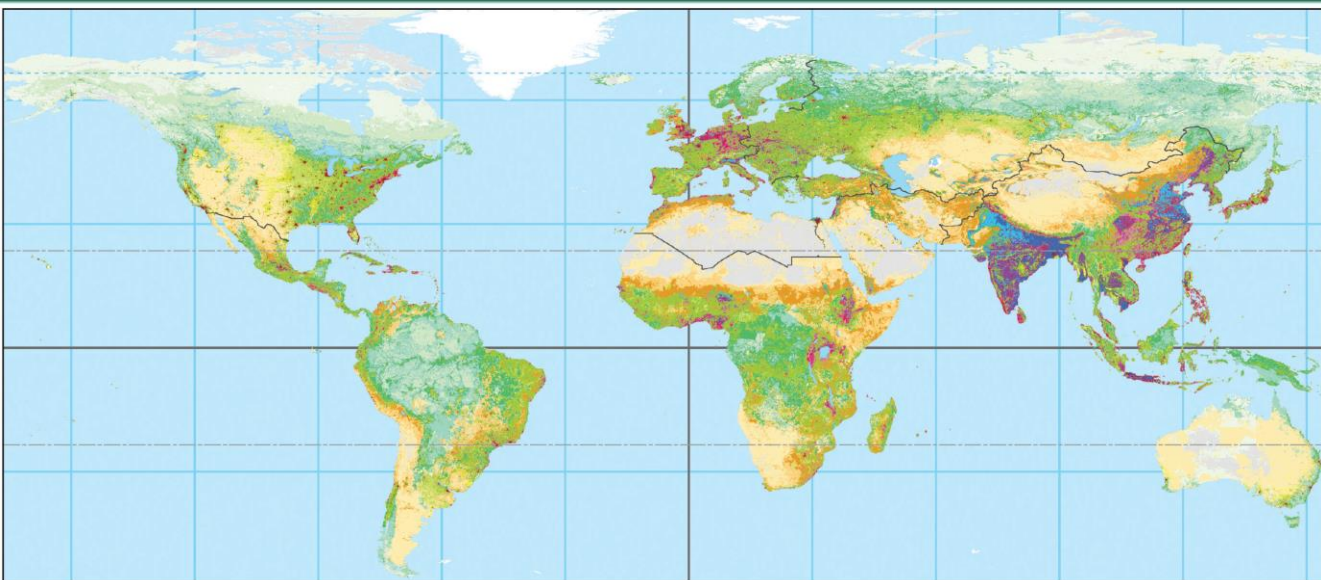
floração:



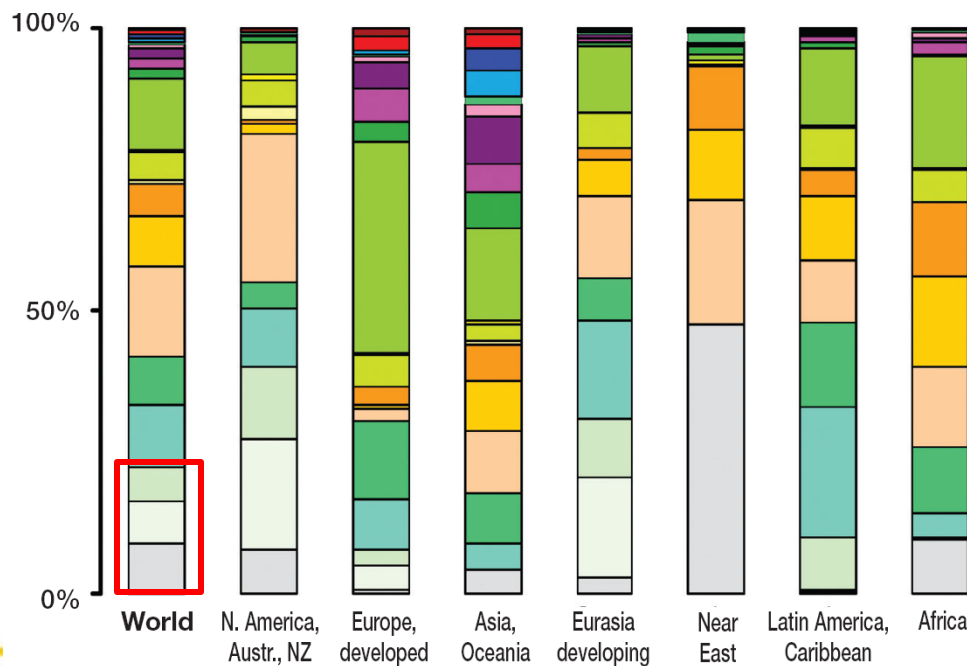
deiscência de frutos e dispersão de sementes *fruit dehiscence and seed dispersal*



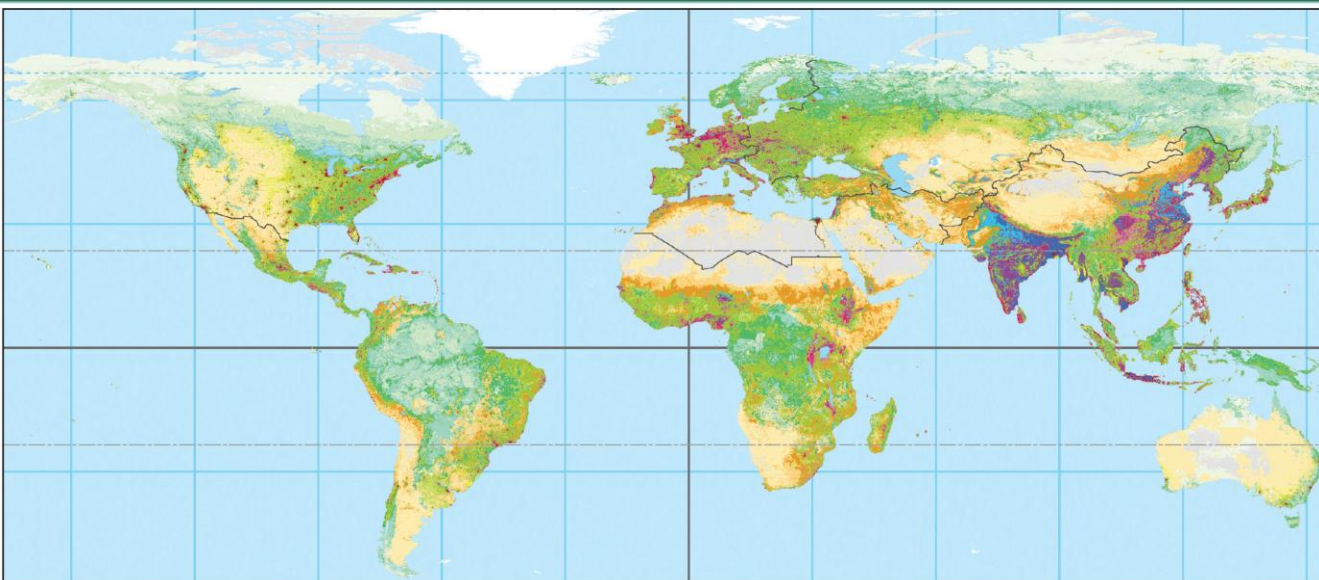
Proporções do planeta ocupado por diferentes classes



