LEZIONI DAL PASSATO per un futuro climatico sostenibile

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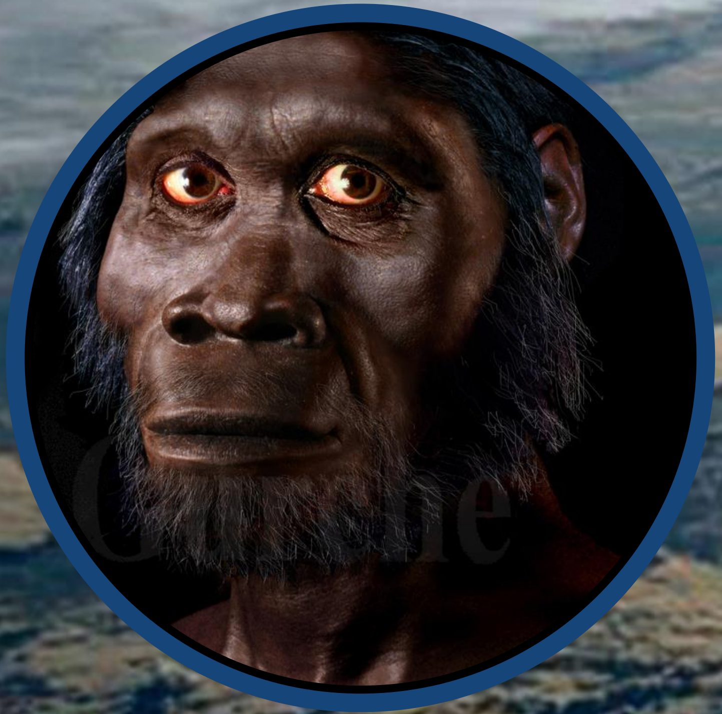
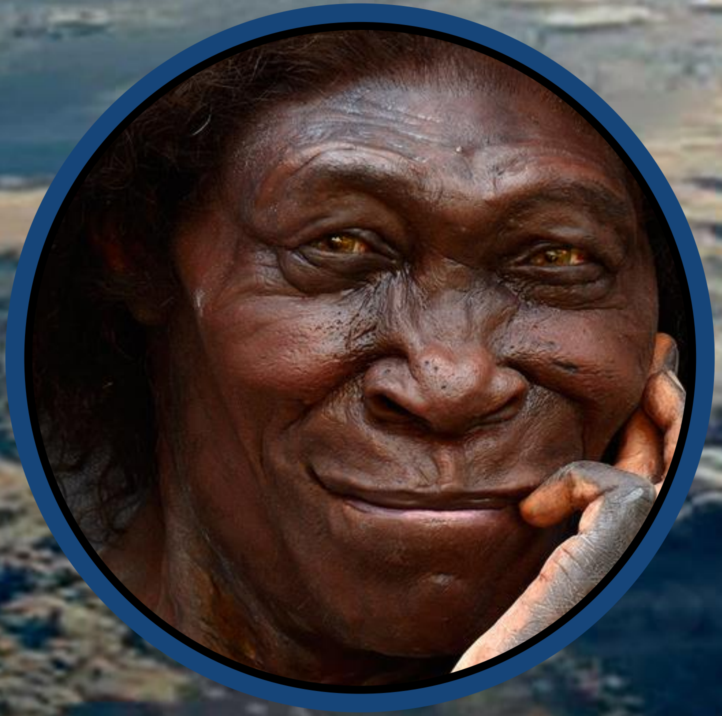
Chi erano i nostri antenati?

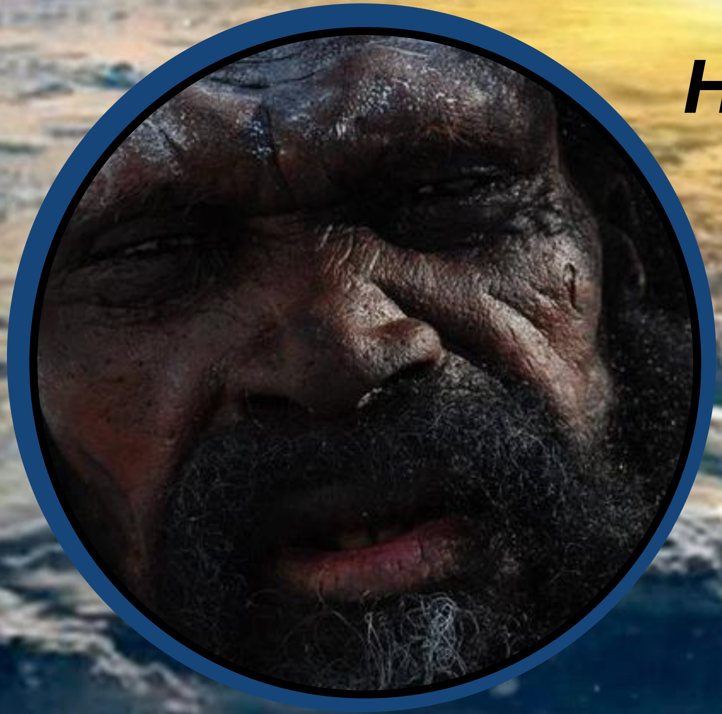
Homo habilis



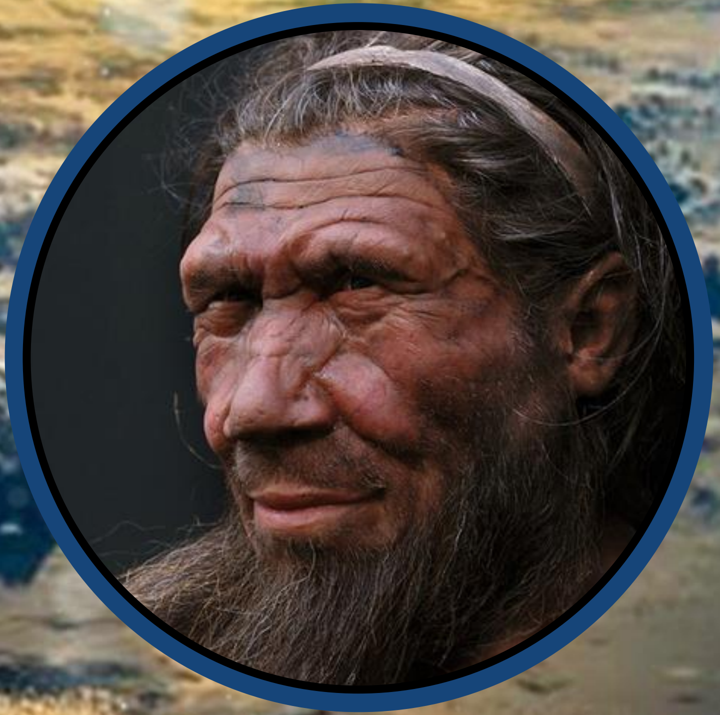
Homo erectus



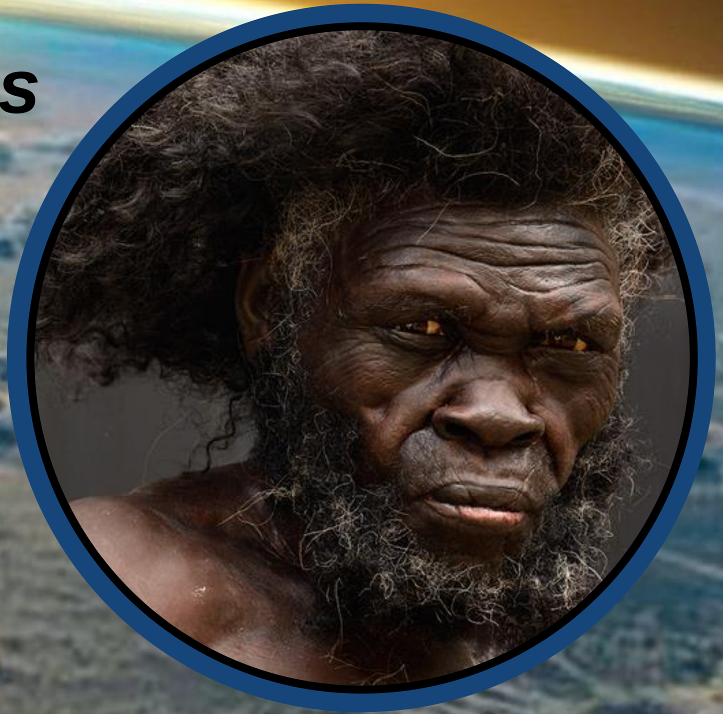
Homo heidelbergensis



Homo neanderthalensis



Homo sapiens



3 milioni di anni fa

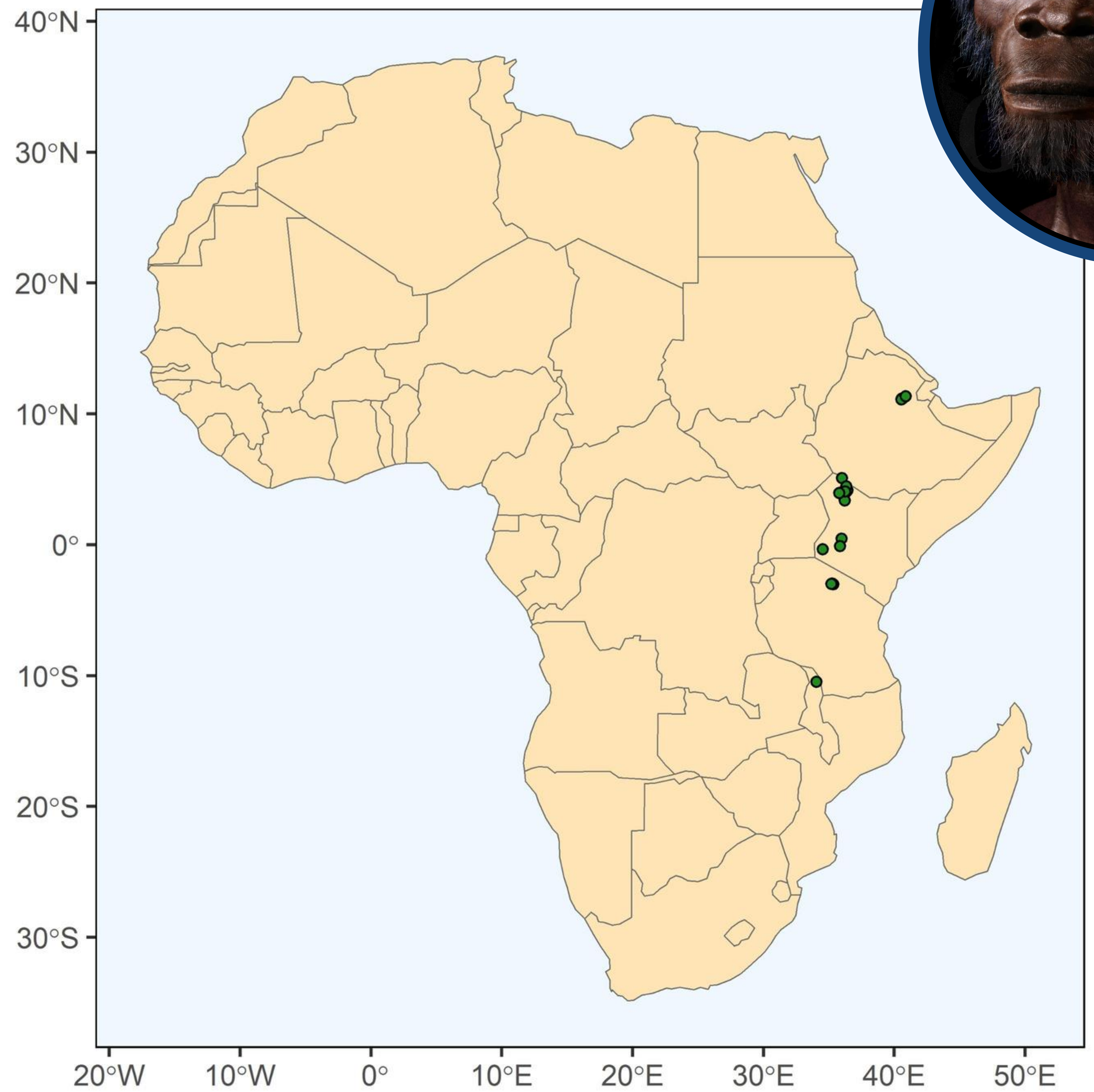
2 milioni di anni fa

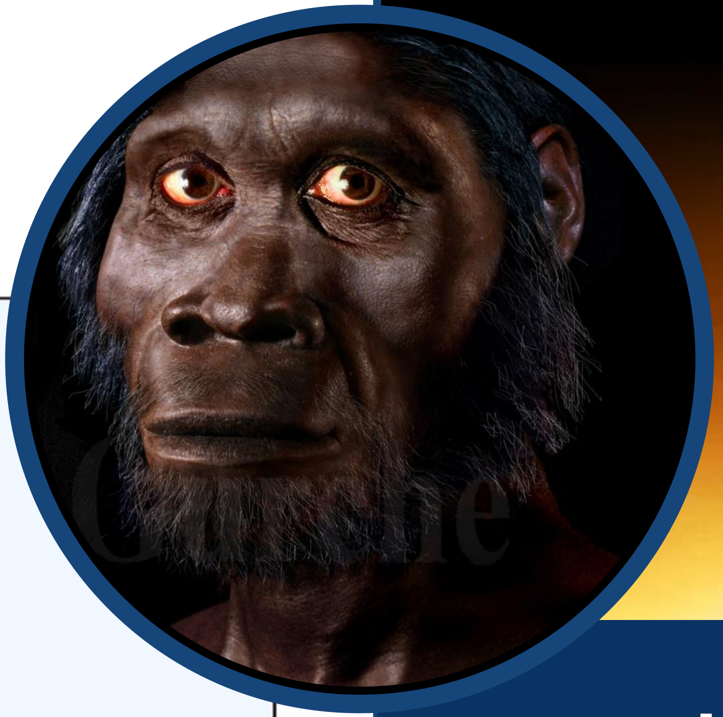
875 000 anni fa

430 000 anni fa

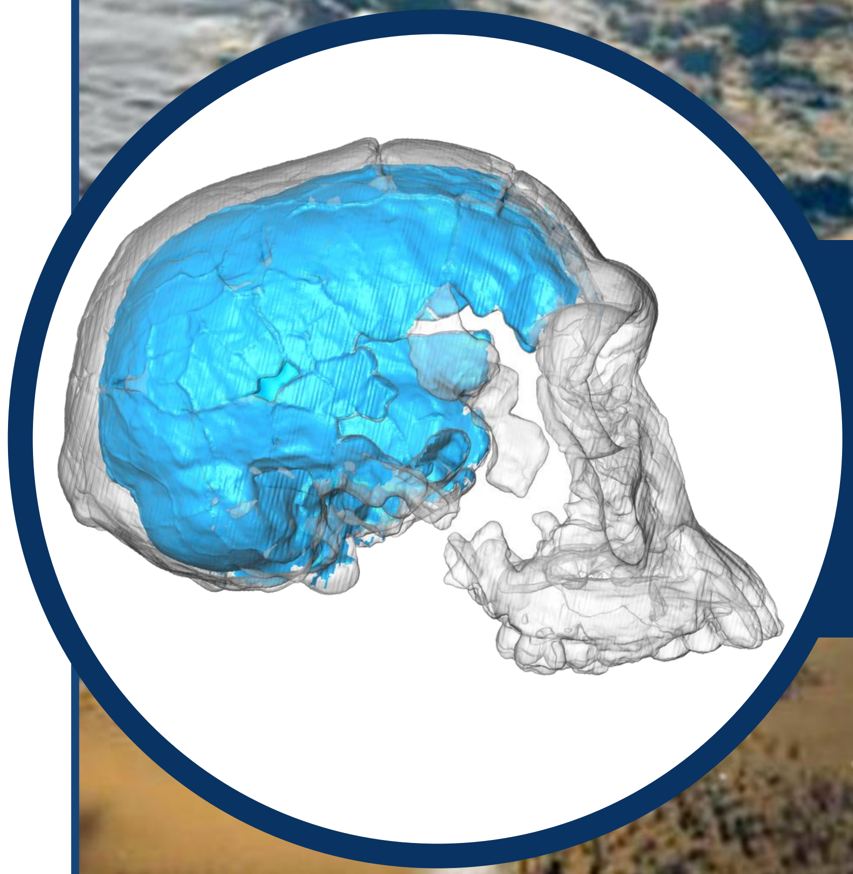
315 000 anni fa

Homo habilis (2.8 - 1.4 Ma)


