FACULTE DES SCIENCES

UNIVERSITÉ SAINT-JOSEPH

EcoplantMed

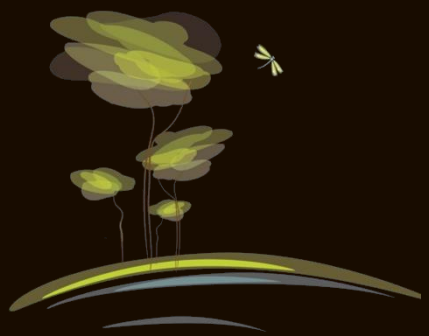
ENPI CBCMED
CROSS-BORDER COOPERATION IN THE MEDITERRANEAN

Project funded by the EUROPEAN UNION

Why Native plants matter?

Magda BOU DAGHER KHARRAT

Laboratoire Caractérisation génétique des plantes - UR FGEM-
Faculté des Sciences - Université Saint Joseph



EcoplantMed International Conference 14, 15, 16 October 2015

Native species

Exotic species

Non Indigenous Species (NIS)

Alien species

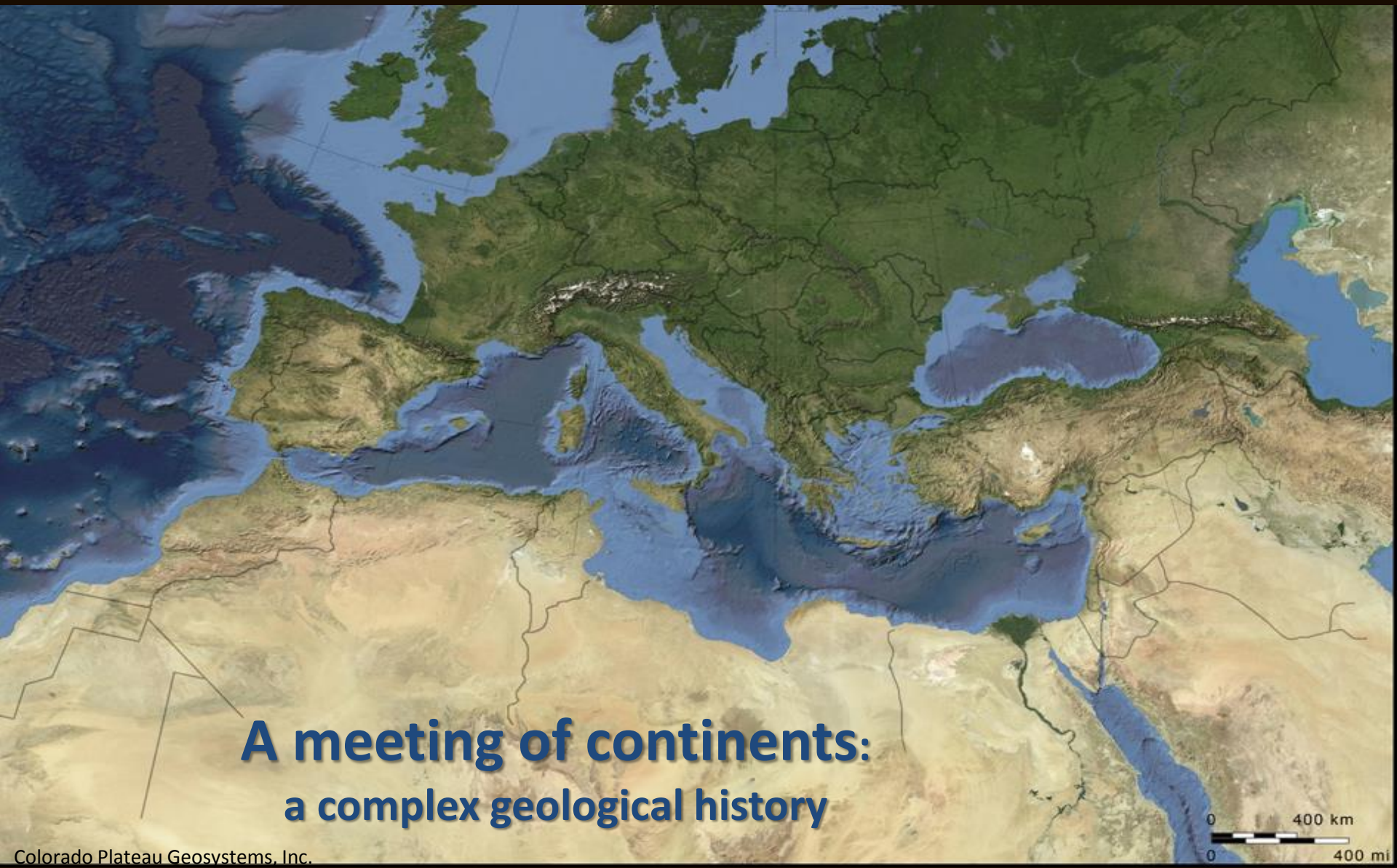
Introduced species

Naturalised species

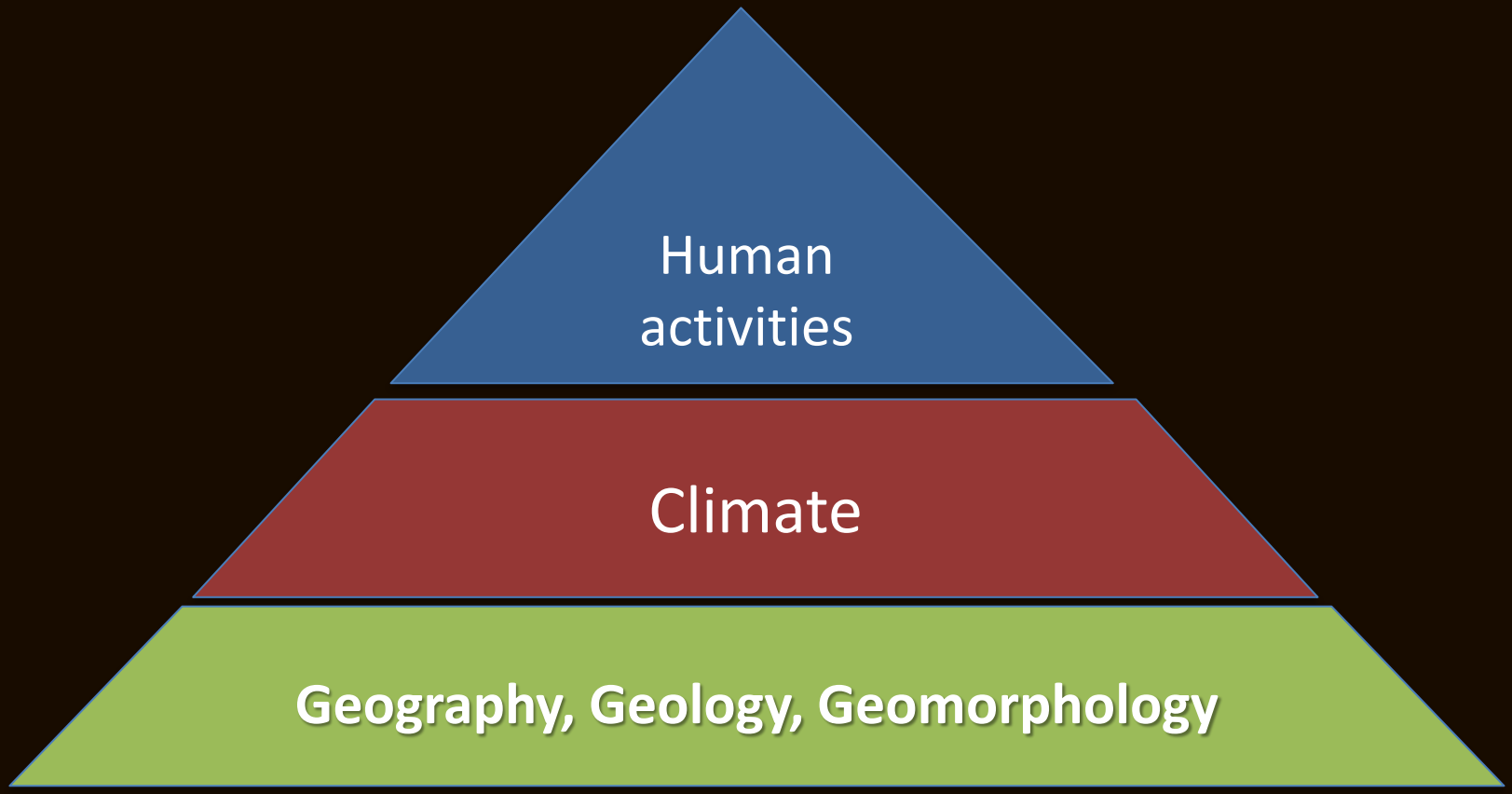
Invasive species

Native species : those species understood as indigenous, occurring in natural associations in habitats that existed prior to significant human impacts and alterations of the landscape.