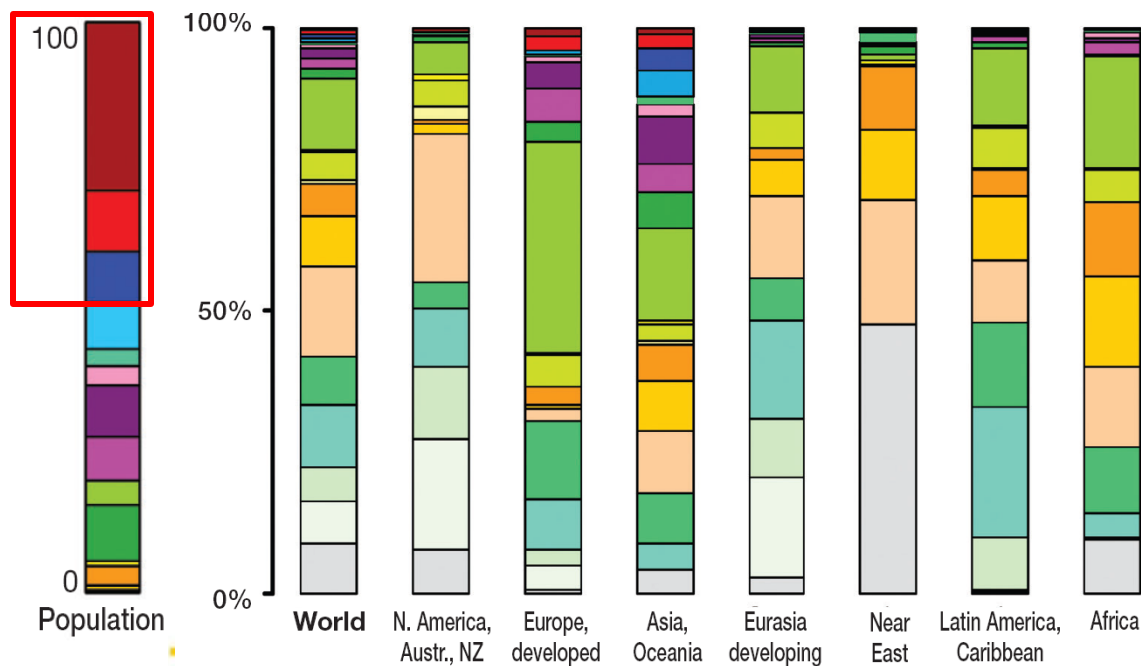
- Urban
- Dense settlements
- Rice villages
- Irrigated villages
- Cropped and pastoral villages
- Pastoral villages
- Rainfed villages
- Rainfed mosaic villages
- Residential irrigated cropland
- Residential rainfed mosaic
- Populated irrigated cropland
- Populated rainfed cropland
- Remote croplands
- Residential rangelands
- Populated rangelands
- Remote rangelands
- Populated forests
- Remote forests
- Wild forests
- Sparse trees
- Barren



Proporções do planeta ocupado por diferentes classes

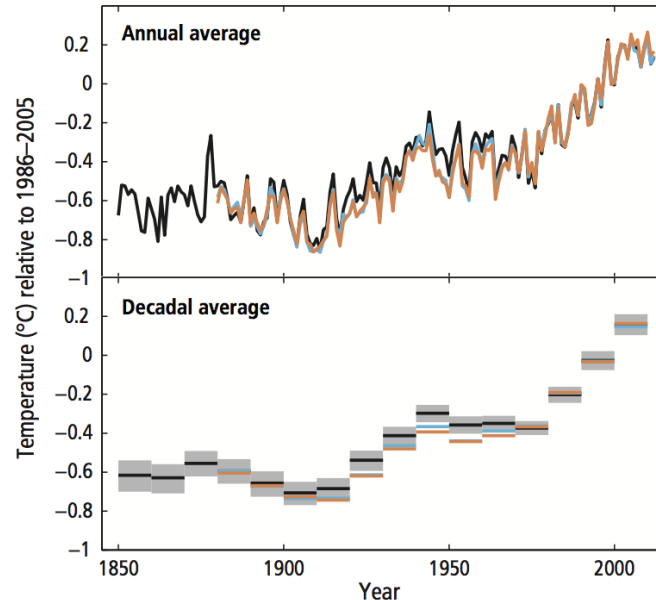


- Urban
- Dense settlements
- Rice villages
- Irrigated villages
- Cropped and pastoral villages
- Pastoral villages
- Rainfed villages
- Rainfed mosaic villages
- Residential irrigated cropland
- Residential rainfed mosaic
- Populated irrigated cropland
- Populated rainfed cropland
- Remote croplands
- Residential rangelands
- Populated rangelands
- Remote rangelands
- Populated forests
- Remote forests
- Wild forests
- Sparse trees
- Barren

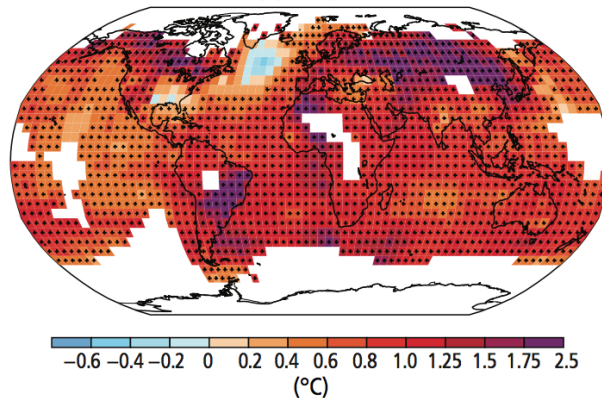


Indicadores

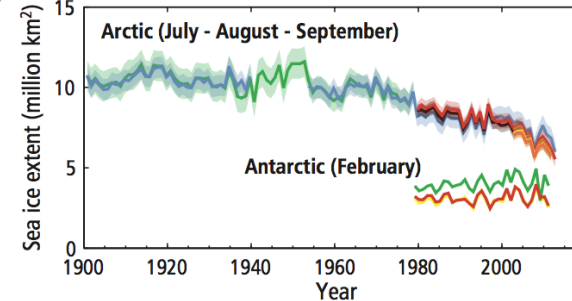
(a) Observed globally averaged combined land and ocean surface temperature anomaly 1850–2012



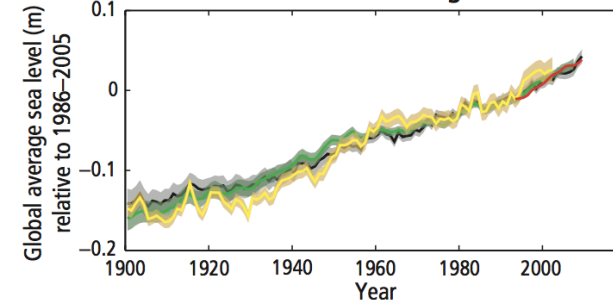
(b) Observed change in surface temperature 1901–2012