40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
20°W
10°W
0°
10°E
20°E
30°E
40°E
50°E



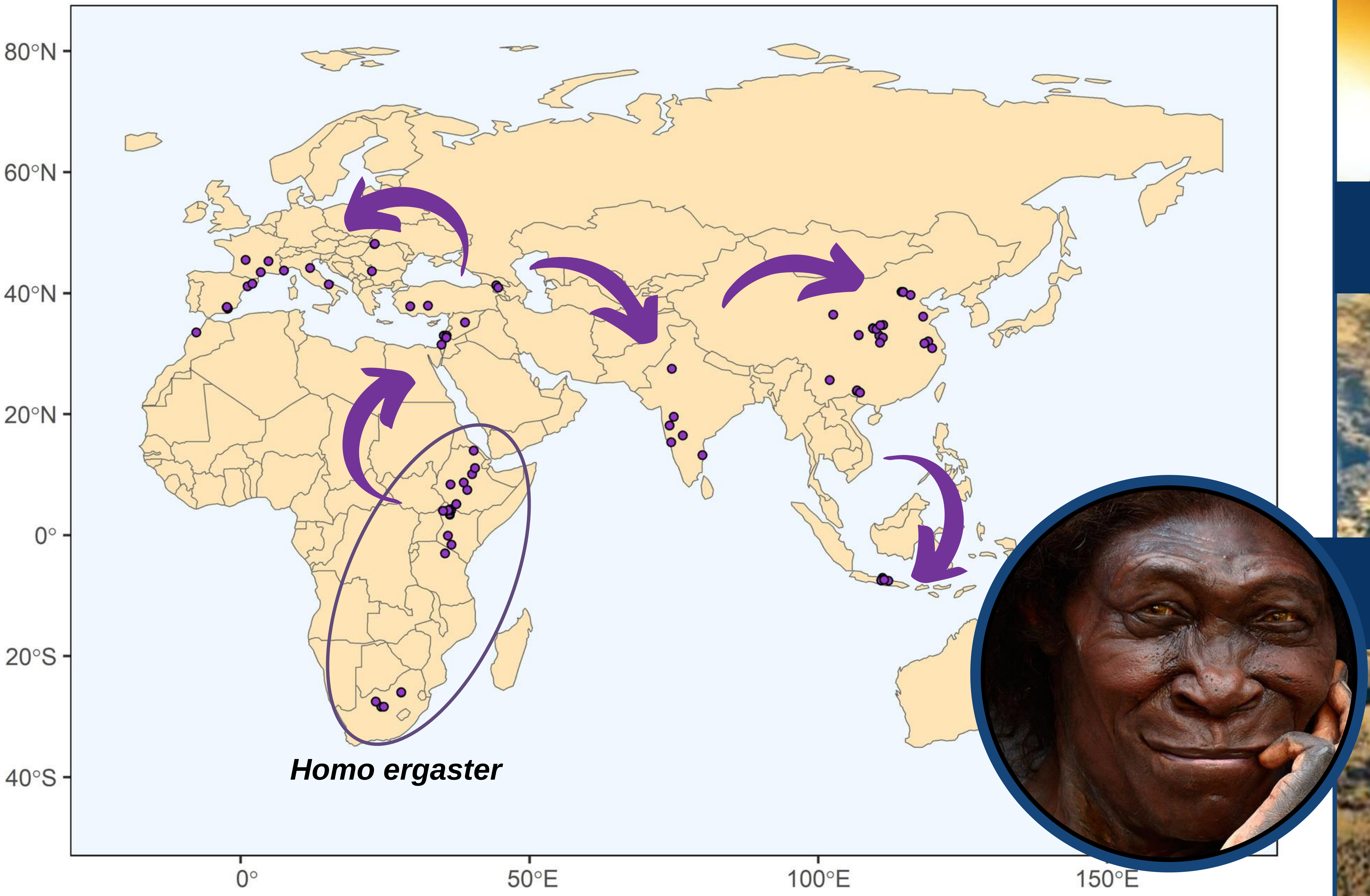
prima industria paleolitica: i chopper



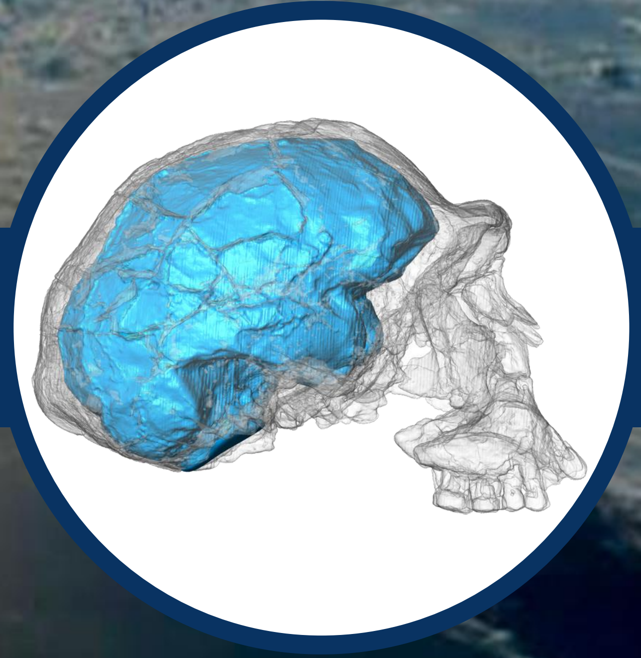
volume endocranico di 650 cc

Homo erectus (2 – 0.117 Ma)

la prima specie umana ad uscire dall'Africa e a colonizzare il Vecchio Mondo

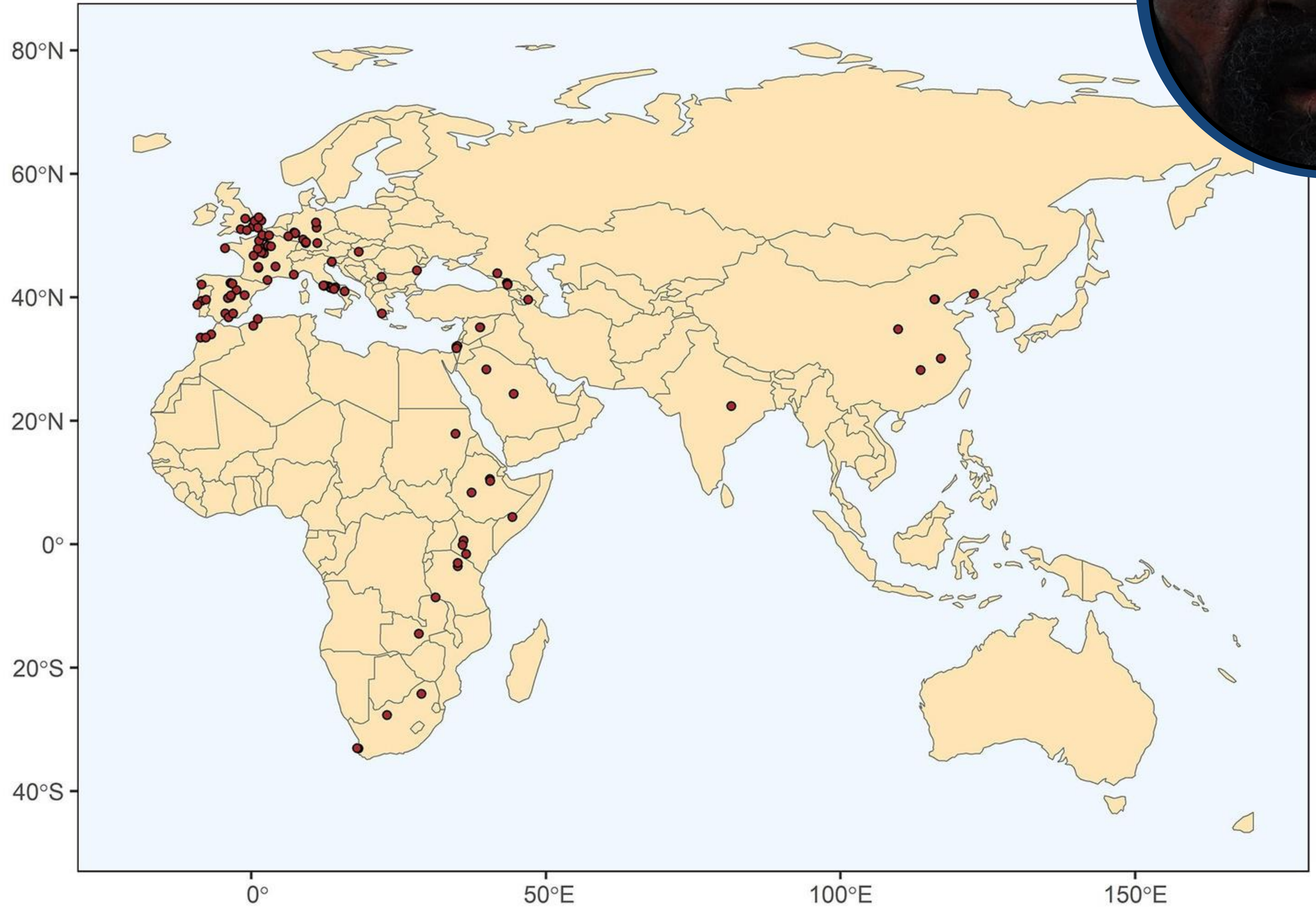

80°N
60°N
40°N
20°N
0°
20°S
40°S
0°
50°E
100°E
150°E
Homo ergaster

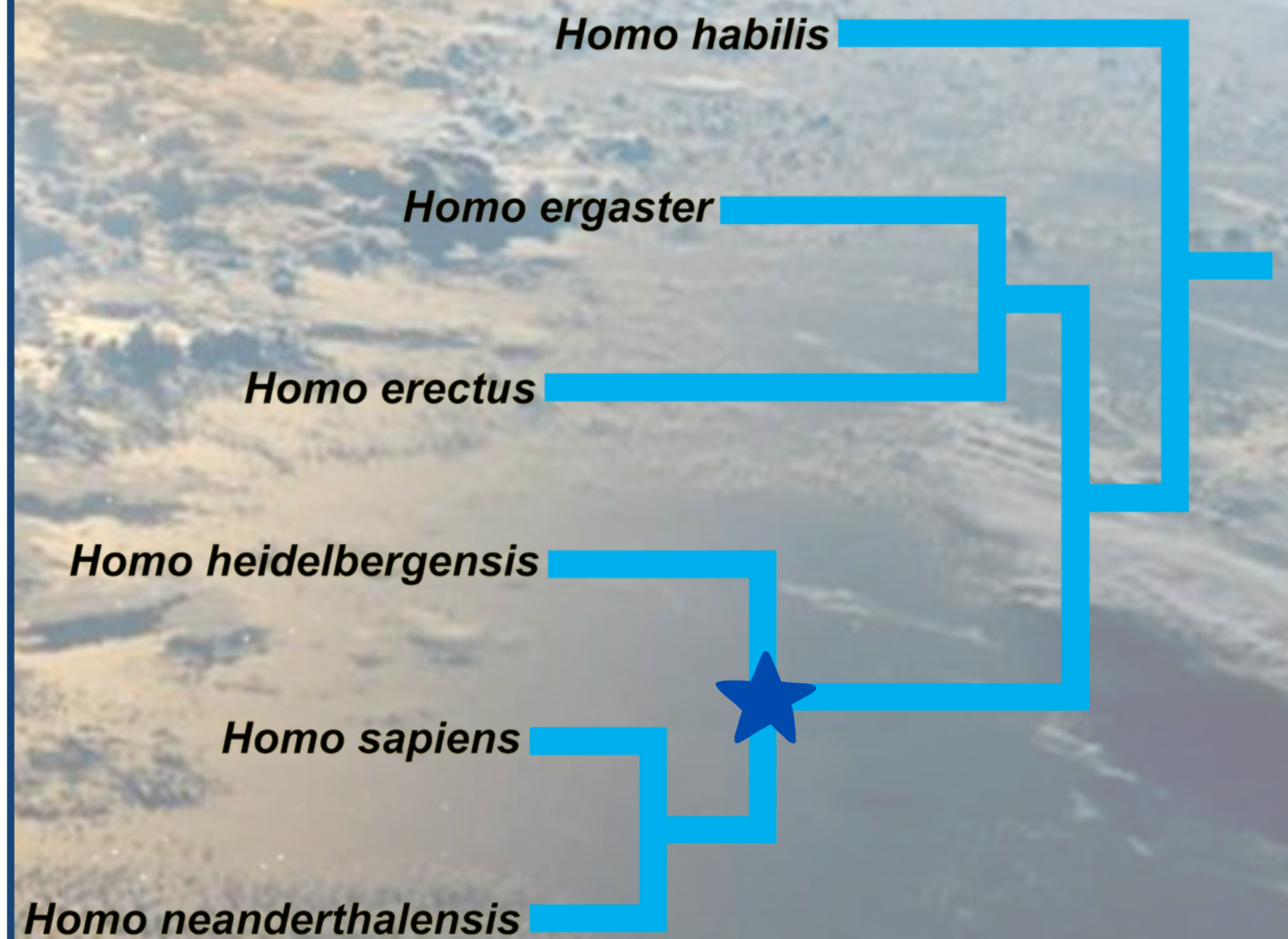
utilizzo del fuoco



850-1000 cc

Homo heidelbergensis (875 – 250 ka)