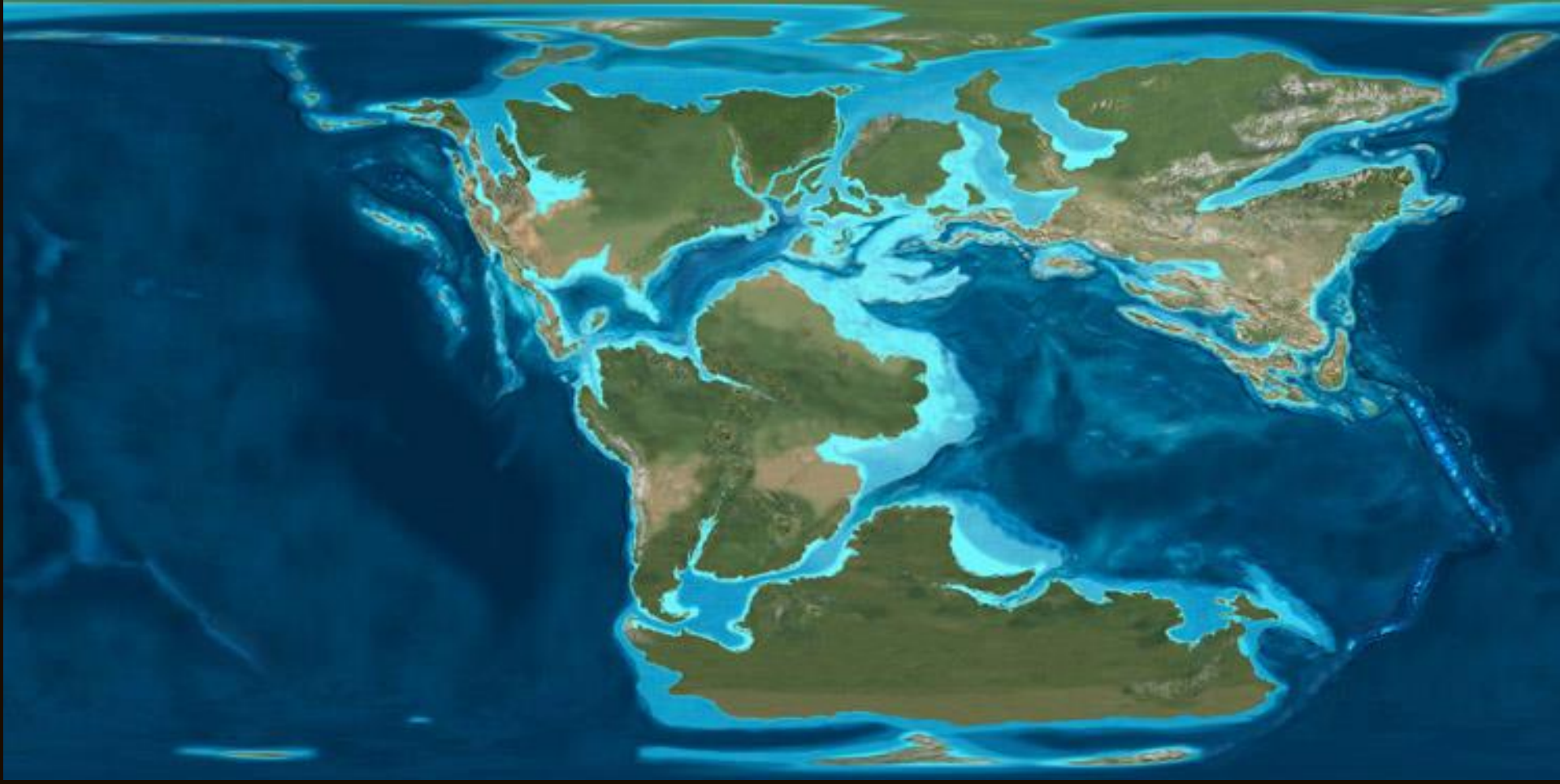
Plant distribution around the Mediterranean