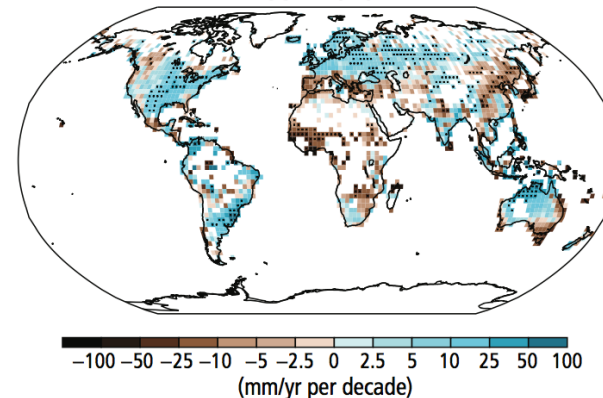
(c) Sea ice extent



(d) Global mean sea level change 1900–2010

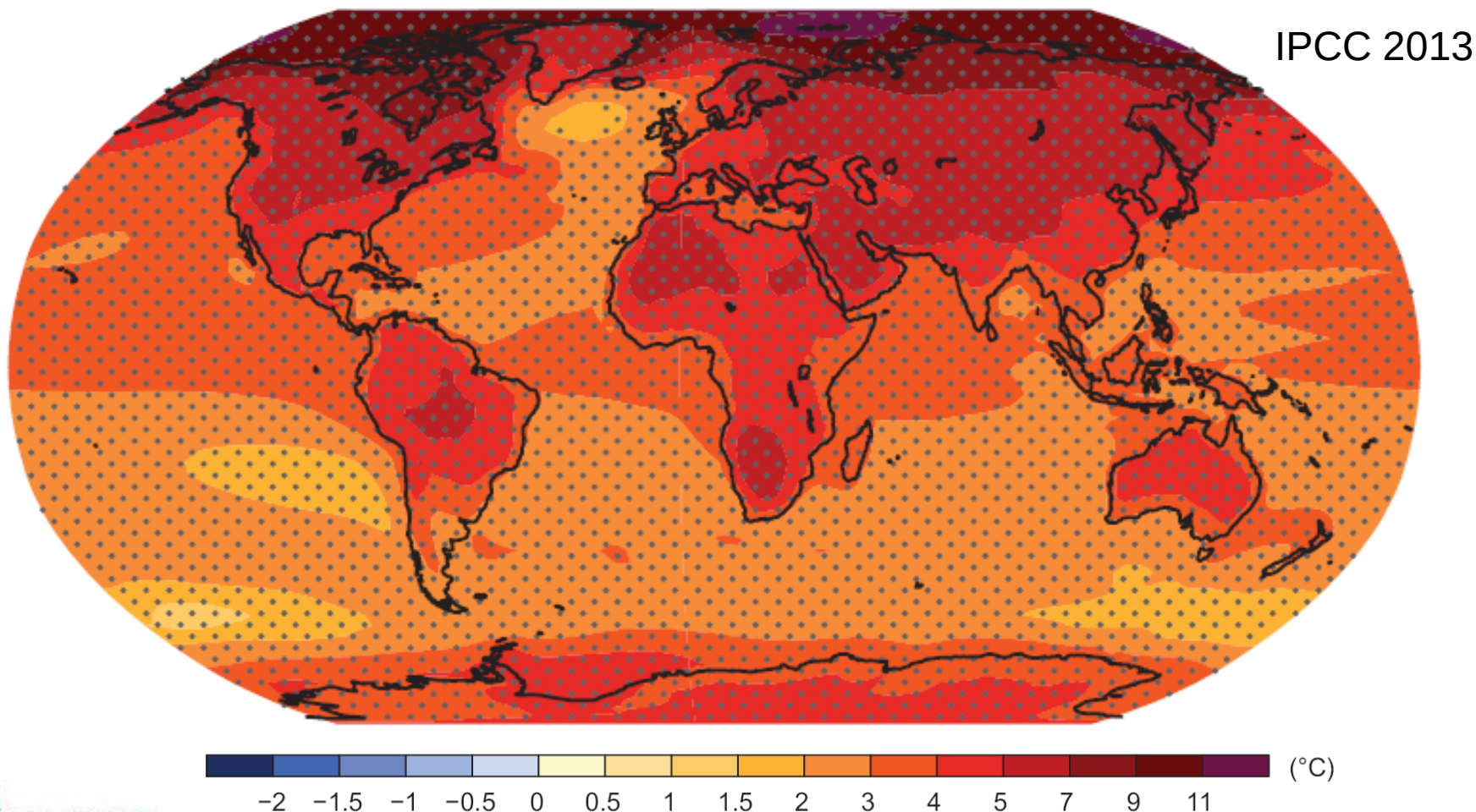


(e) Observed change in annual precipitation over land 1951–2010



Previsões de mudanças climáticas

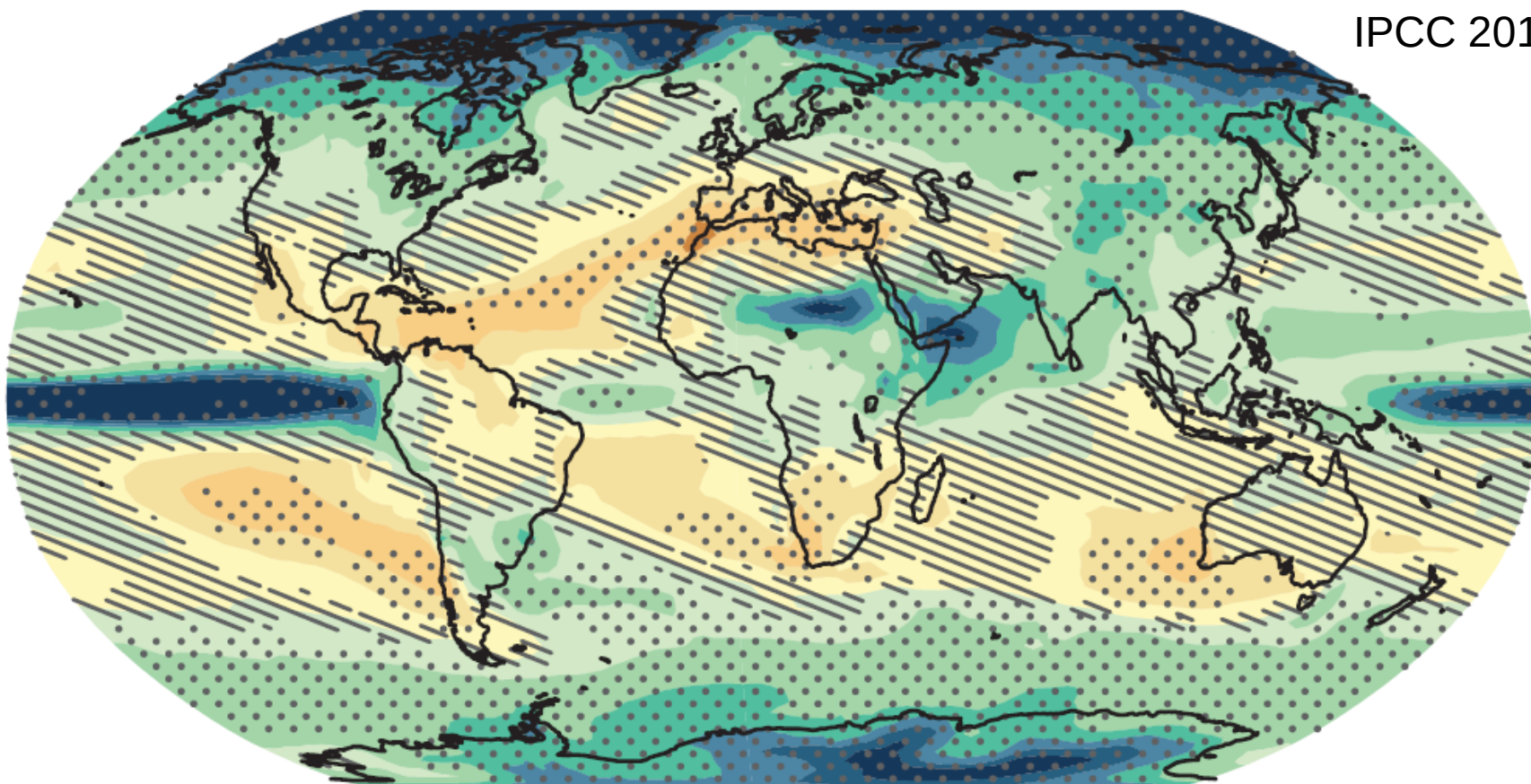
Mudança na temperatura média até 2100 (RCP 8.5)



Previsões de mudanças climáticas

Mudança na precipitação média até 2100 (RCP 8.5)

IPCC 2013



Previsões de mudanças climáticas

38 espécies arbóreas (Colombo & Joly 2010 – Braz. J. Biol.)