80°N
60°N
40°N
20°N
0°
20°S
40°S
0°
50°E
100°E
150°E



Homo habilis

Homo ergaster

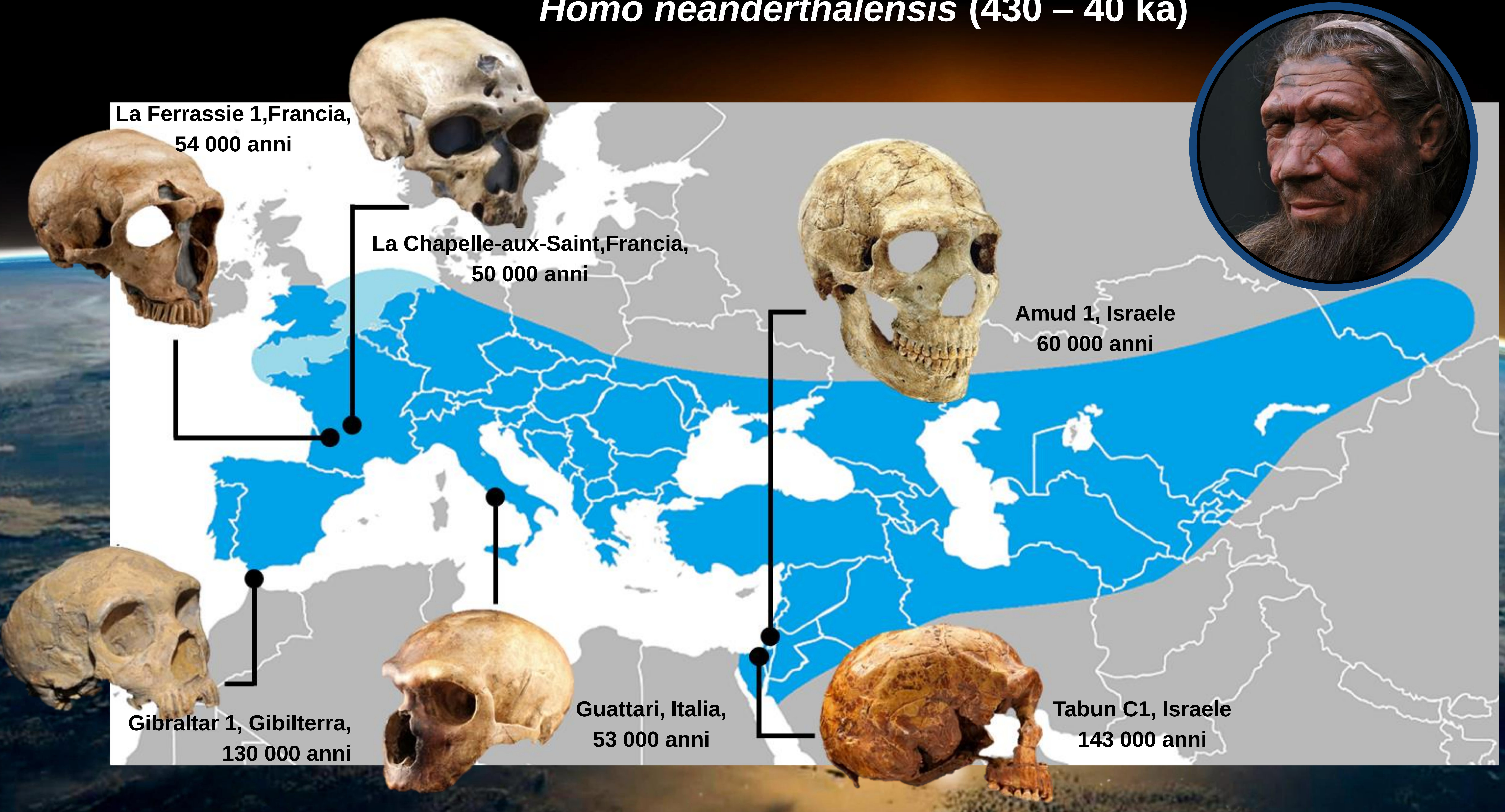
Homo erectus

Homo heidelbergensis

Homo sapiens

Homo neanderthalensis

Homo neanderthalensis (430 – 40 ka)



La Ferrassie 1,Francia,
54 000 anni

La Chapelle-aux-Saint,Francia,
50 000 anni

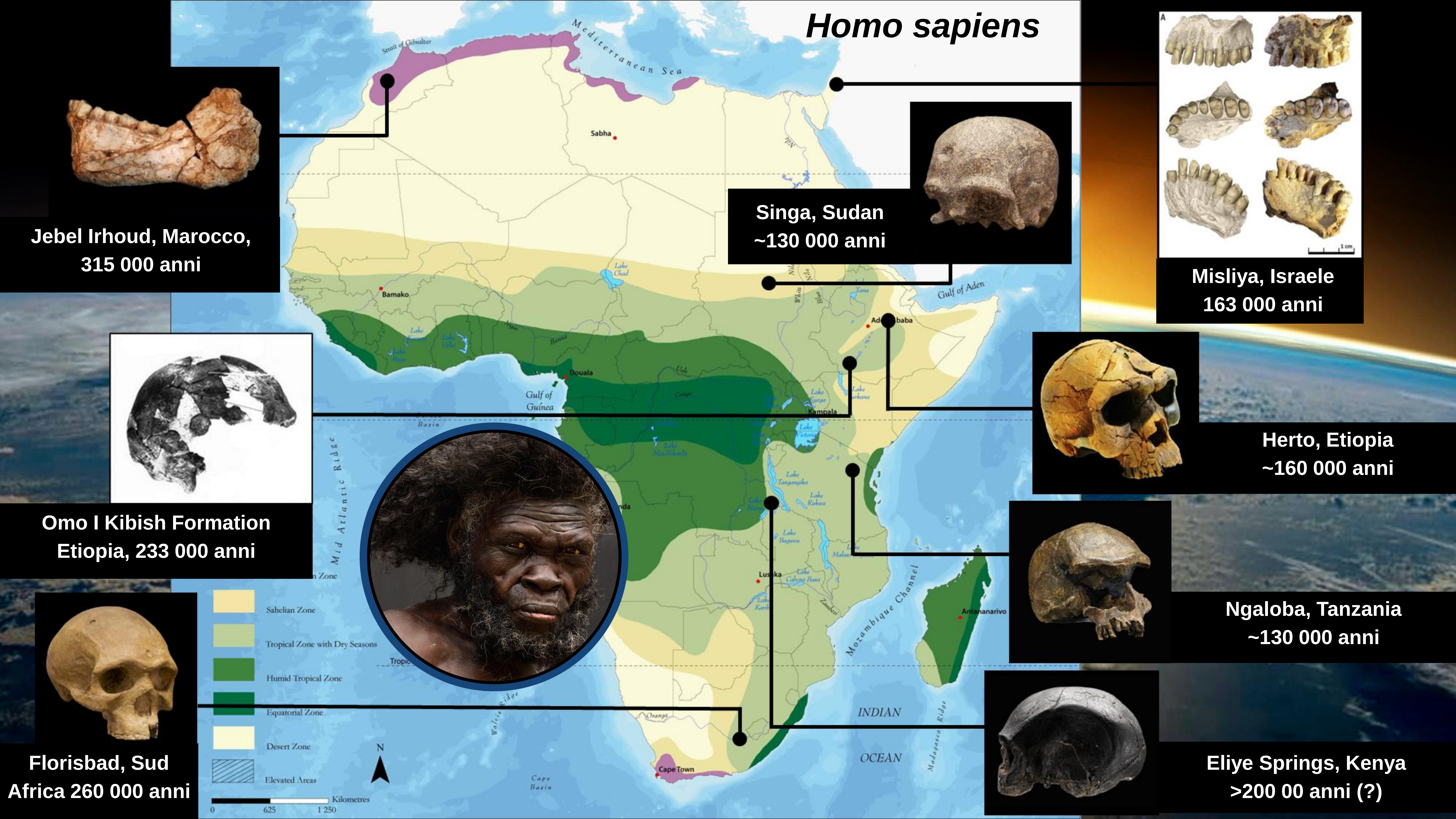
Amud 1, Israele
60 000 anni

Gibraltar 1, Gibilterra,
130 000 anni

Guattari, Italia,
53 000 anni

Tabun C1, Israele
143 000 anni

Homo sapiens



Strait of Gibraltar
Mediterranean Sea
Sabha
Nile
Bamako
Lake Chad
Gulf of Aden
Addis Ababa
Douala
Gulf of Guinea
Kampala
Lake Victoria
Lake Tanganyika
Lusaka
Mozambique Channel
Antananarivo
INDIAN OCEAN
Cape Town
Mid Atlantic Ridge
Sahelian Zone
Tropical Zone with Dry Seasons
Humid Tropical Zone
Equatorial Zone
Desert Zone
Elevated Areas
N
Kilometres
0
625
1 250
1 cm

Jebel Irhoud, Marocco, 315 000 anni

Omo I Kibish Formation Etiopia, 233 000 anni

Florisbad, Sud Africa 260 000 anni

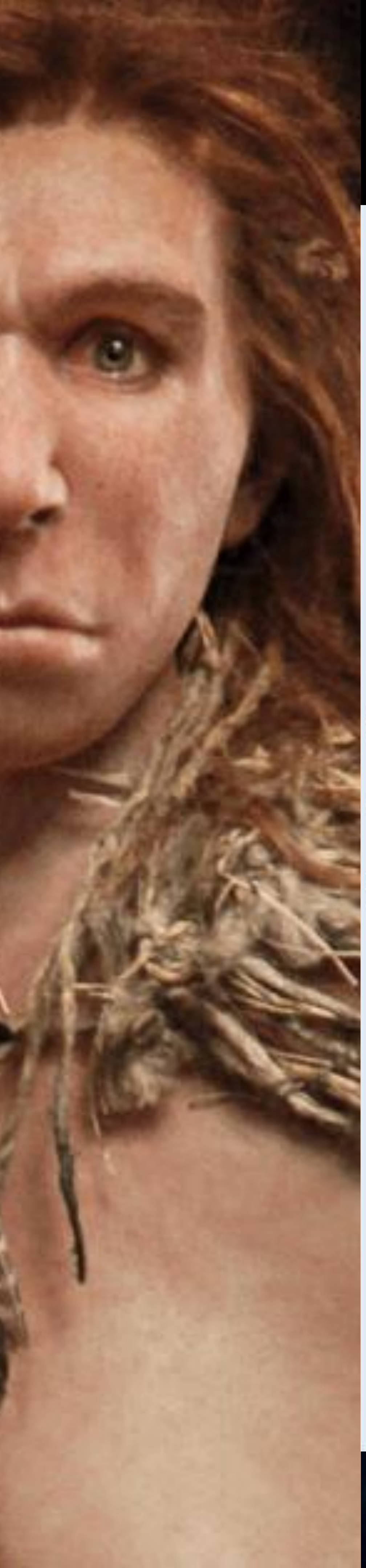
Singa, Sudan ~130 000 anni

Misliya, Israele 163 000 anni

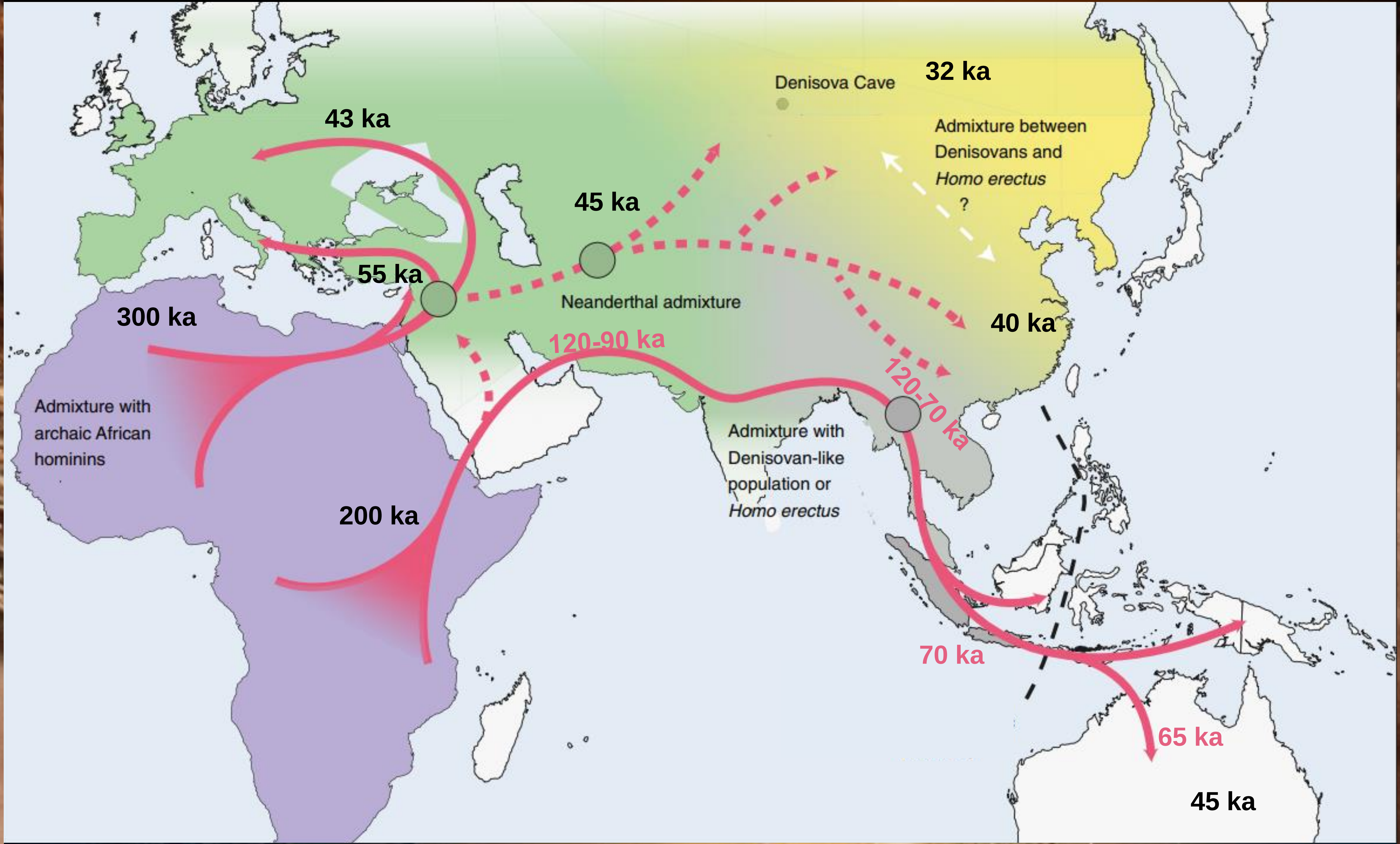
Herto, Etiopia ~160 000 anni

Ngaloba, Tanzania ~130 000 anni

Eliye Springs, Kenya >200 00 anni (?)