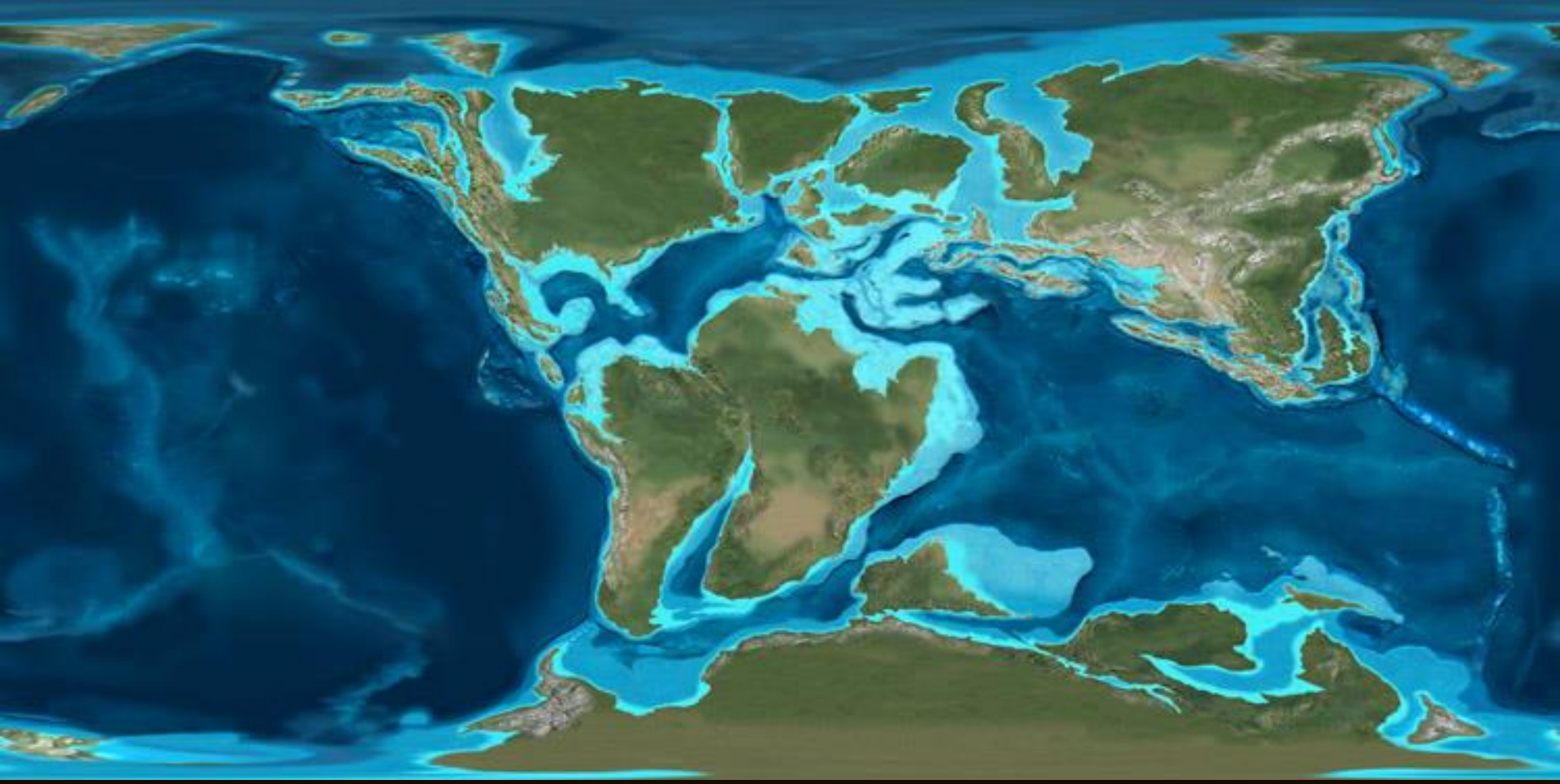
Plant distribution is affected by :