- Riqueza de espécies +

32 spp – redução de área
2 spp – redução >50%

38 spp – redução de área
19 spp – redução >50%

Atual

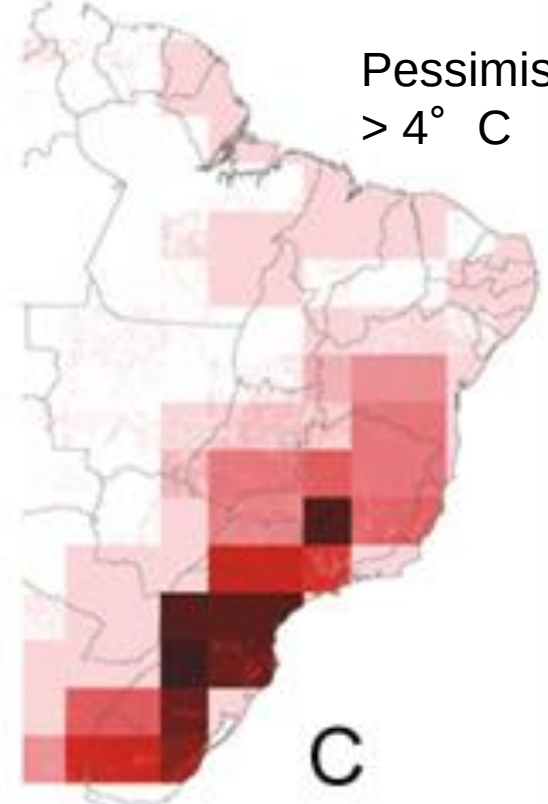
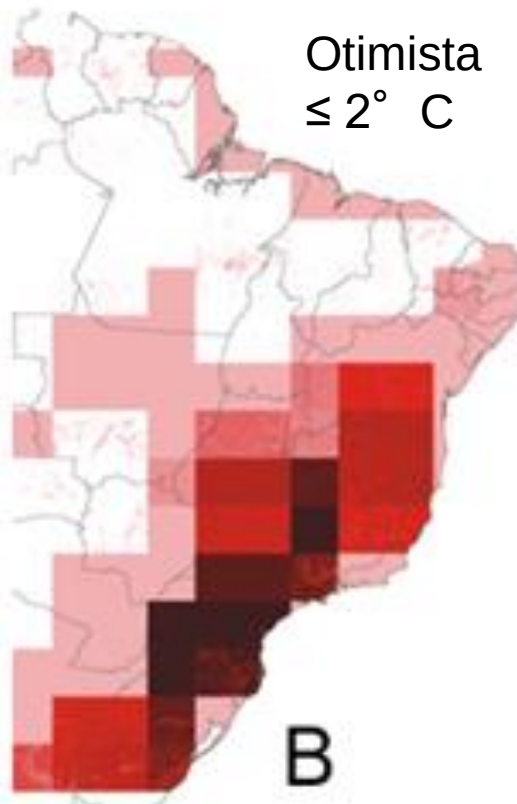
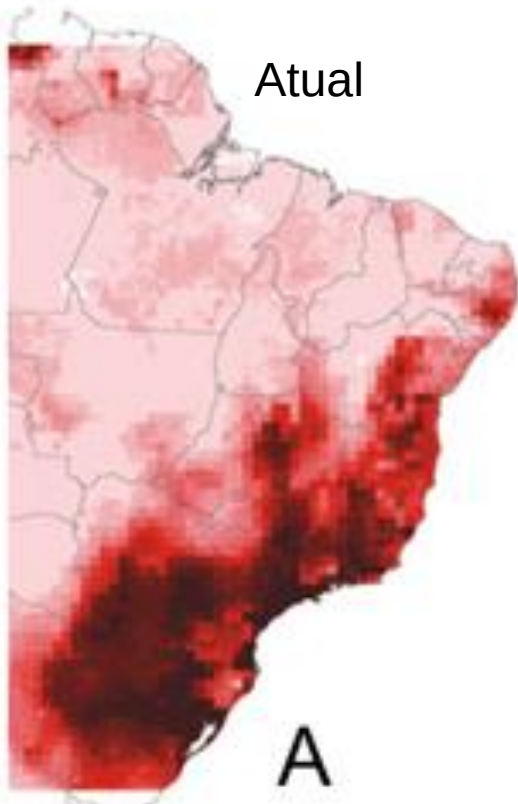
Otimista
 $\leq 2^{\circ} \text{ C}$