Flusso genico tra *Homo sapiens* e i Neandertaliani


32 ka
Denisova Cave
43 ka
Admixture between
Denisovans and
Homo erectus
?
45 ka
55 ka
Neanderthal admixture
300 ka
40 ka
120-90 ka
120-70 ka
Admixture with
archaic African
hominins
Admixture with
Denisovan-like
population or
Homo erectus
200 ka
70 ka
65 ka
45 ka

Cambiamenti astronomici

Concentrazione di CO2 in atmosfera

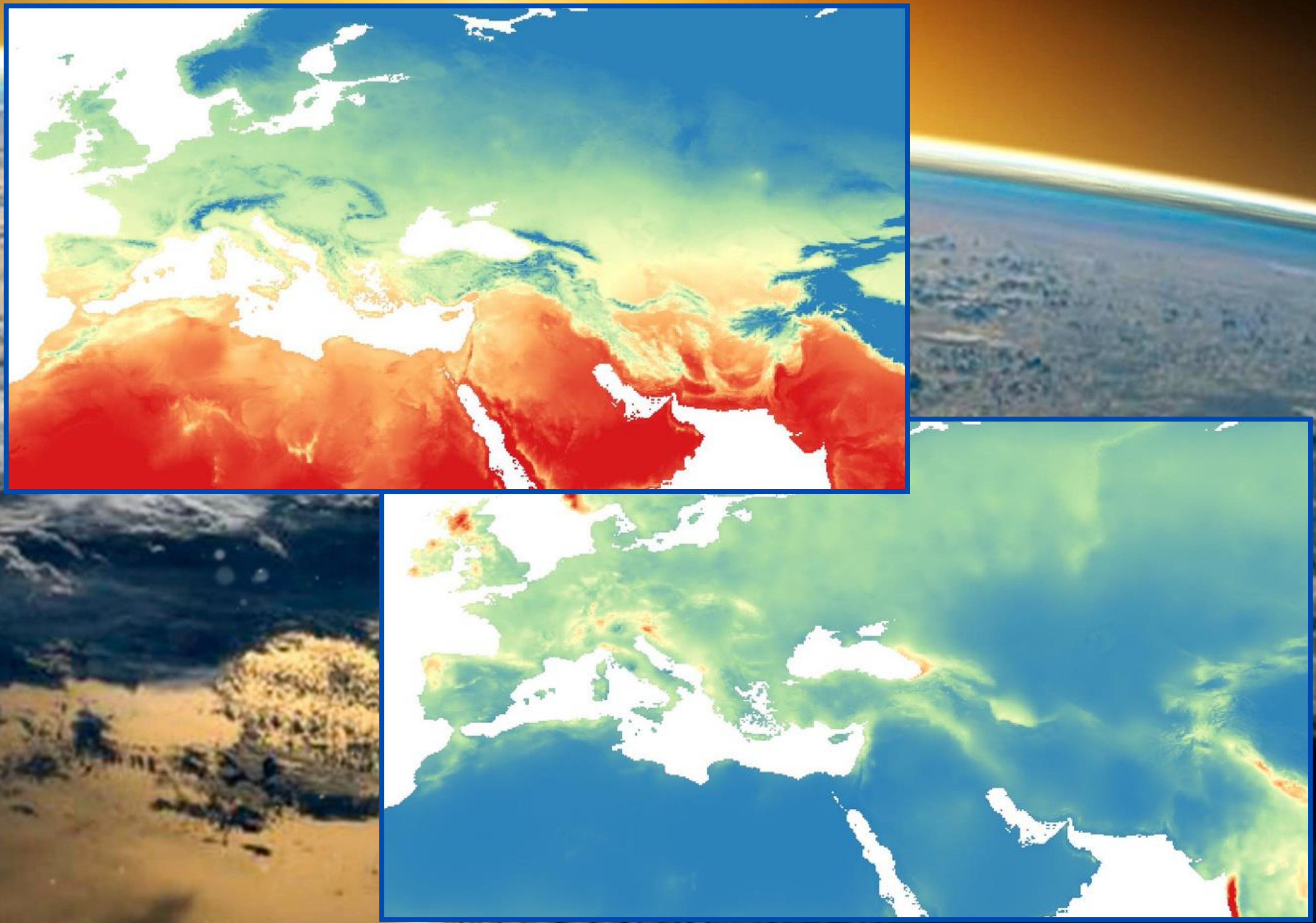
Topografia

Distribuzione e spessore delle calotte glaciali

PALEO-EMULATORI

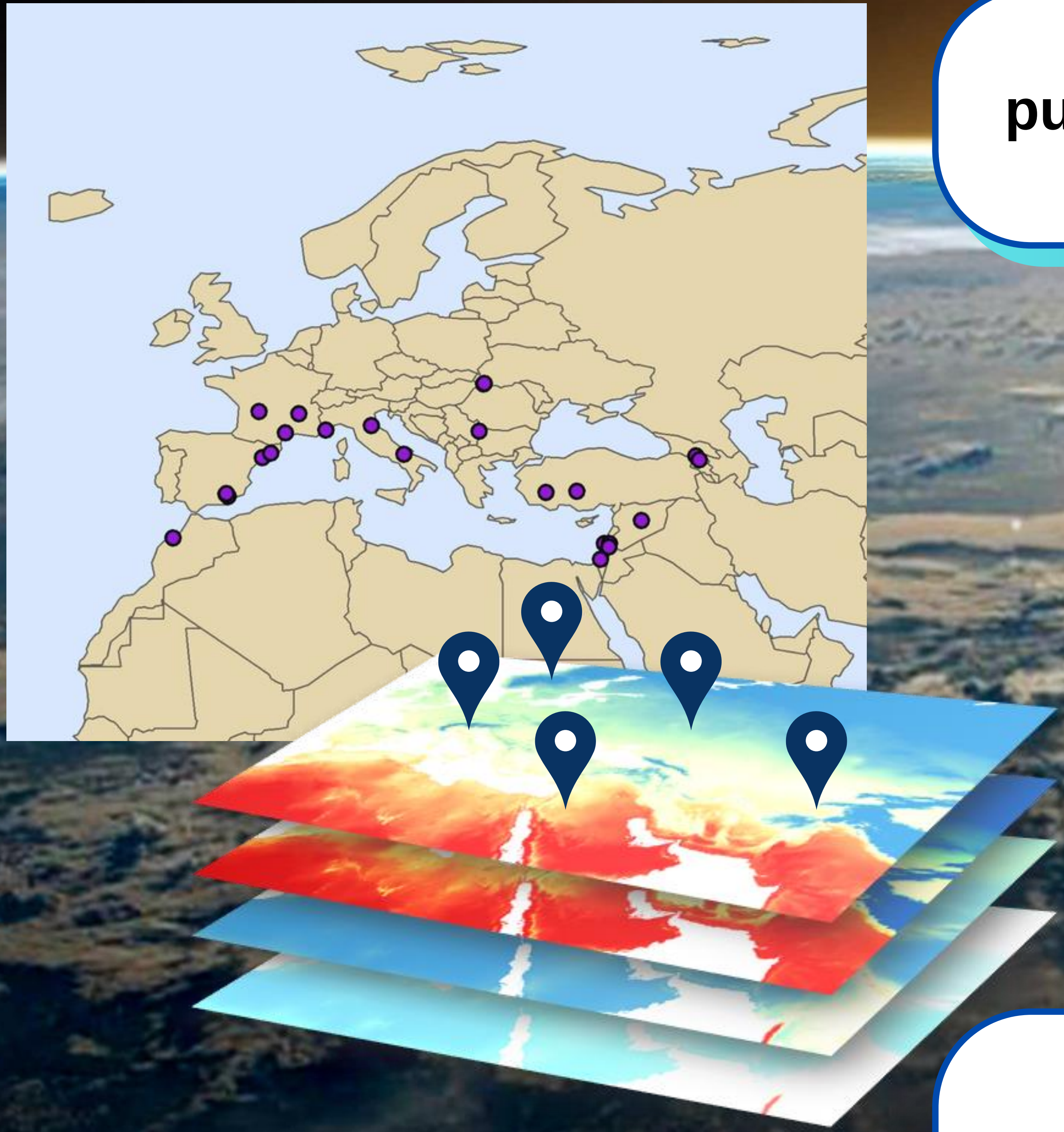
→

Ricostruzioni Paleoclimatiche



Mappe di idoneità ambientale

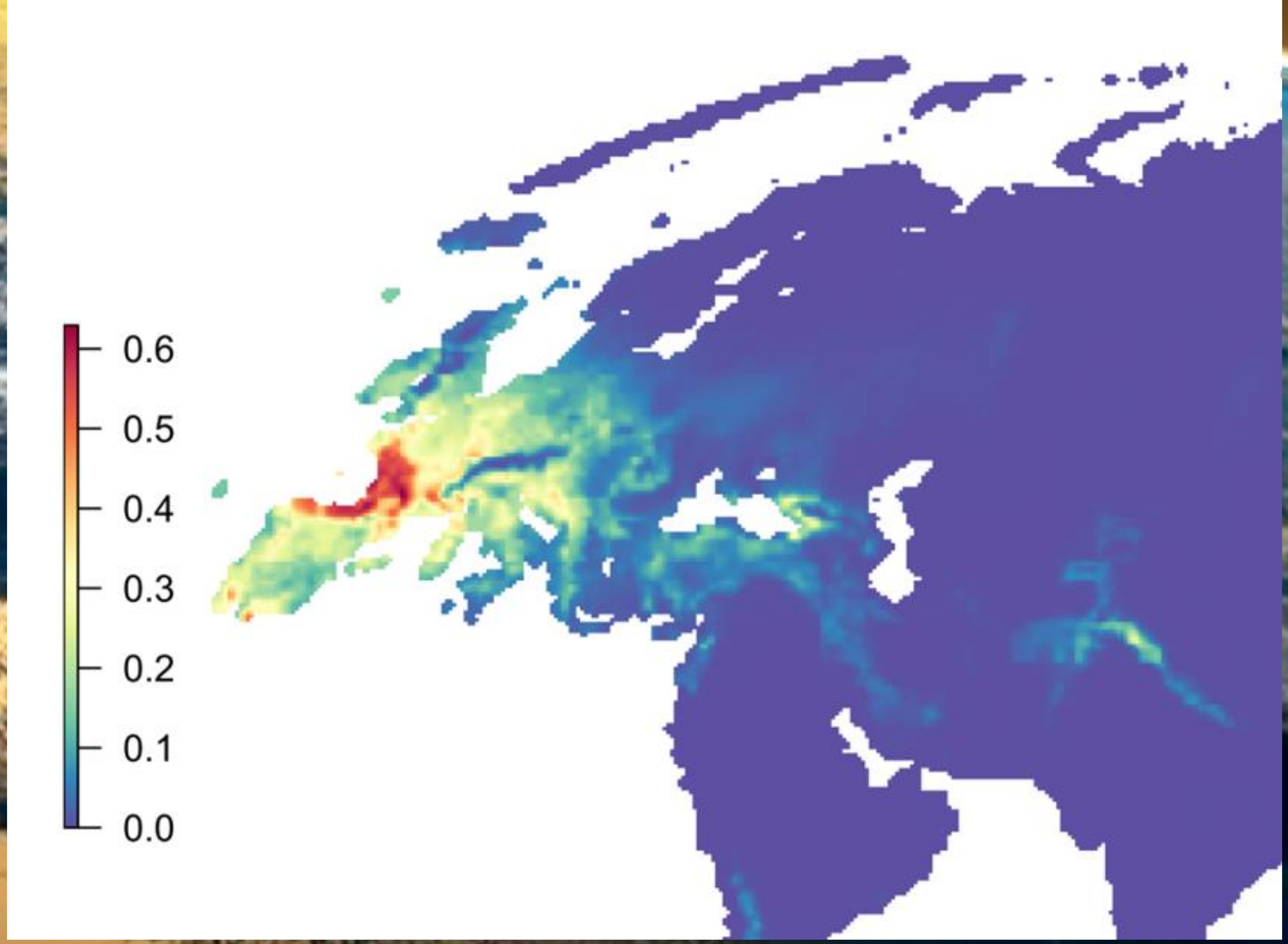
INPUT



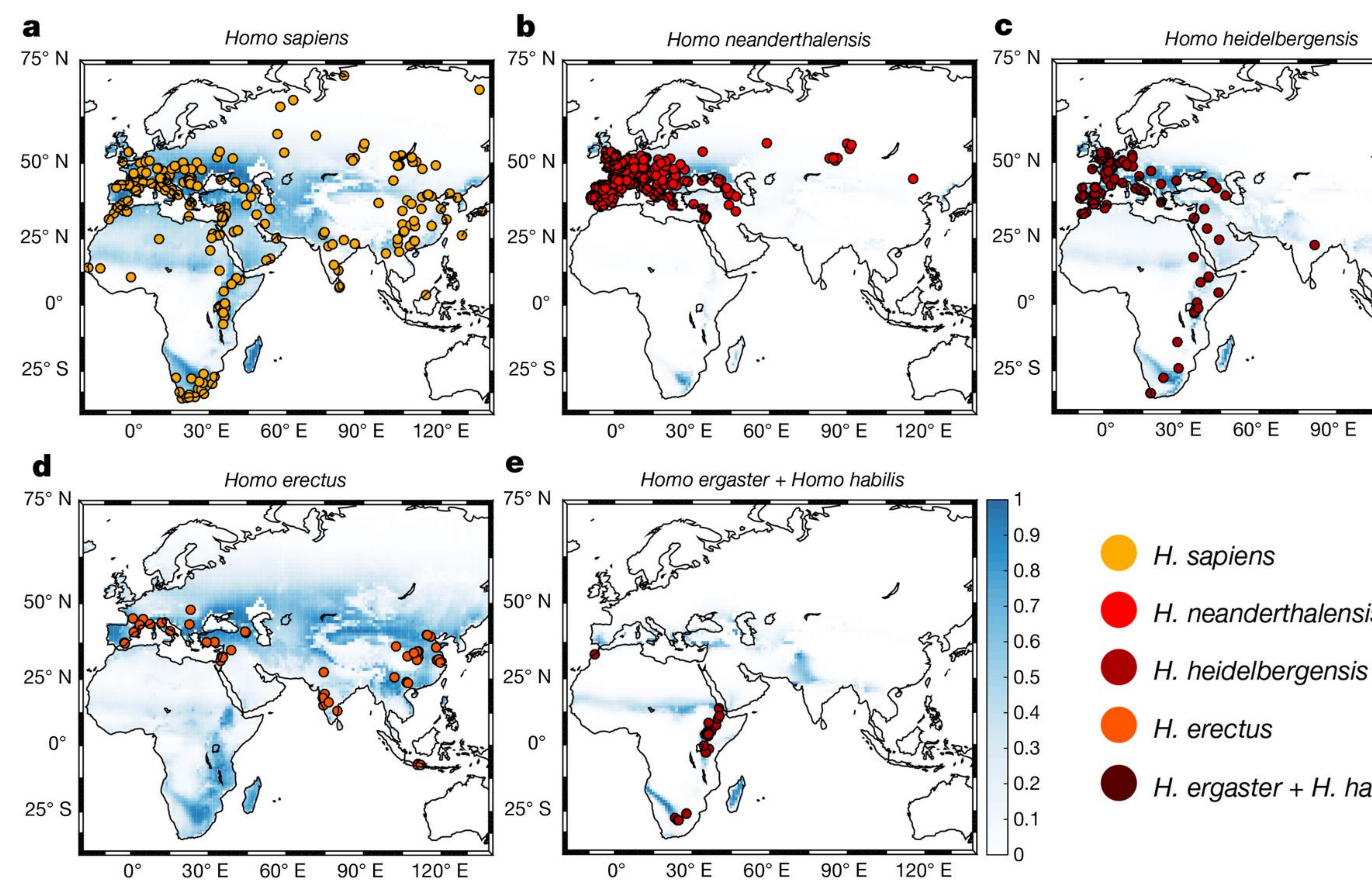
occorrenze
punti di presenza delle specie

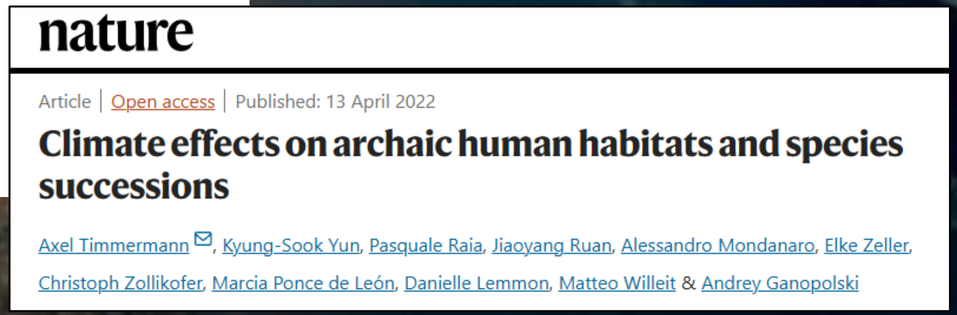
variabili bioclimatiche

OUTPUT


0.6
0.5
0.4
0.3
0.2
0.1
0.0

Mappe di idoneità ambientale delle specie umane


a
Homo sapiens
b
Homo neanderthalensis
c
Homo heidelbergensis
d
Homo erectus
e
Homo ergaster + Homo habilis
75° N
50° N
25° N
0°
25° S
0°
30° E
60° E
90° E
120° E
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
H. sapiens
H. neanderthalensis
H. heidelbergensis
H. erectus
H. ergaster + H. habilis