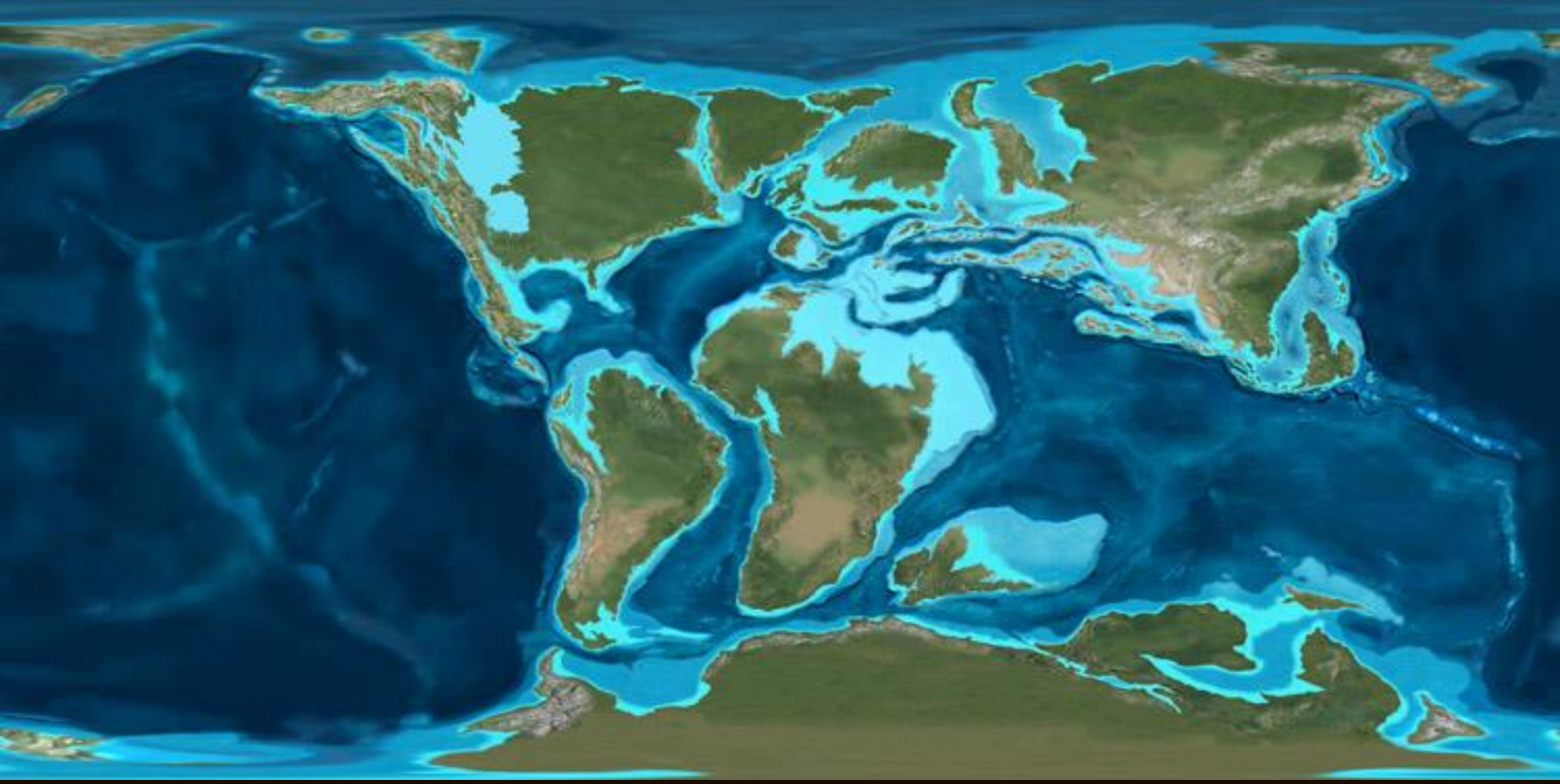
Tectonic activity and edaphic variation have created a template for plant evolution, which has been further modulated by climate and then more recently by human activities.



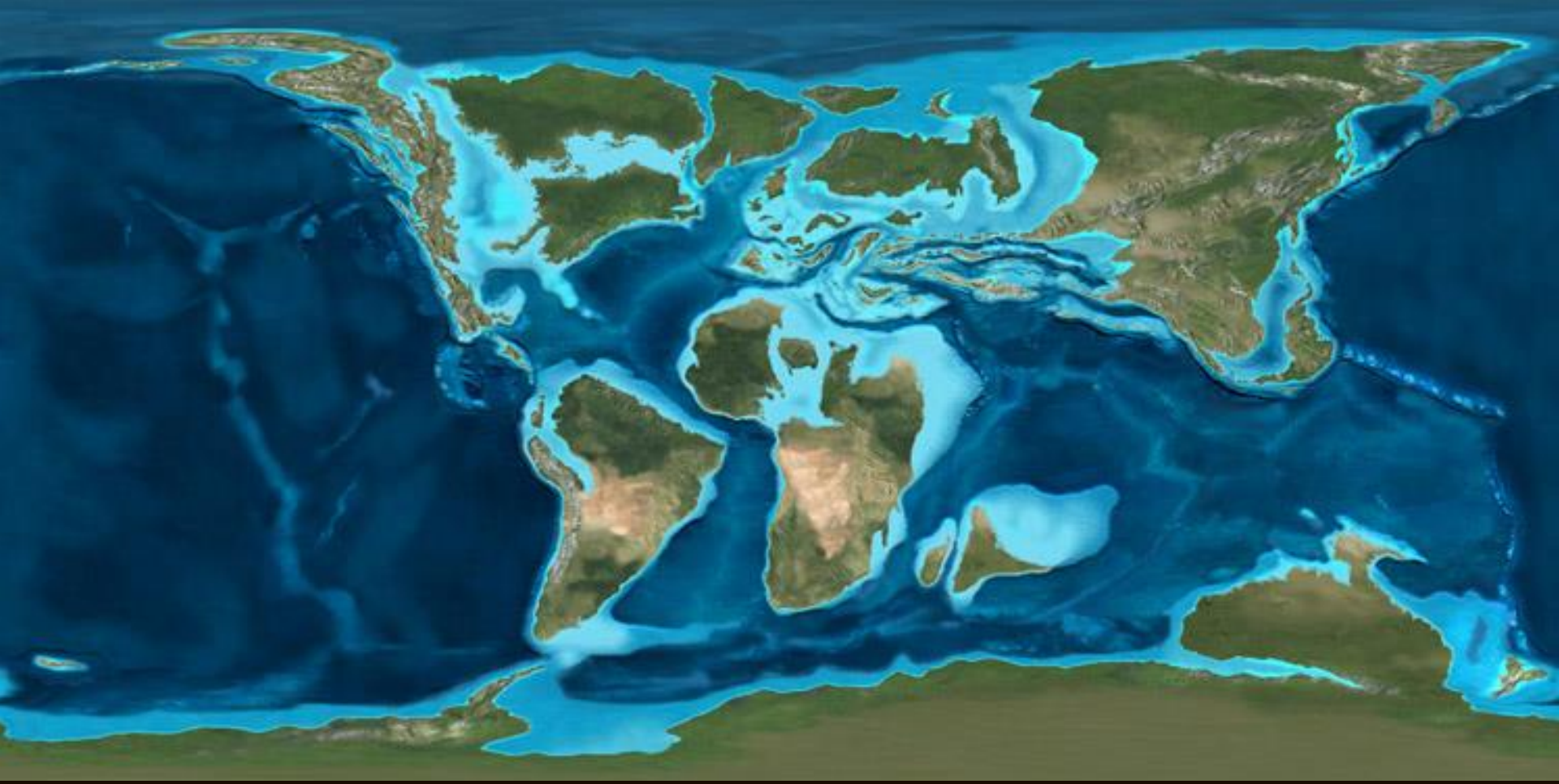
Late Jurassic (-154 Ma)