Pessimista
 $> 4^{\circ} \text{ C}$

A

B

C



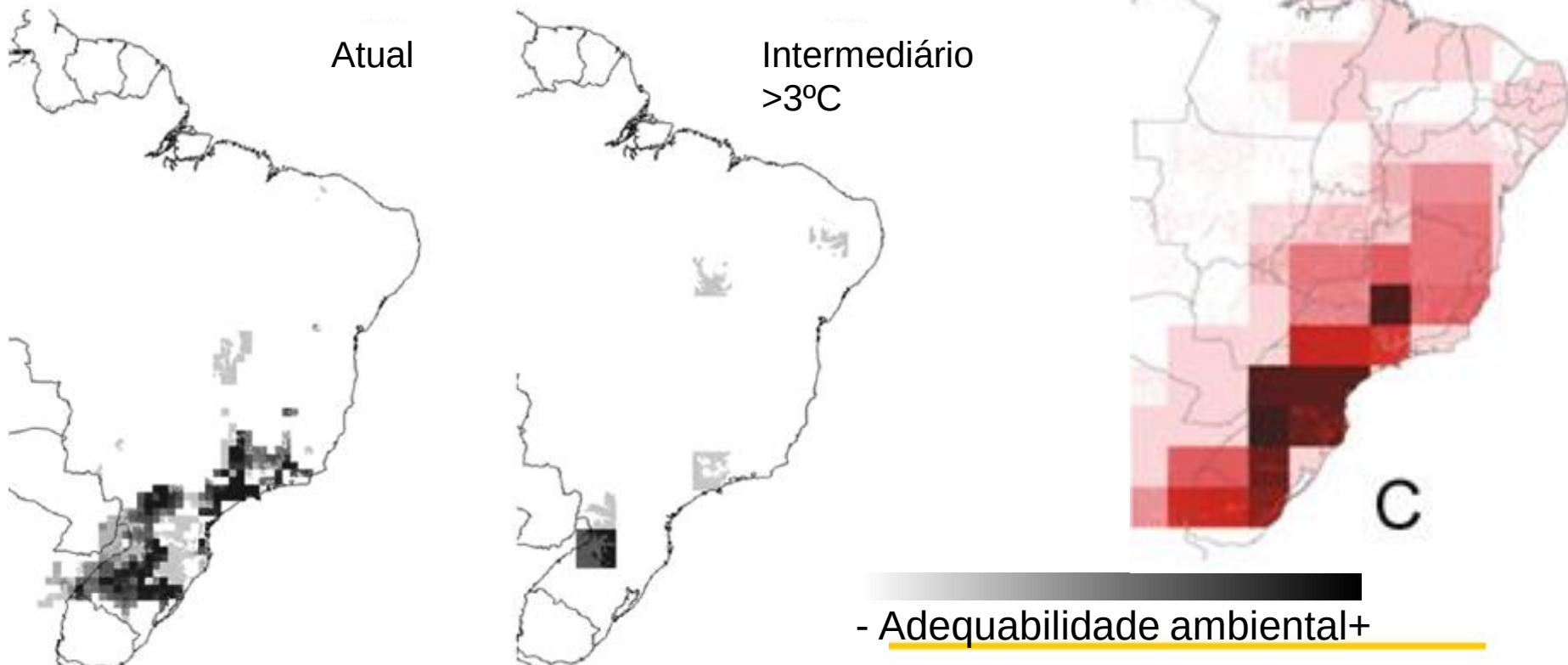
Previsões de mudanças climáticas

Vochysia magnifica

(Colombo & Joly 2010 – Braz. J. Biol.)

Redução da distribuição: até 72,8%

Tendência de deslocamento para as regiões Sul e Sudeste



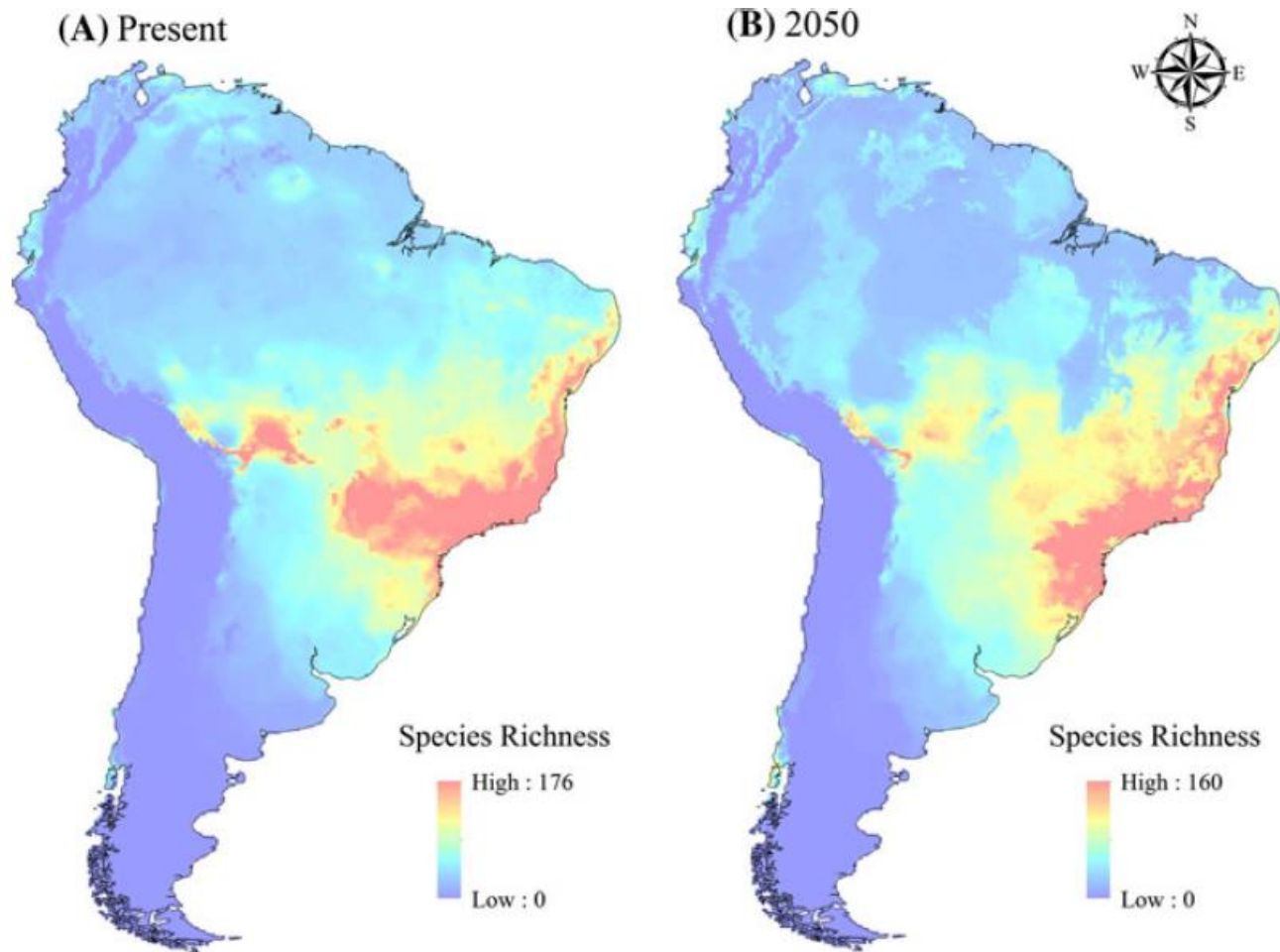
Previsões de mudanças climáticas

430 spp

(Lemes et al. 2014 – Biodivers. Conserv)