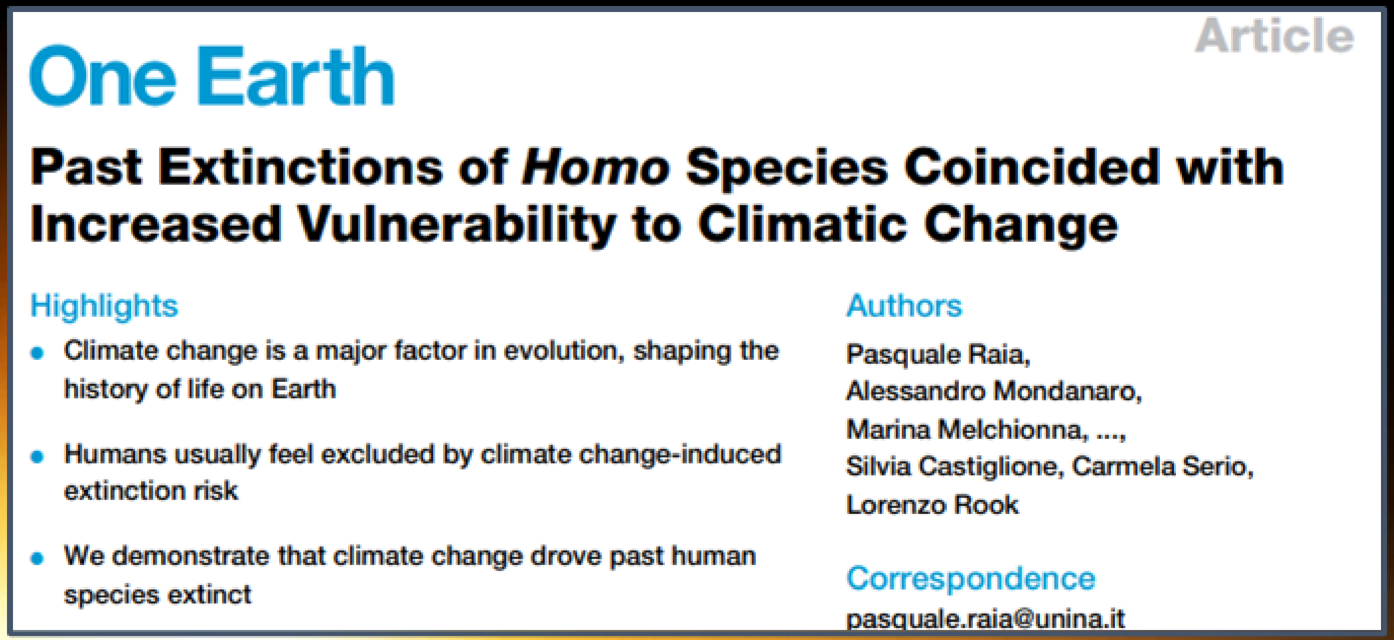
nature

Article | Open access | Published: 13 April 2022

Climate effects on archaic human habitats and species successions

Axel Timmermann, Kyung-Sook Yun, Pasquale Raia, Jiaoyang Ruan, Alessandro Mondanaro, Elke Zeller, Christoph Zollikofer, Marcia Ponce de León, Danielle Lemmon, Matteo Willeit & Andrey Ganopolski

Vulnerabilità al cambiamento climatico delle singole specie umane



Article

One Earth

Past Extinctions of *Homo* Species Coincided with Increased Vulnerability to Climatic Change

Highlights

- Climate change is a major factor in evolution, shaping the history of life on Earth
- Humans usually feel excluded by climate change-induced extinction risk
- We demonstrate that climate change drove past human species extinct

Authors

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Marina Melchionna, ...,
Silvia Castiglione, Carmela Serio,
Lorenzo Rook

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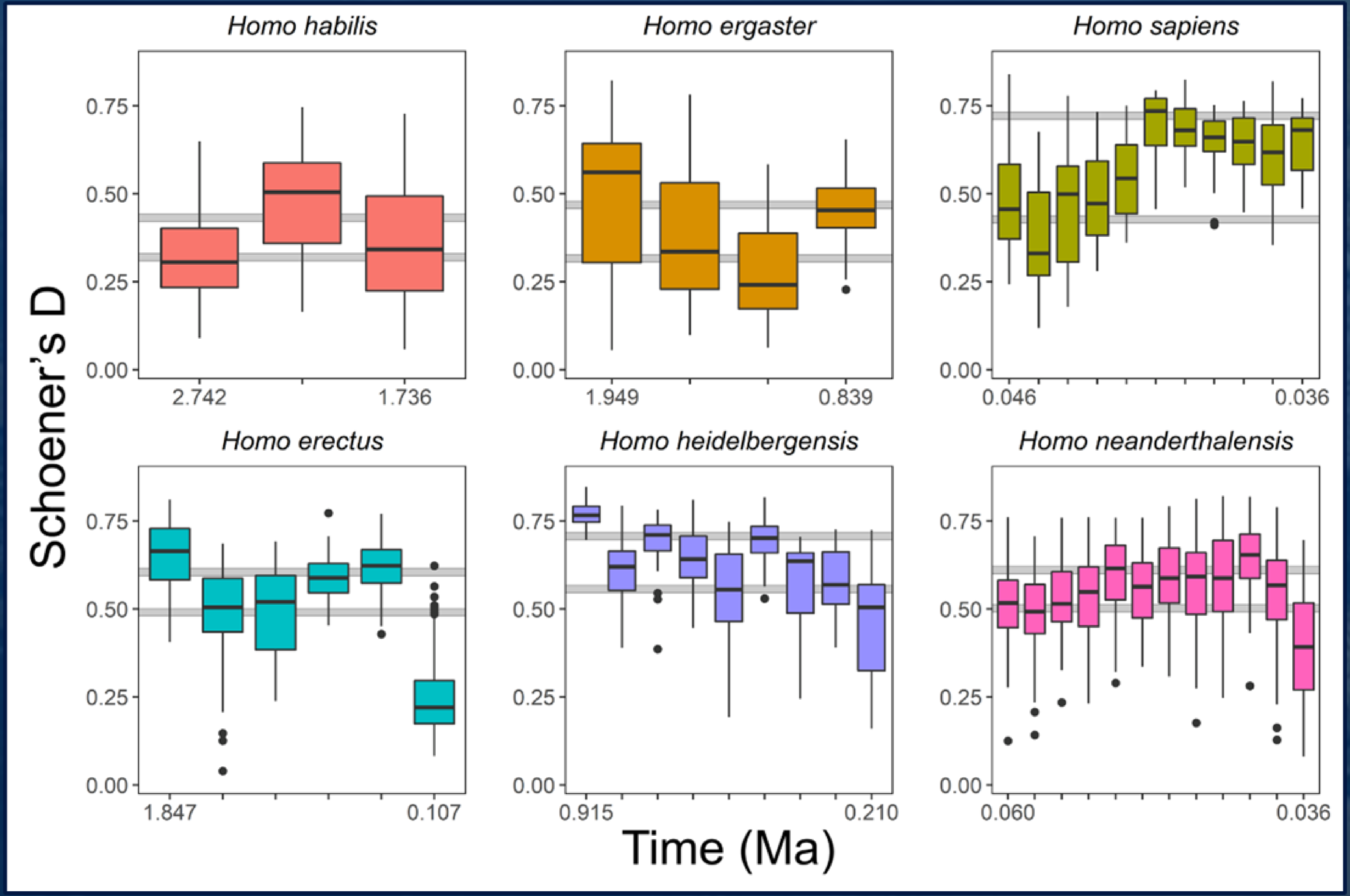
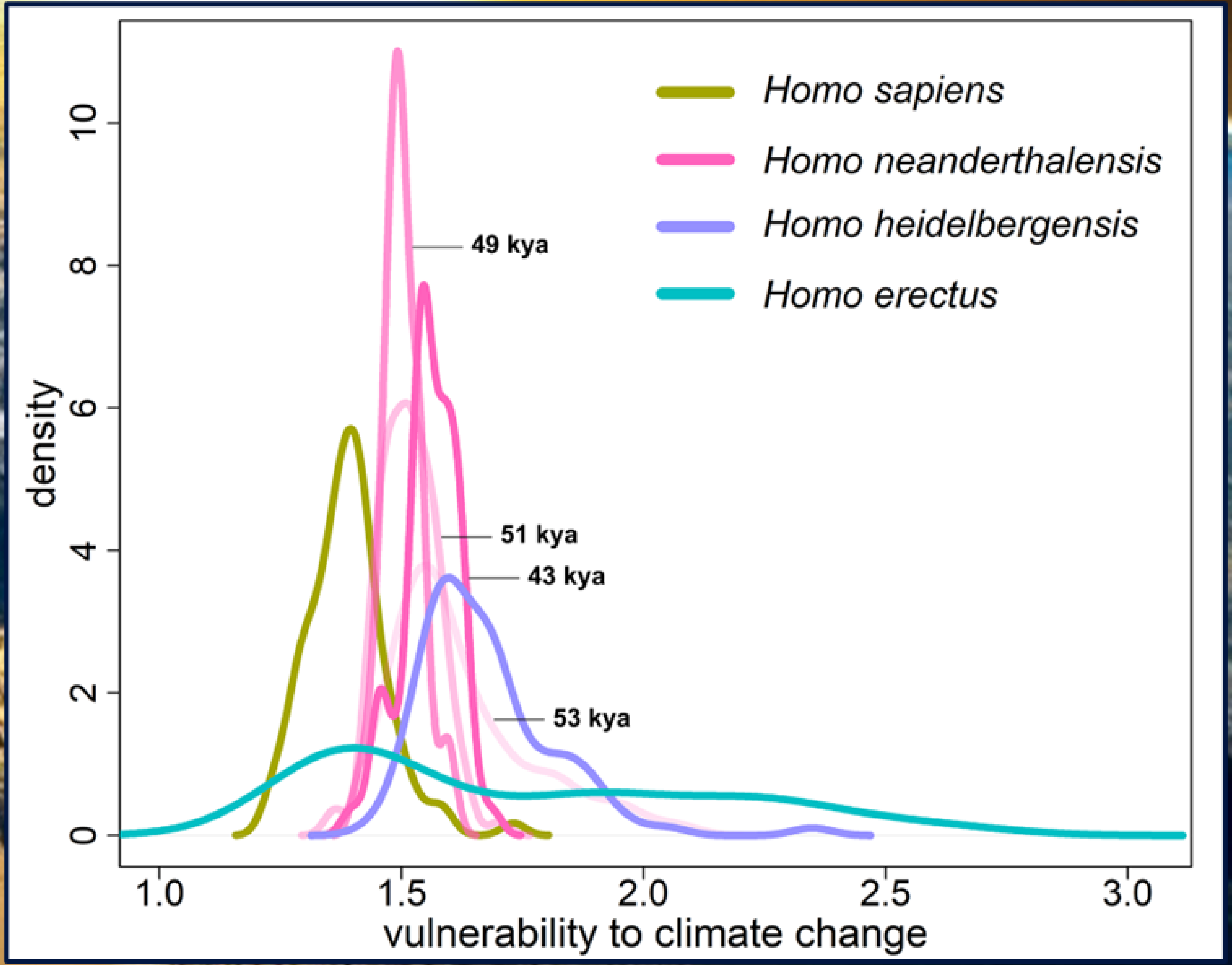




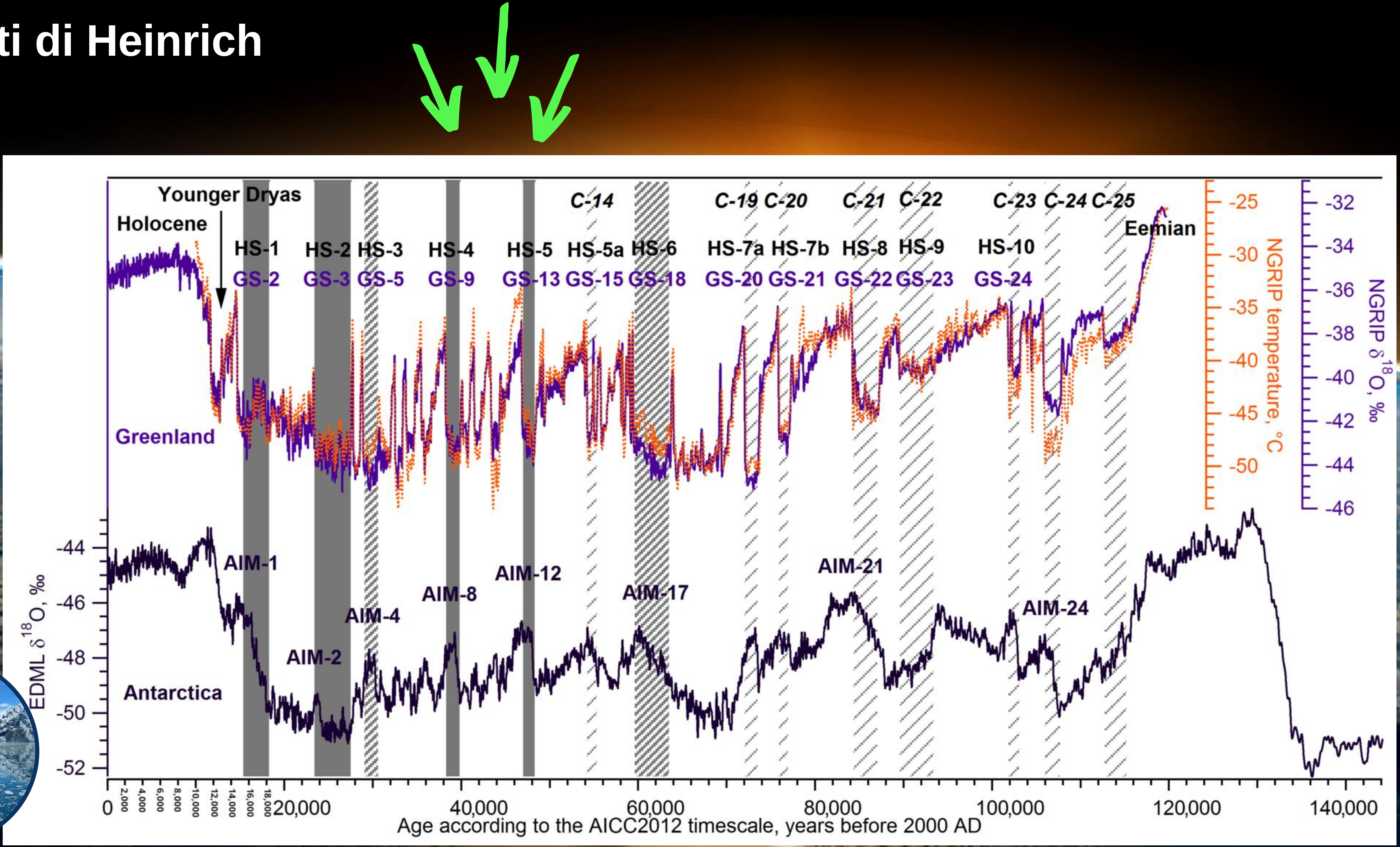
Si stima che i Neandethal si siano estinti circa 40 000 anni fa