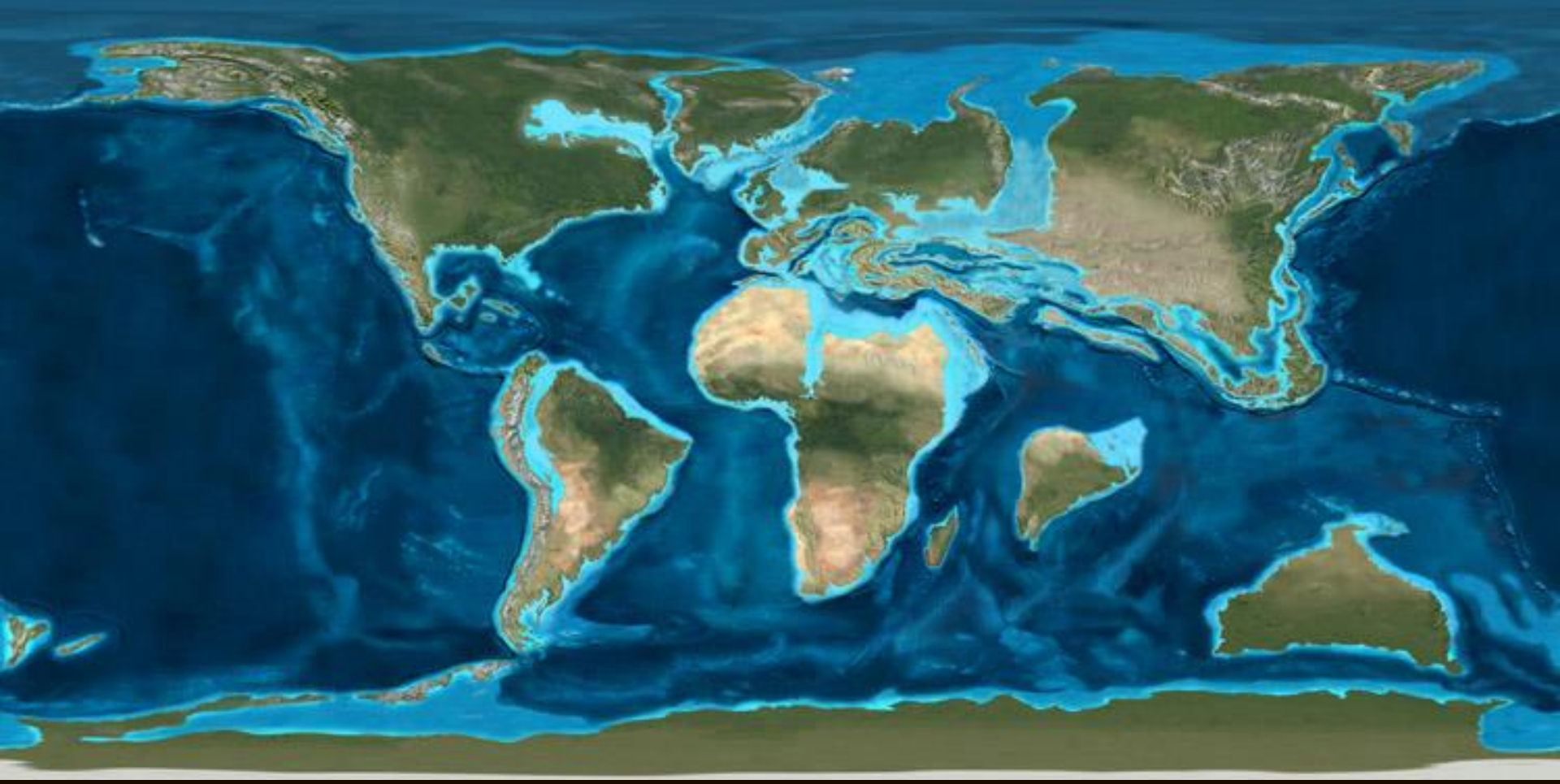
Early Cretaceous (-135 Ma)