Redução da riqueza de spp mesmo nas áreas central e sudeste

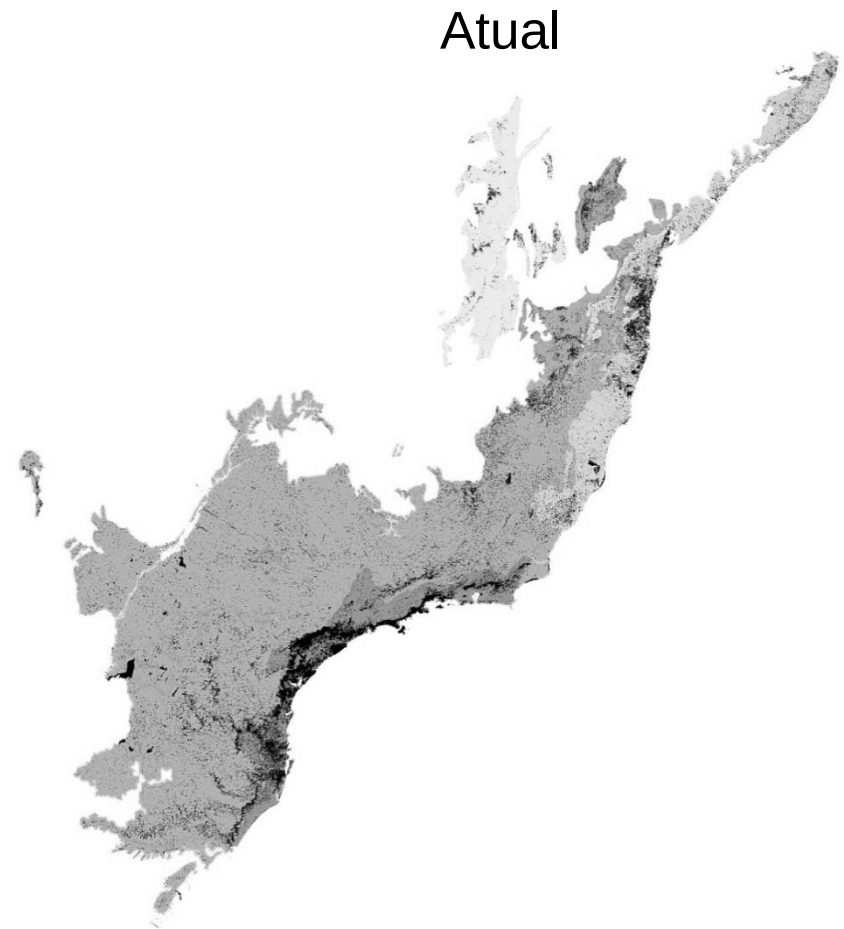
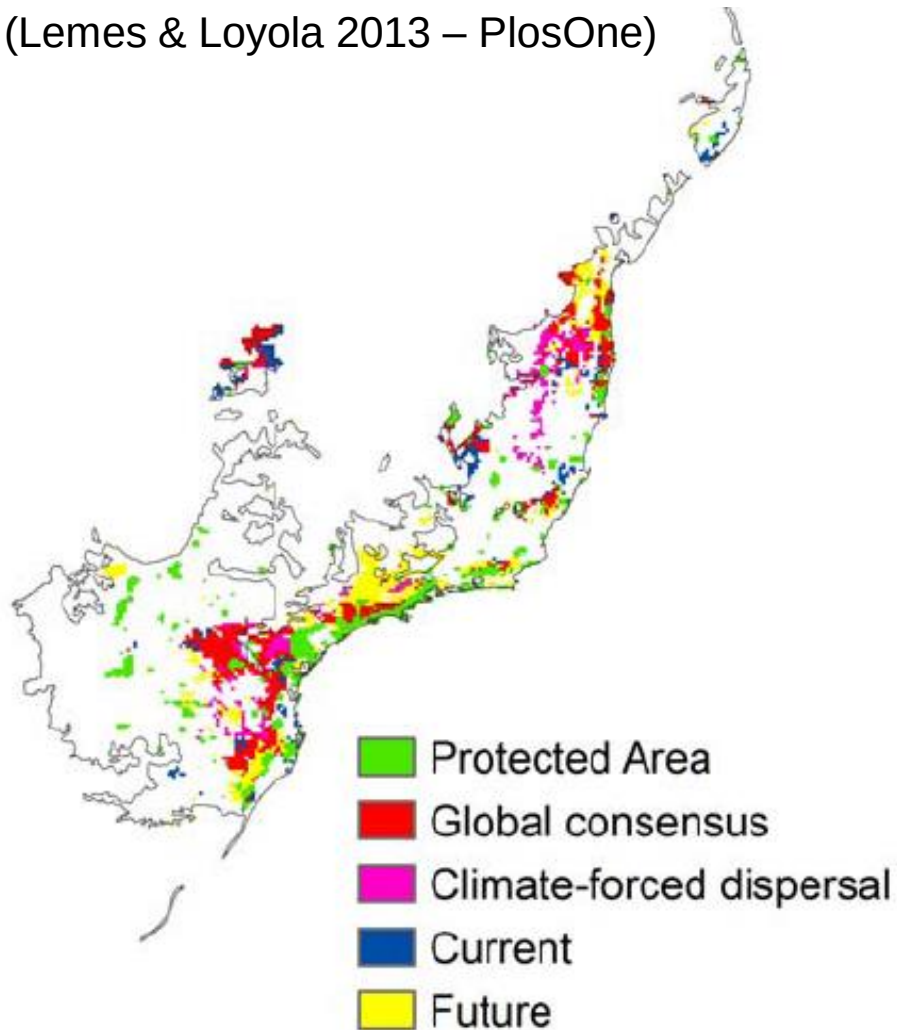
Perda de grande número de spp nas regiões norte e sul



Previsões de mudanças climáticas

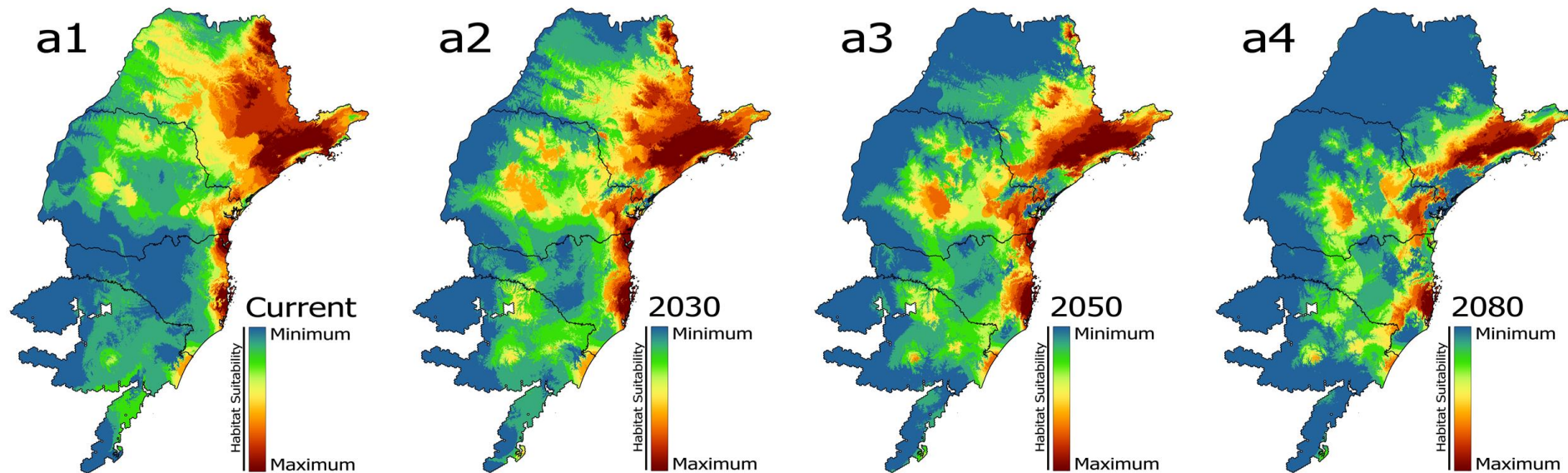
Deslocamento nas áreas de distribuição

(Lemes & Loyola 2013 – PlosOne)



Previsões de mudanças climáticas

- Redução e deslocamento da área de distribuição de *Melipona quadrifasciata*
- Importante polinizador de culturas agrícolas (maracujá)