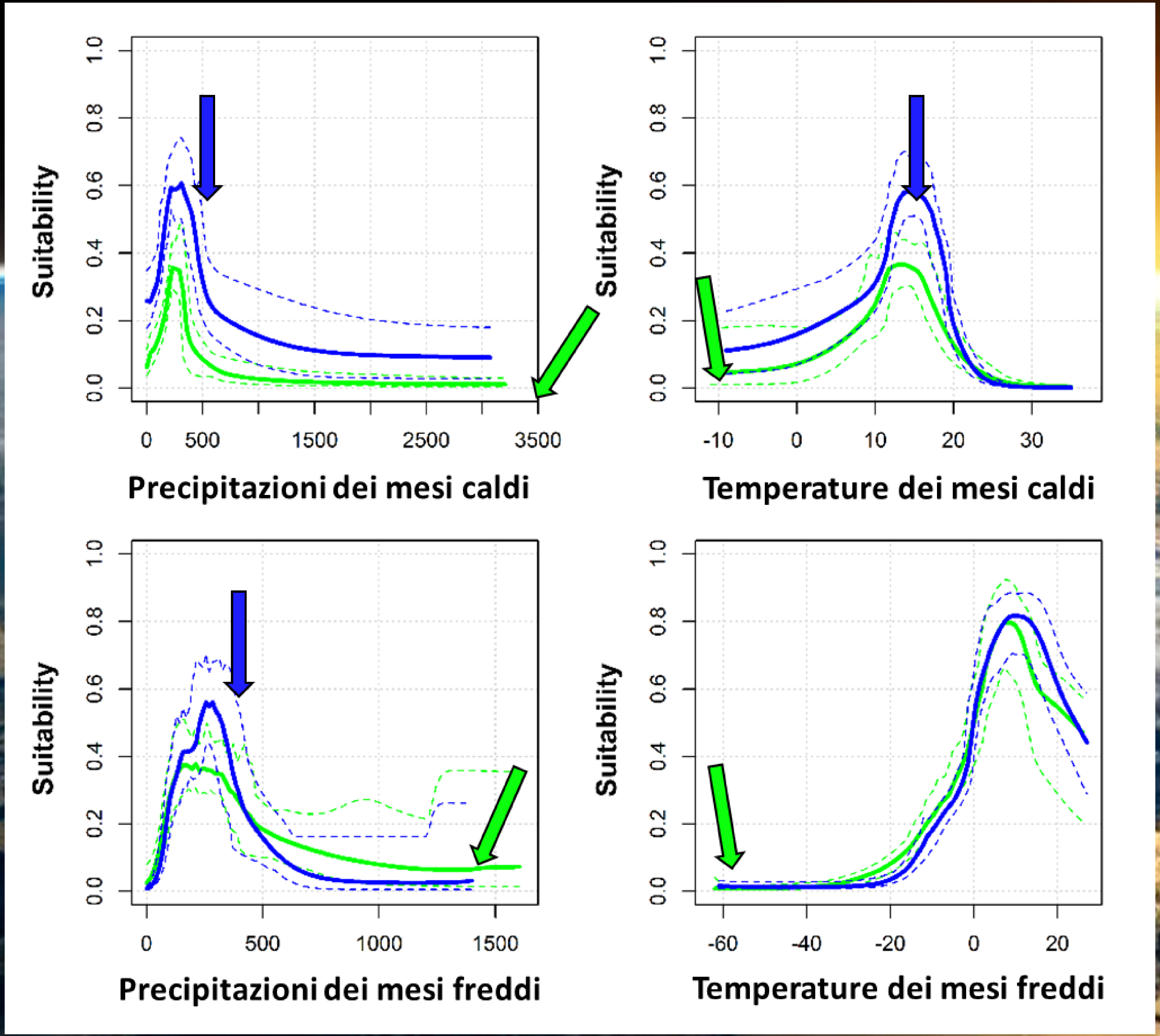
Competizione diretta e/o indiretta con *Homo sapiens*

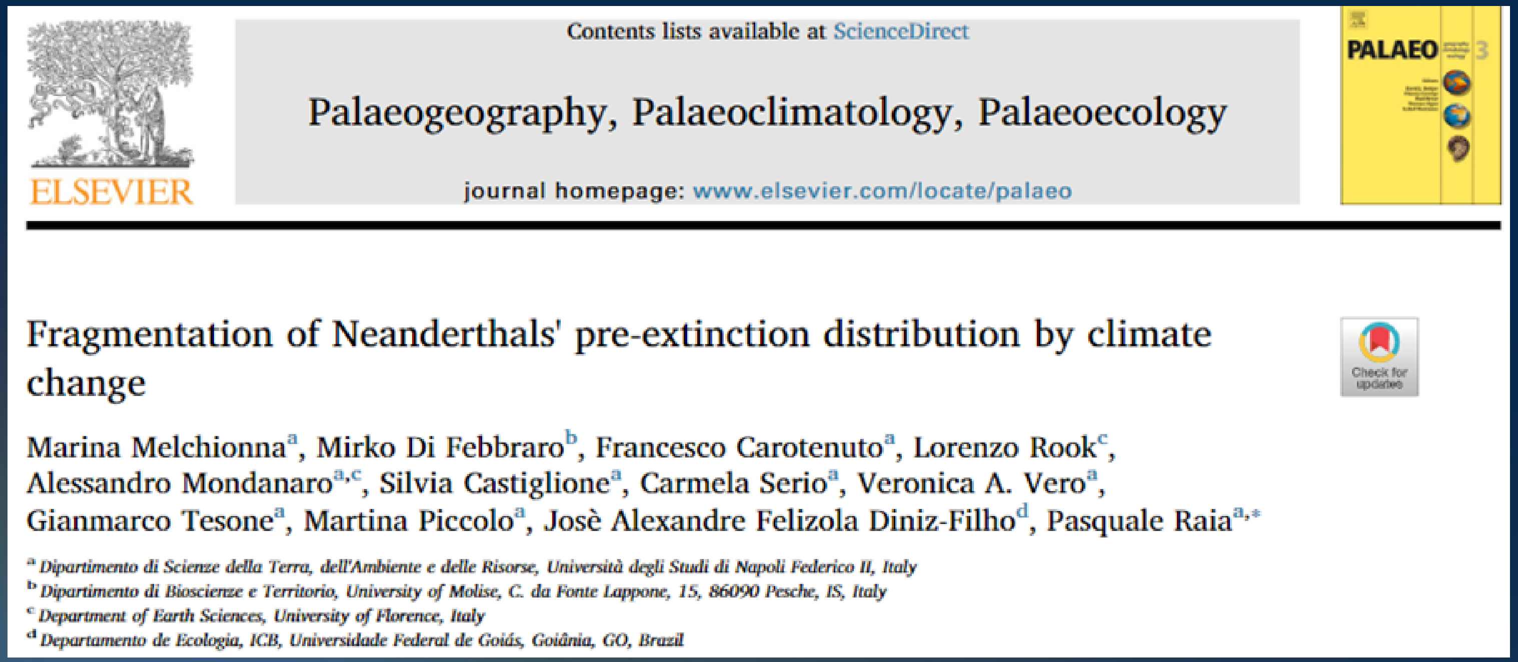
oppure

Cambiamenti climatici avvenuti durante la fine del Pleistocene

Eventi di Heinrich






Contents lists available at ScienceDirect

Palaeogeography, Palaeoclimatology, Palaeoecology

journal homepage: www.elsevier.com/locate/palaeo

Fragmentation of Neanderthals' pre-extinction distribution by climate change

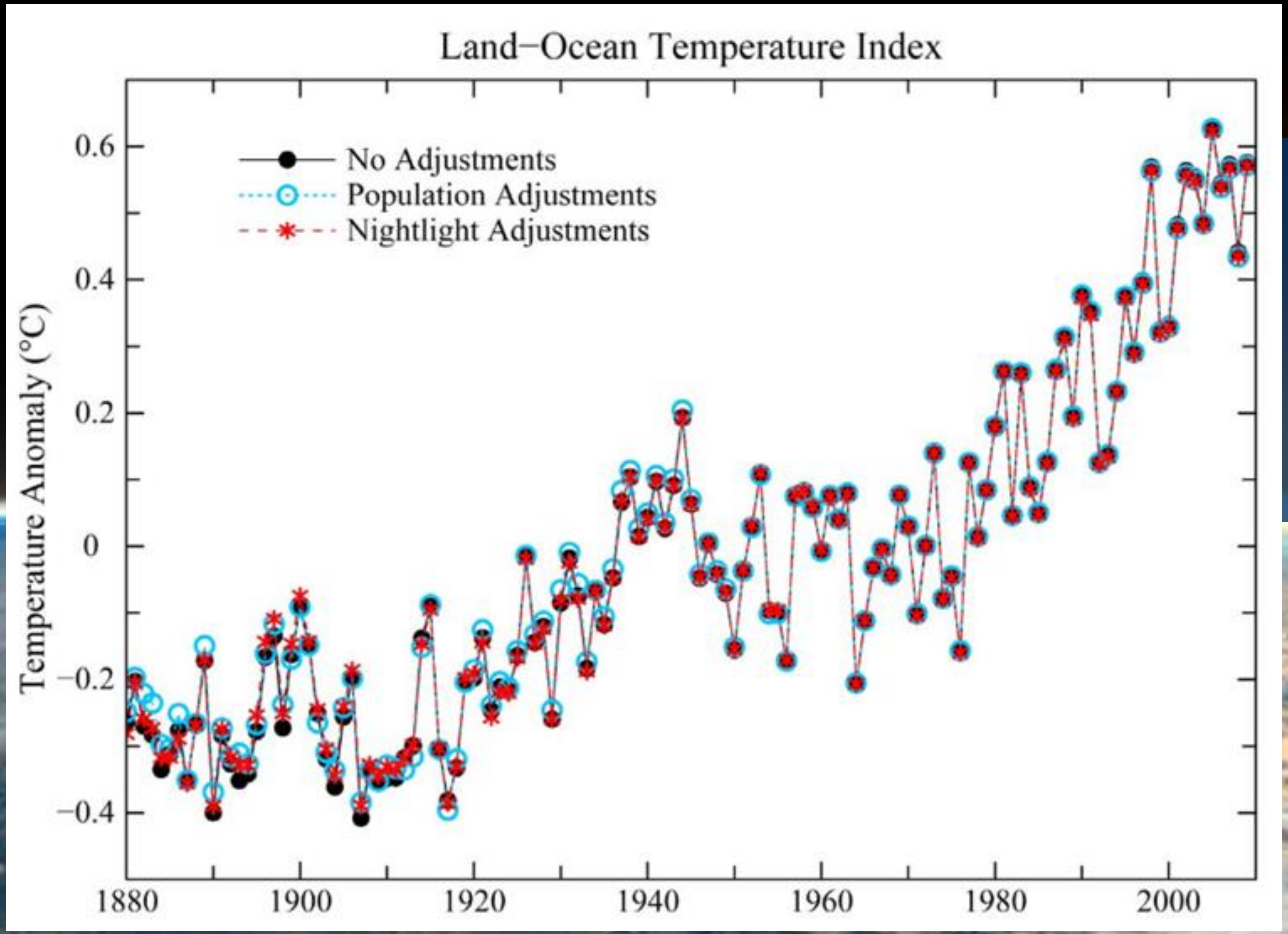
Marina Melchionna[a], Mirko Di Febbraro[b], Francesco Carotenuto[a], Lorenzo Rook[c], Alessandro Mondanaro[a,c], Silvia Castiglione[a], Carmela Serio[a], Veronica A. Vero[a], Gianmarco Tesone[a], Martina Piccolo[a], Josè Alexandre Felizola Diniz-Filho[d], Pasquale Raia[a,*]

[a] *Dipartimento di Scienze della Terra, dell'Ambiente e delle Risorse, Università degli Studi di Napoli Federico II, Italy*
[b] *Dipartimento di Bioscienze e Territorio, University of Molise, C. da Fonte Lappone, 15, 86090 Pesche, IS, Italy*
[c] *Department of Earth Sciences, University of Florence, Italy*
[d] *Departamento de Ecologia, ICB, Universidade Federal de Goiás, Goiânia, GO, Brazil*

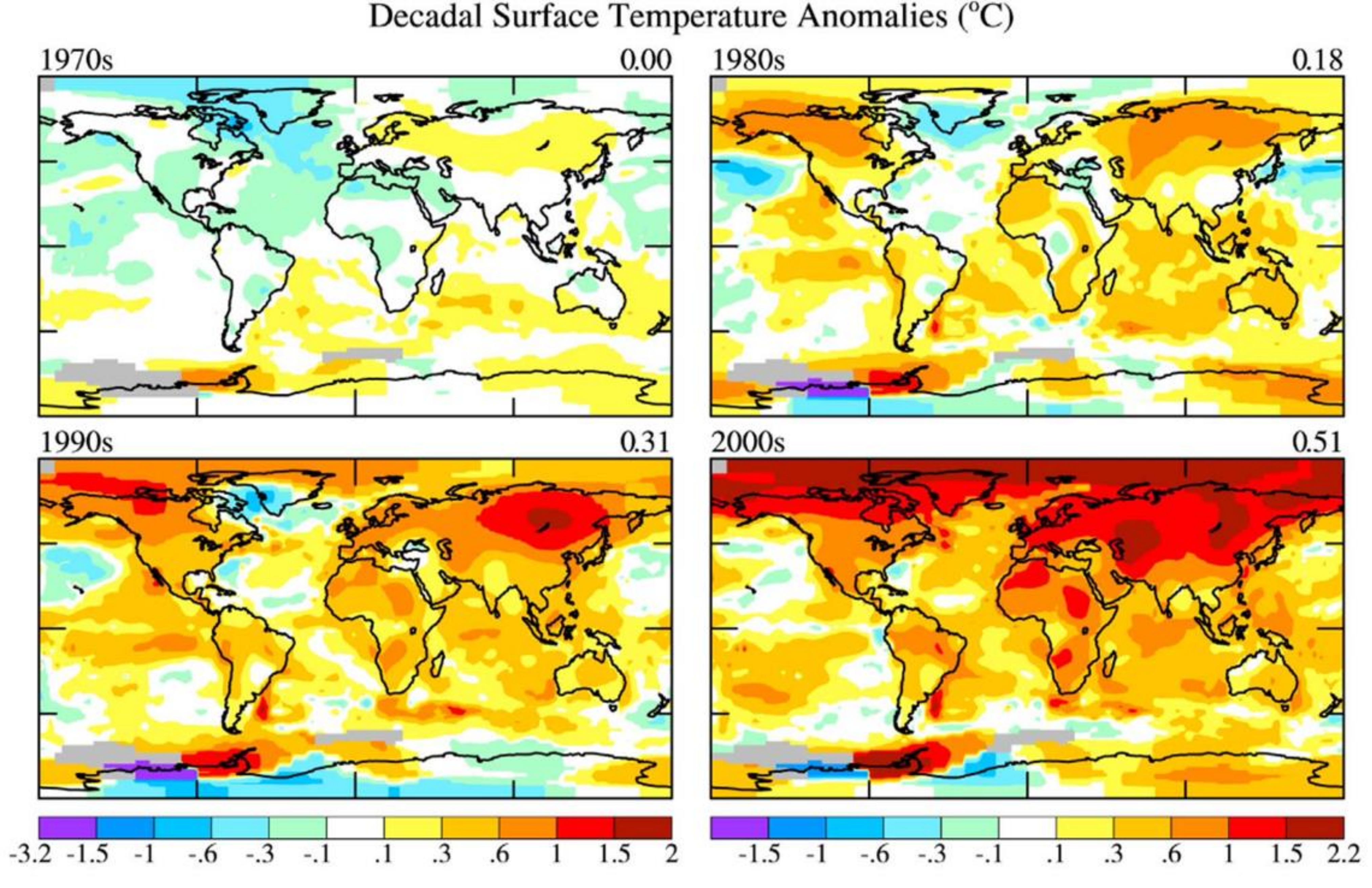
Idoneità delle due specie (*H. sapiens* e *H. neanderthalensis*) in relazione alle precipitazioni e alle temperature