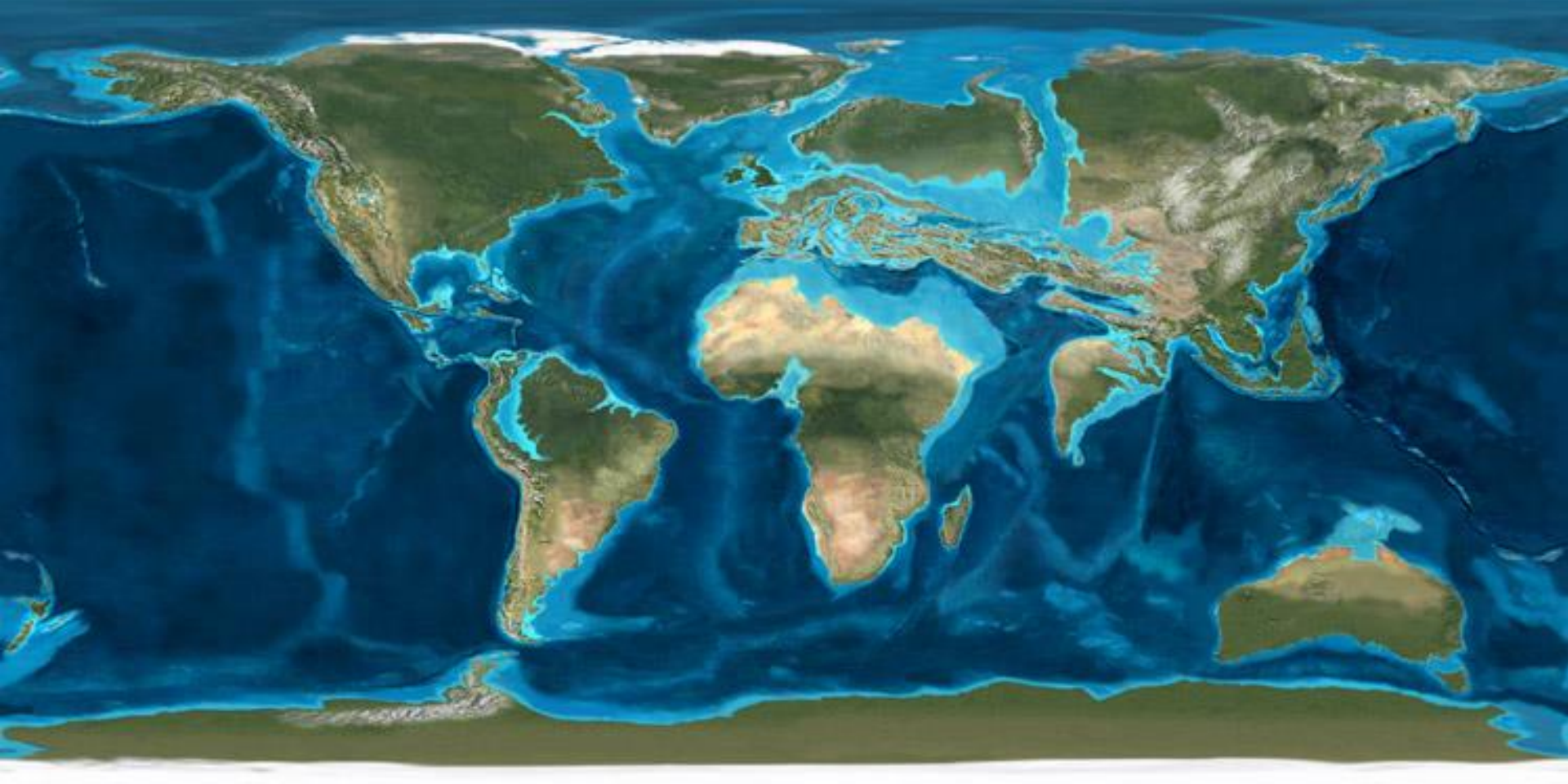
Mid Cretaceous (- 96 Ma)