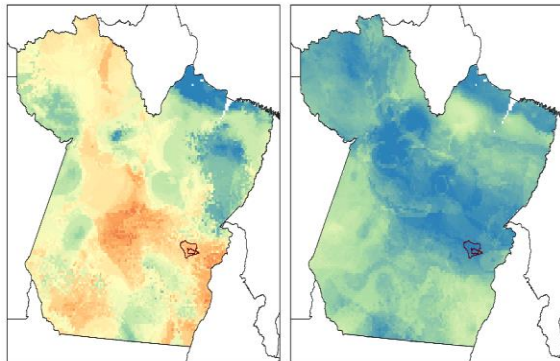
Resultados



• FLORA – SÍNDROMES DE POLINIZAÇÃO

Atual

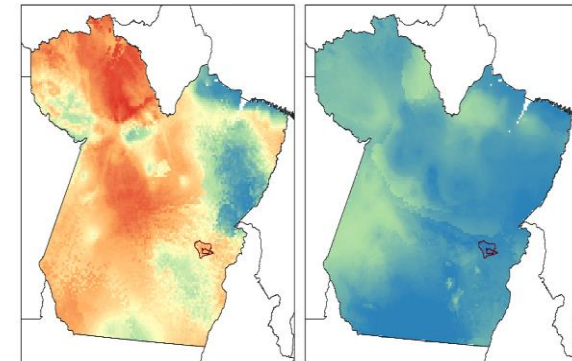
2050 RCP 8.5



Polinizadas por morcegos

Atual

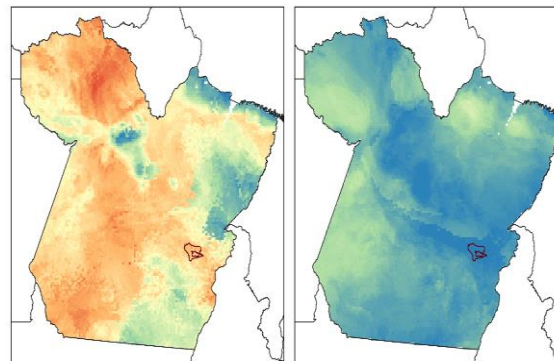
2050 RCP 8.5



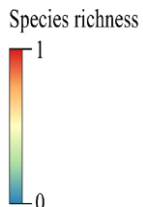
Polinizadas por abelhas

Atual

2050 RCP 8.5



Polinizadas por aves



Previsões de mudanças climáticas

Mudanças climáticas globais: projeção para o Brasil

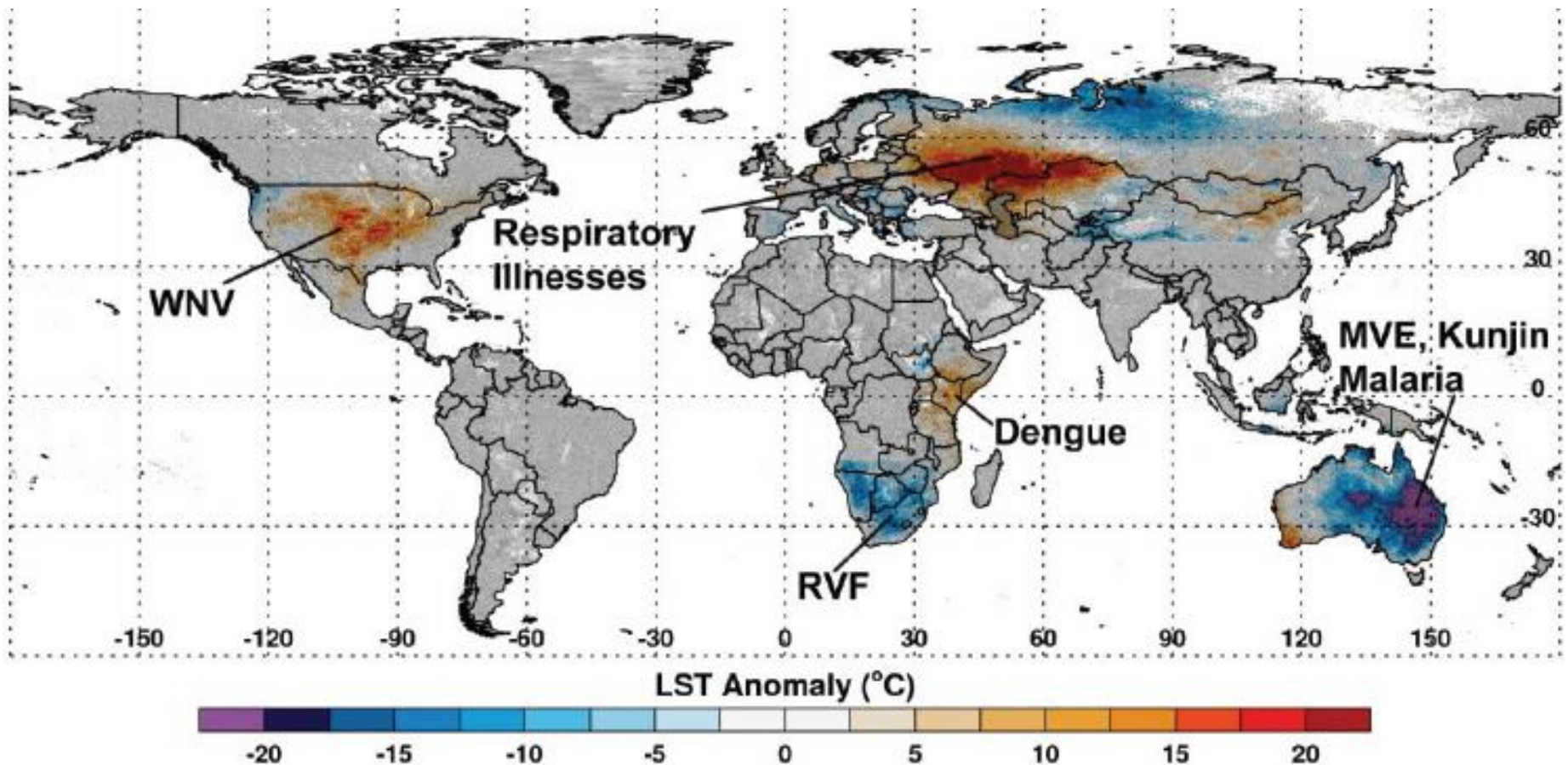
Aumento dos eventos extremos



J. A. Marengo

Previsões de mudanças climáticas

Mudanças climáticas e surtos de doenças



<https://www.nap.edu/read/21792/chapter/9>

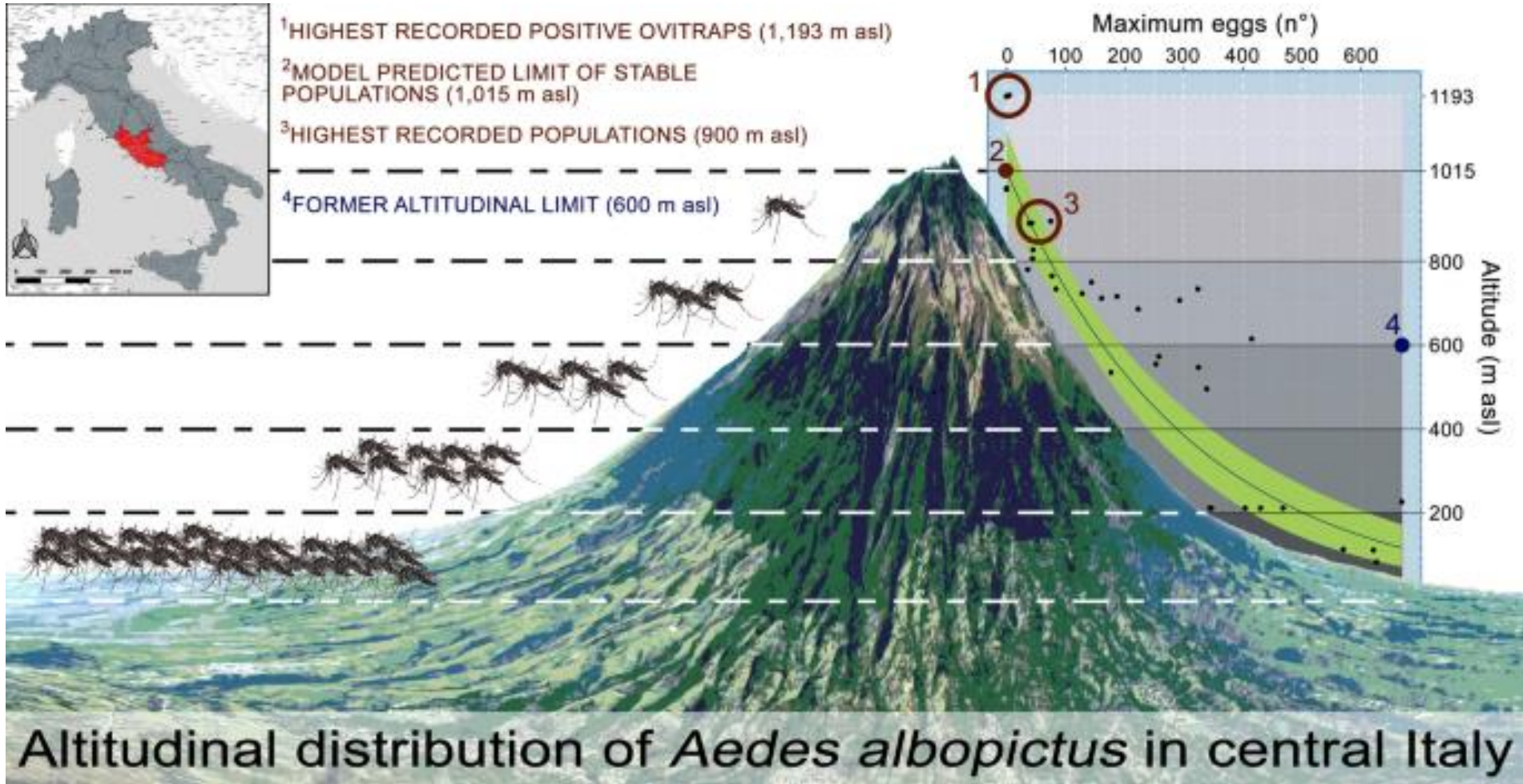
RVF- Rift valley fever

MVE- Murray Valley encephalitis

WNV- West Nile virus

Previsões de mudanças climáticas

Mudanças climáticas e surtos de doenças



Previsões de mudanças climáticas

Mudanças climáticas e risco de transmissão de doenças

Prist et al. 2017 – Climate change and sugarcane expansion increase Hantavirus infection risk. *Plos Neglected Tropical Diseases*

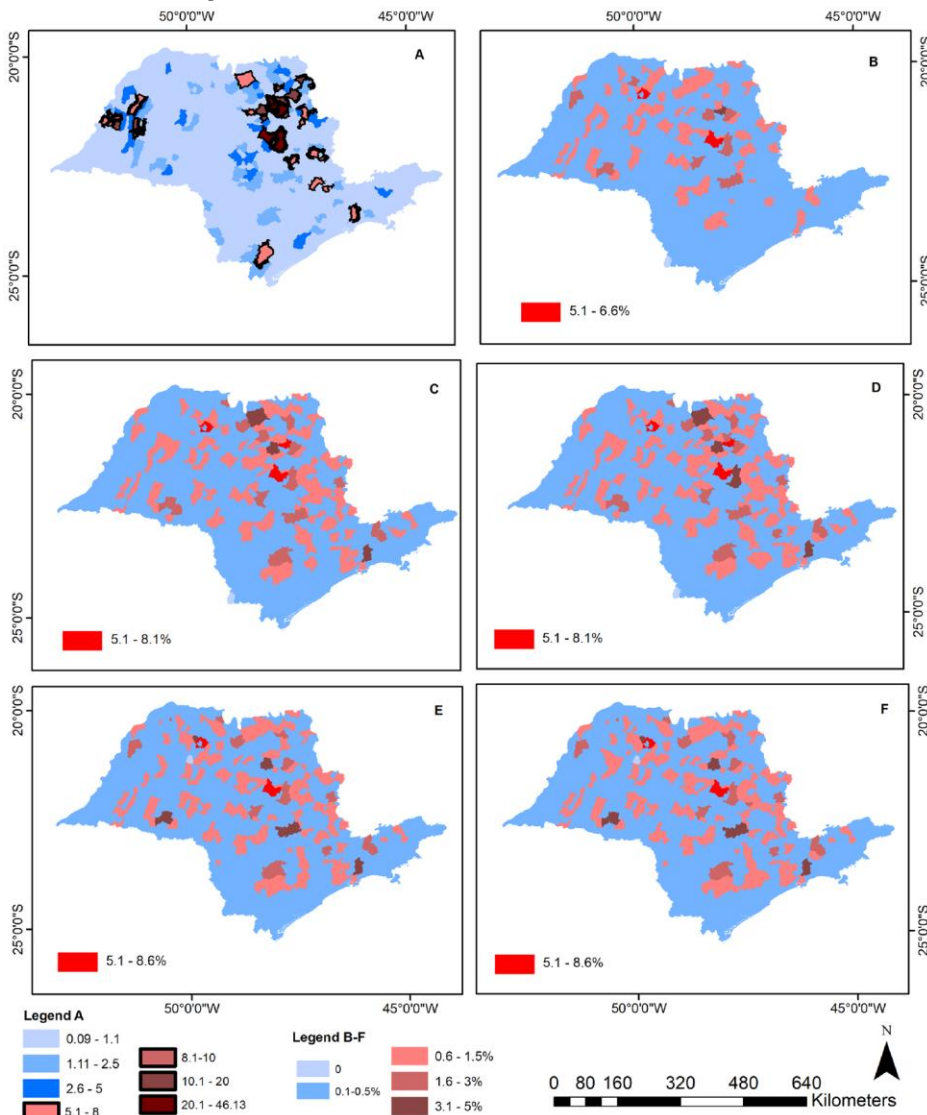


Fig 3. HPS risk maps. Current condition (baseline, A) and probability change in Hantavirus infection risk according to five scenarios: only sugarcane expansion (B), 2040–2050 temperature anomalies from the RCP4.5 (C) and RCP8.5 scenarios (D), combined effect of sugarcane expansion with RCP4.5 (E) and RCP8.5 (F) scenarios. Legend inside each map represents the change in the maximum risk for each scenario. Legend A is associated with map A and legends B-F with maps B to F.