🟩 ***Homo sapiens***

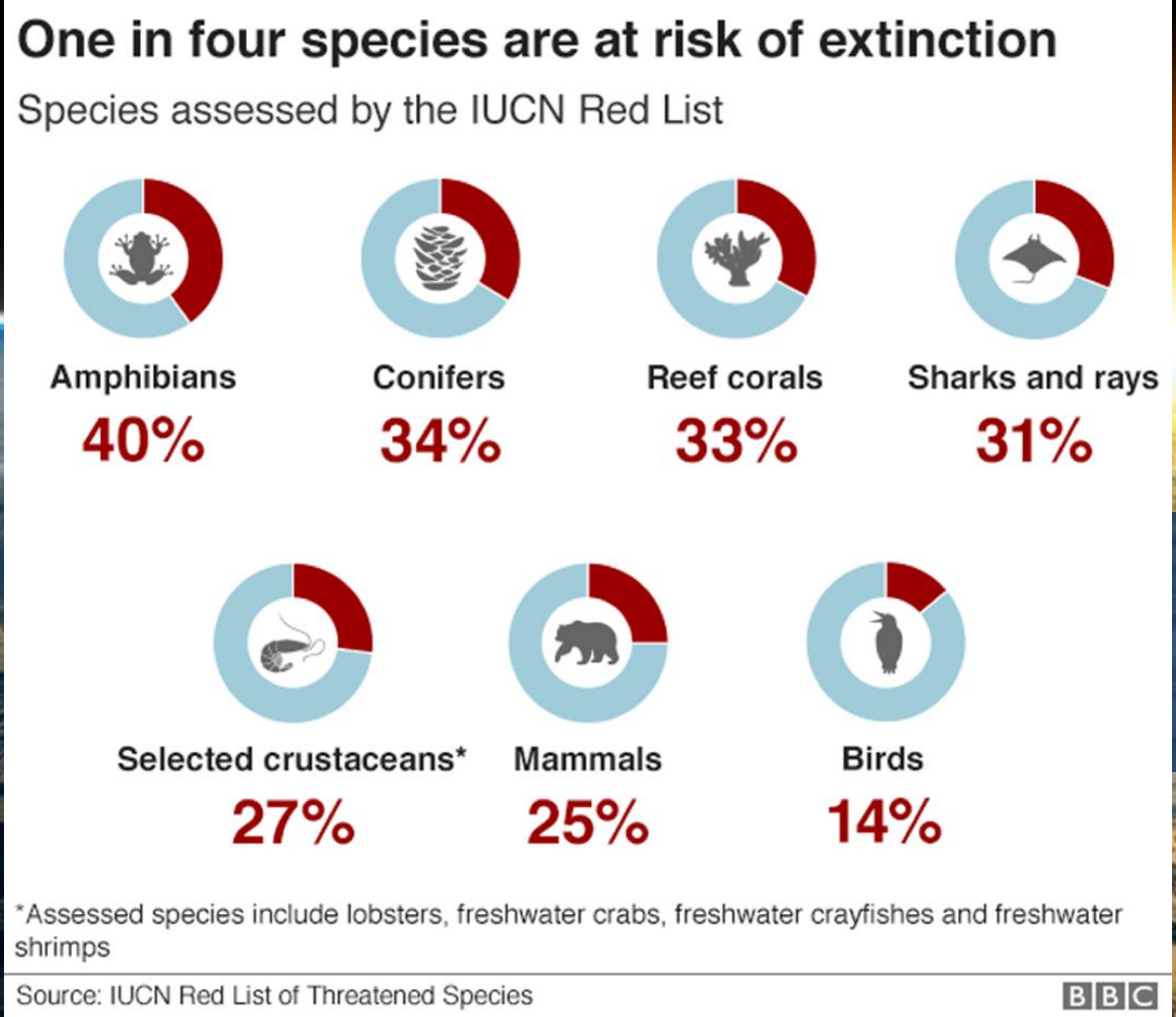
🟦 ***Homo neanderthalensis***



Dal 1880, la temperature media globale è incrementata di più di 1°C


Decadal Surface Temperature Anomalies (°C)
1970s
0.00
1980s
0.18
1990s
0.31
2000s
0.51
-3.2 -1.5 -1 -.6 -.3 -.1 .1 .3 .6 1 1.5 2
-1.5 -1 -.6 -.3 -.1 .1 .3 .6 1 1.5 2.2

Dal 1975 è stato osservato un aumento di circa 0.15–0.2 °C per decade



One in four species are at risk of extinction

Species assessed by the IUCN Red List

*Assessed species include lobsters, freshwater crabs, freshwater crayfishes and freshwater shrimps

Source: IUCN Red List of Threatened Species

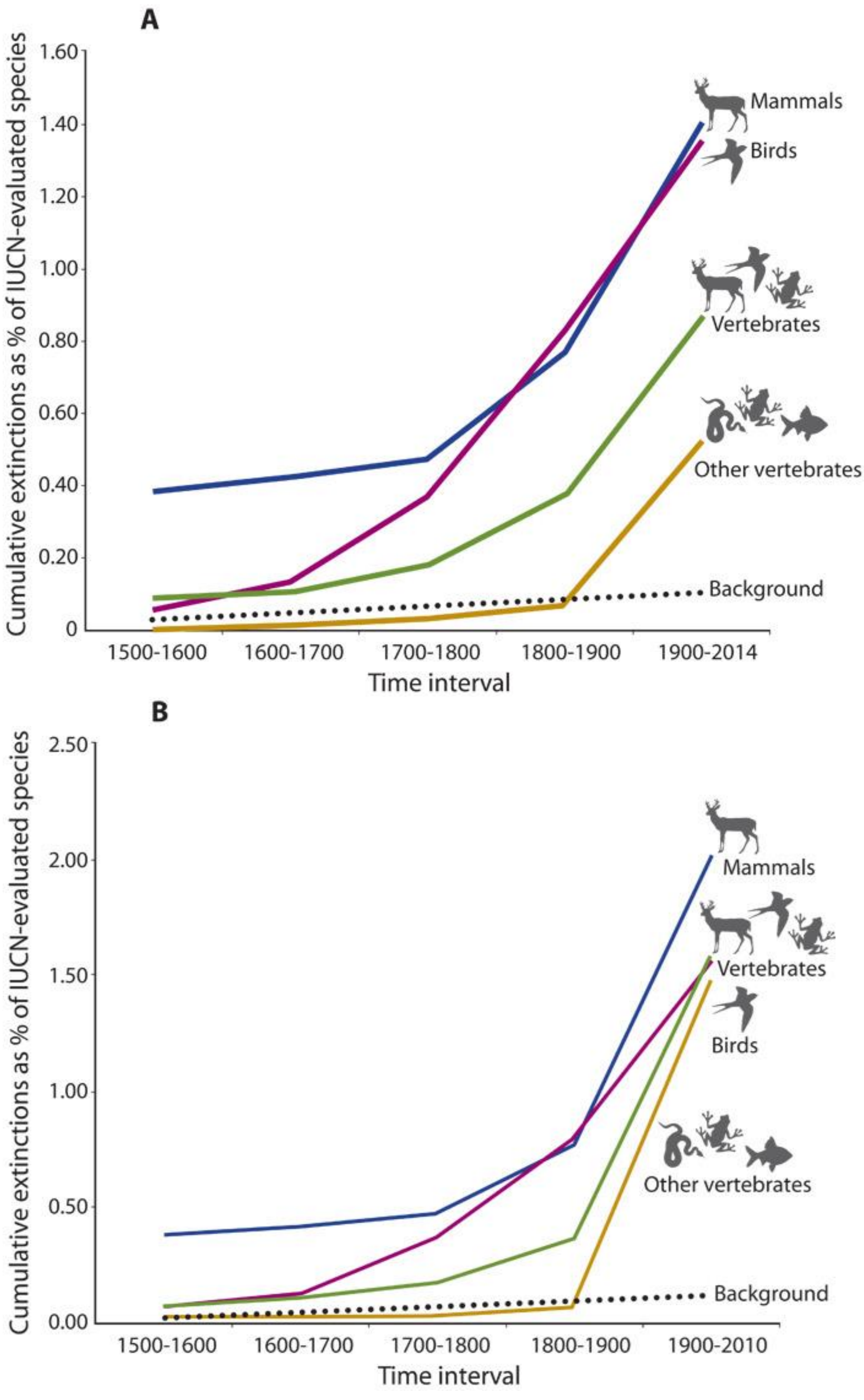
BBC

IUCN RED LIST ©

L’impatto antropico è correlato all’estinzione di circa 1 milione di specie

IUCN: International Union for Conservation of Nature

Lista Rossa: database di informazioni sullo stato di conservazione delle specie animali e vegetali



La sesta estinzione di massa

Dati utilizzati: IUCN dal 1500

- 328 vertebrati sono stati considerati estinti (EX)
- 279 sono stati considerati estinti in natura (EW) o elencati come possibilmente estinti (PE)
- 617 vertebrati di specie totali considerando le tre categorie sopraelencate

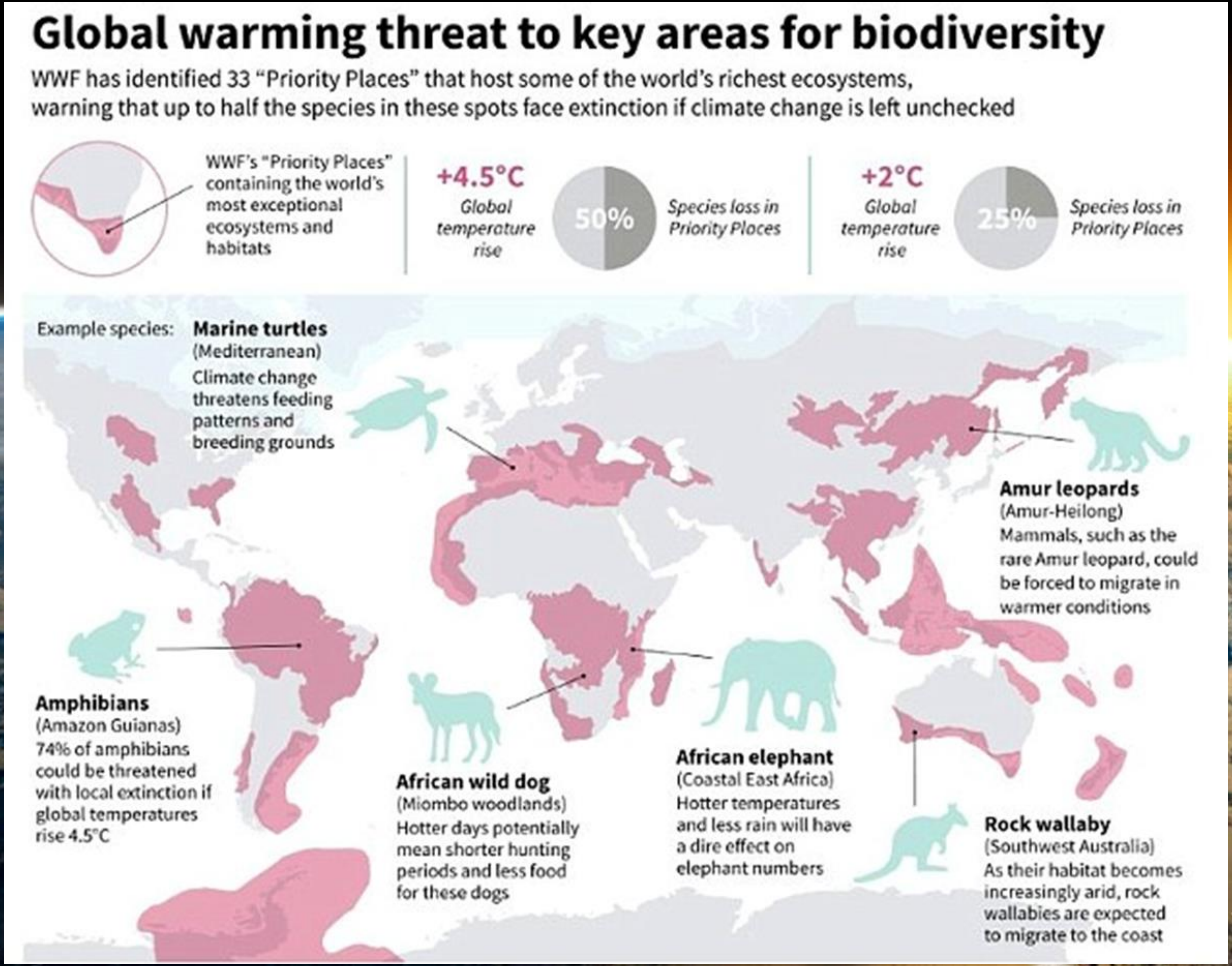
Background

2 specie di vertebrati estinti su 10.000 specie ogni 100 anni

I tassi di estinzione sono da 8 a 100 volte maggiori di quelli previsti per le estinzioni di background

Ceballos et al. 2015 Science Advances

Human-induced global warming and extinction



Global warming threat to key areas for biodiversity

WWF has identified 33 "Priority Places" that host some of the world's richest ecosystems, warning that up to half the species in these spots face extinction if climate change is left unchecked

WWF's "Priority Places" containing the world's most exceptional ecosystems and habitats

+4.5°C *Global temperature rise*

50% *Species loss in Priority Places*

+2°C *Global temperature rise*

25% *Species loss in Priority Places*

Example species:

Marine turtles
(Mediterranean)
Climate change threatens feeding patterns and breeding grounds

Amur leopards
(Amur-Heilong)
Mammals, such as the rare Amur leopard, could be forced to migrate in warmer conditions

Amphibians
(Amazon Guianas)
74% of amphibians could be threatened with local extinction if global temperatures rise 4.5°C

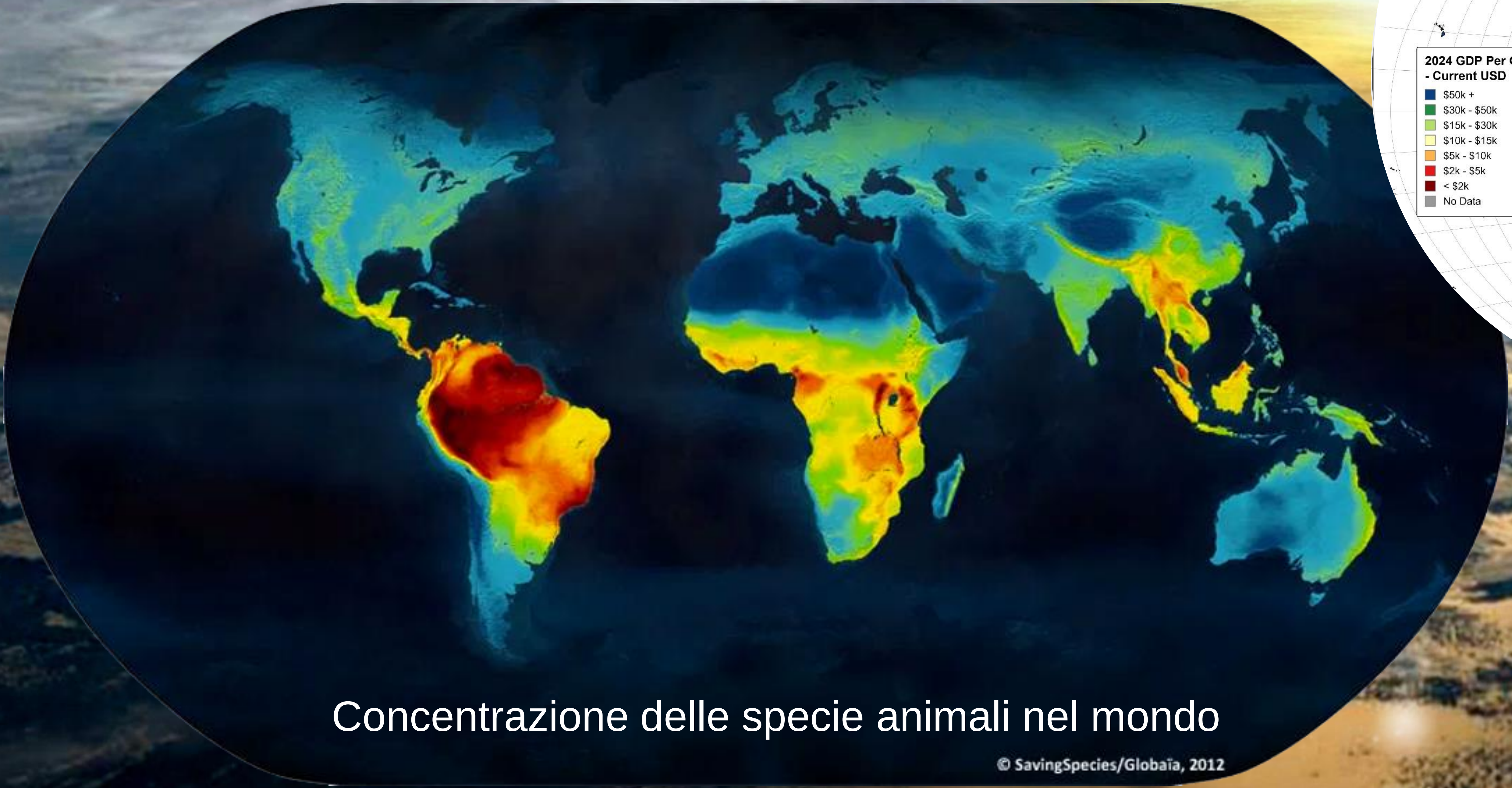
African wild dog
(Miombo woodlands)
Hotter days potentially mean shorter hunting periods and less food for these dogs

African elephant
(Coastal East Africa)
Hotter temperatures and less rain will have a dire effect on elephant numbers

Rock wallaby
(Southwest Australia)
As their habitat becomes increasingly arid, rock wallabies are expected to migrate to the coast

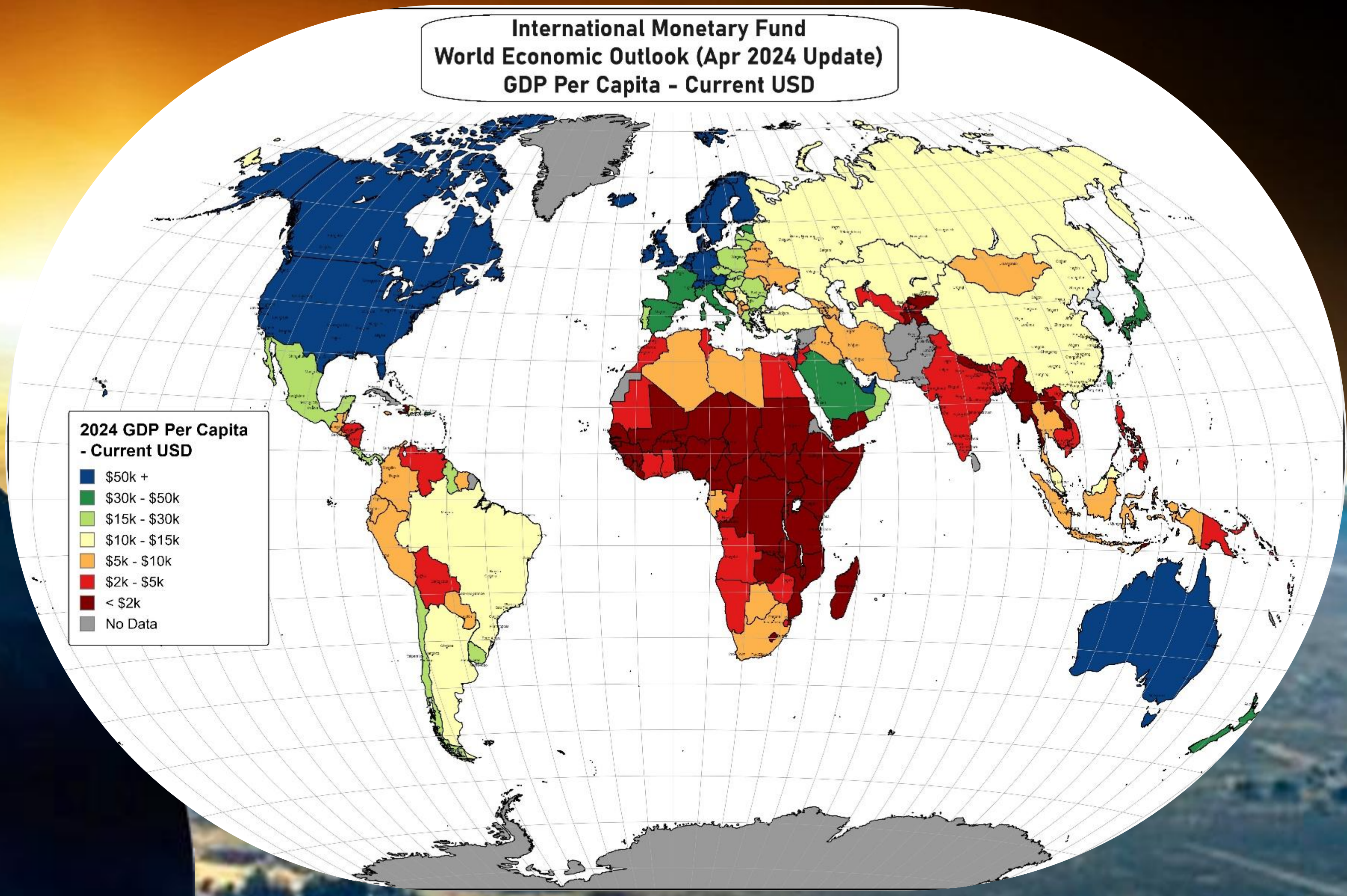
Problema #1 Money –

Gli ecosistemi più ricchi si trovano nei paesi più poveri



Concentrazione delle specie animali nel mondo

© SavingSpecies/Globaïa, 2012


International Monetary Fund
World Economic Outlook (Apr 2024 Update)
GDP Per Capita - Current USD
2024 GDP Per Capita - Current USD
$50k +
$30k - $50k
$15k - $30k
$10k - $15k
$5k - $10k
$2k - $5k
< $2k
No Data

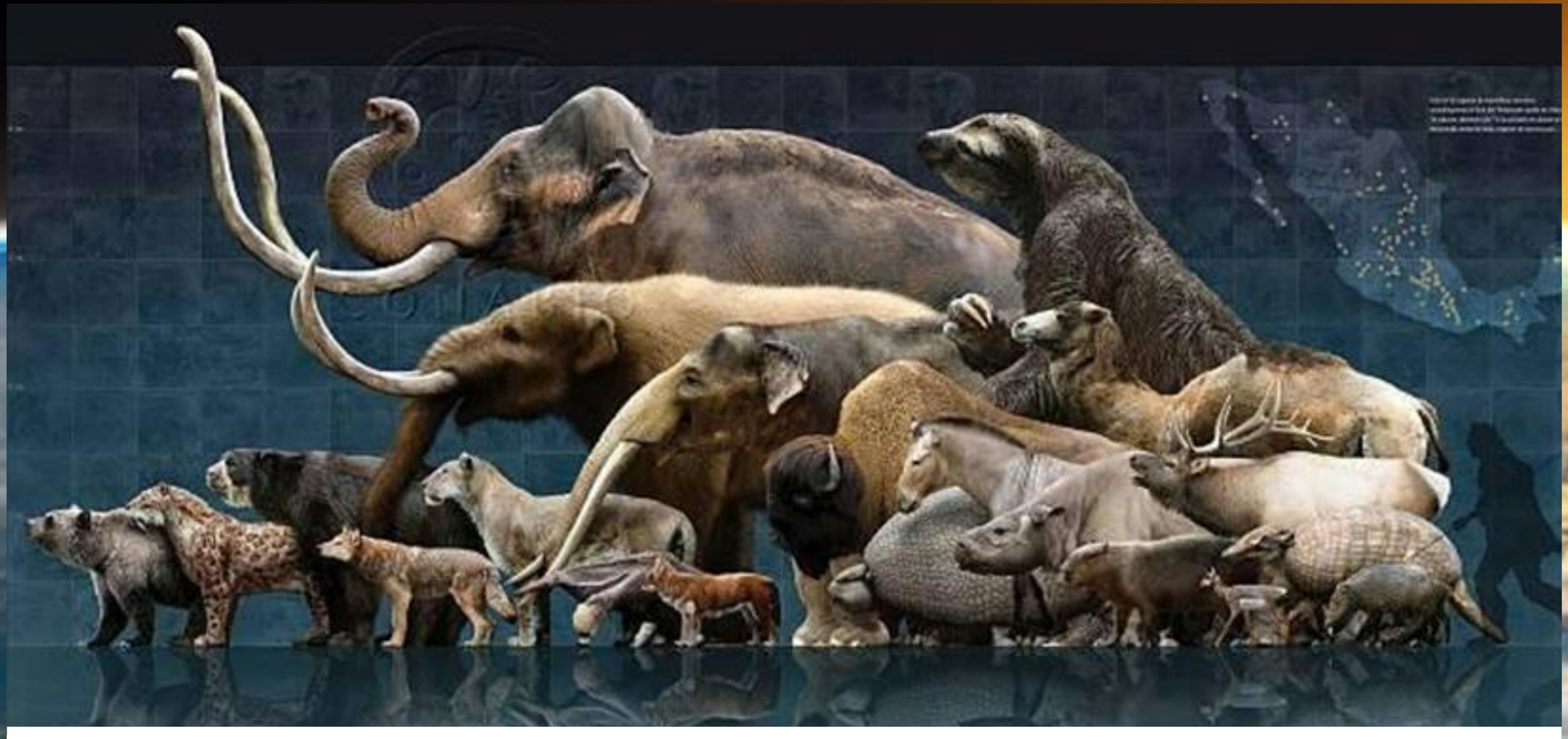
PIL PRO CAPITE

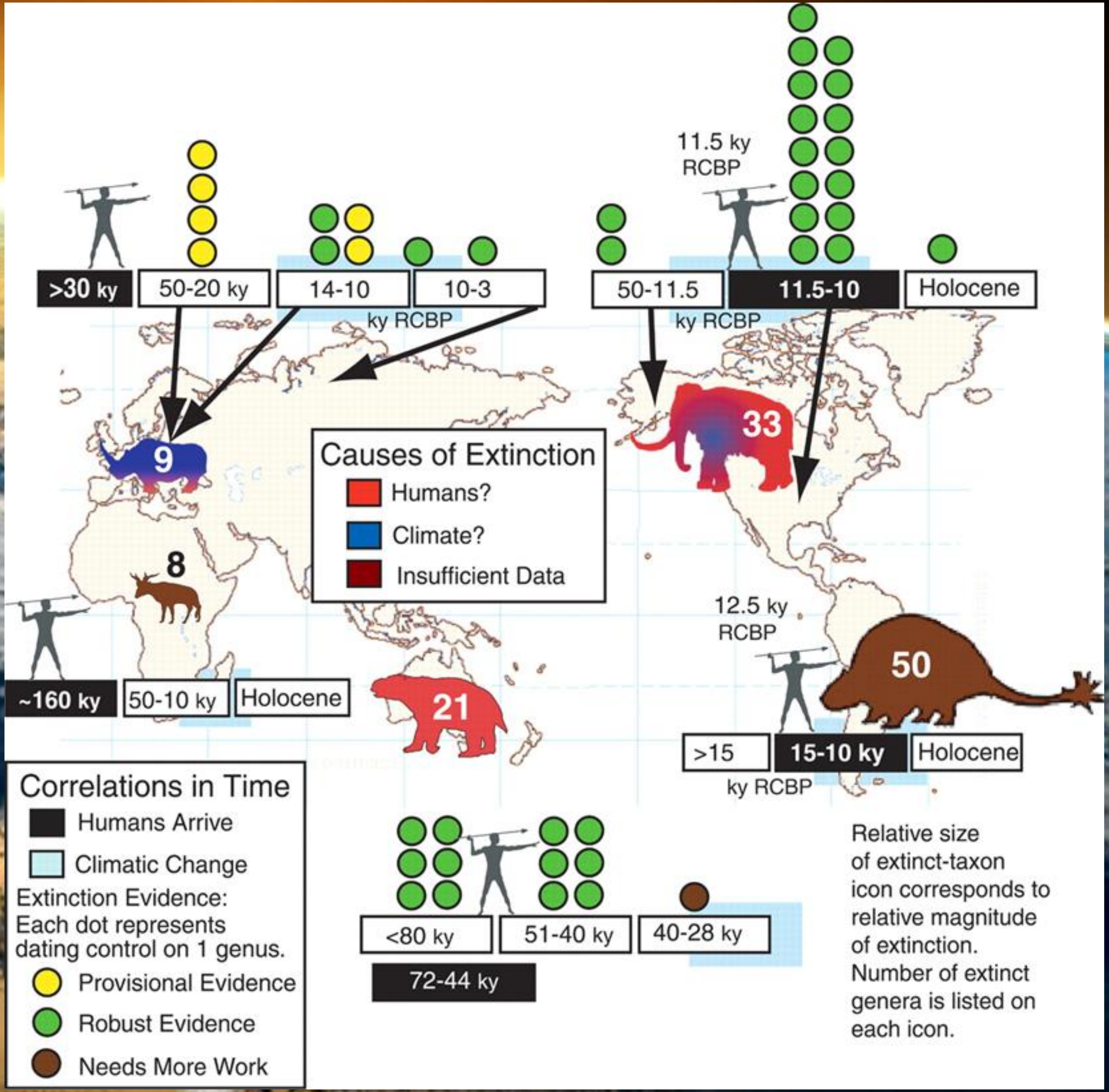
Problema #2 Conflitti Uomo-Natura

- Impatto dell’attività antropica sull’ambiente
- Conflitti con le forze socio-politiche a scala locale e globale
- Conflitti tra coloro che dovrebbero programmare azioni/progetti chiari per la salvaguardia e tutela della biodiversità

Problema #3 Mancanza di conoscenze

Gli attuali ecosistemi sono una scarsa rapresentazione della “vera” biodiversità




>30 ky
50-20 ky
14-10
10-3
ky RCBP
50-11.5
11.5 ky RCBP
11.5-10
ky RCBP
Holocene
9
33
8
21
50
~160 ky
50-10 ky
Holocene
12.5 ky RCBP
>15
15-10 ky
Holocene
ky RCBP
<80 ky
51-40 ky
40-28 ky
72-44 ky
Causes of Extinction
🟥 Humans?
🟦 Climate?
🟥 Insufficient Data
Correlations in Time
■ Humans Arrive
□ Climatic Change
Extinction Evidence:
Each dot represents dating control on 1 genus.
● Provisional Evidence
● Robust Evidence
● Needs More Work
Relative size of extinct-taxon icon corresponds to relative magnitude of extinction. Number of extinct genera is listed on each icon.

GRAZIE
PER
L'ATTENZIONE