Recapitulando

Nós fazemos parte, influenciemos e dependemos da dinâmica dos ecossistemas que são altamente influenciados pelo clima

As espécies presentes nos diferentes biomas foram selecionadas ao longo de milênios e apresentam adaptações às condições ambientais locais

As mudanças climáticas representam ameaças à manutenção das espécies e dos processos ecológicos responsáveis pela manutenção das comunidades biológicas

Estas mudanças podem levar a perda de espécies, alteração na disponibilidade de recursos naturais (água, alimento, matéria-prima...) e ao deslocamento e surgimento de novas doenças



Divisão da apresentação dos artigos

Gabriel Olivieri - The Atlantic Forest of South America: Spatiotemporal dynamics of the vegetation and implications for conservation

Juliana Fernandes Victorino de França - Defaunation in the Anthropocene

João Pereira do Carmo Filho - Investigated the role of community based approaches for biodiversity conservation and socio-economic development in Bale Mountains National Park, Southeast Ethiopi

Cristiane Alejo de Freitas Maximiano - The Impacts of Ocean Acidification on Marine Ecosystems and Reliant Human Communities

Matheus Barbosa Herbst de Oliveira - Ecological impacts of freshwater algal blooms on water quality, plankton biodiversity, structure, and ecosystem functioning

Obrigado