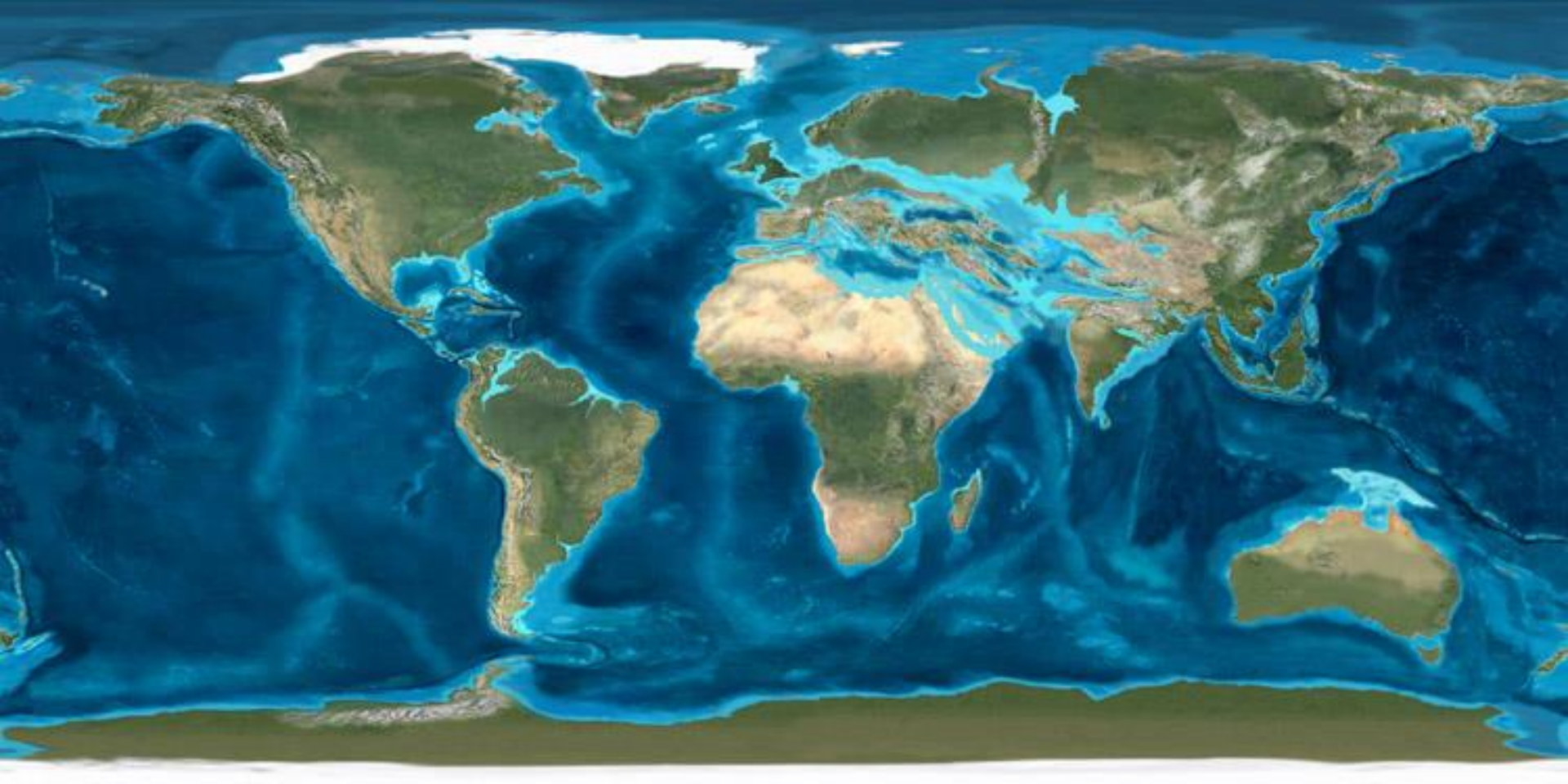
Late Creatceous (-96 -72 Ma)



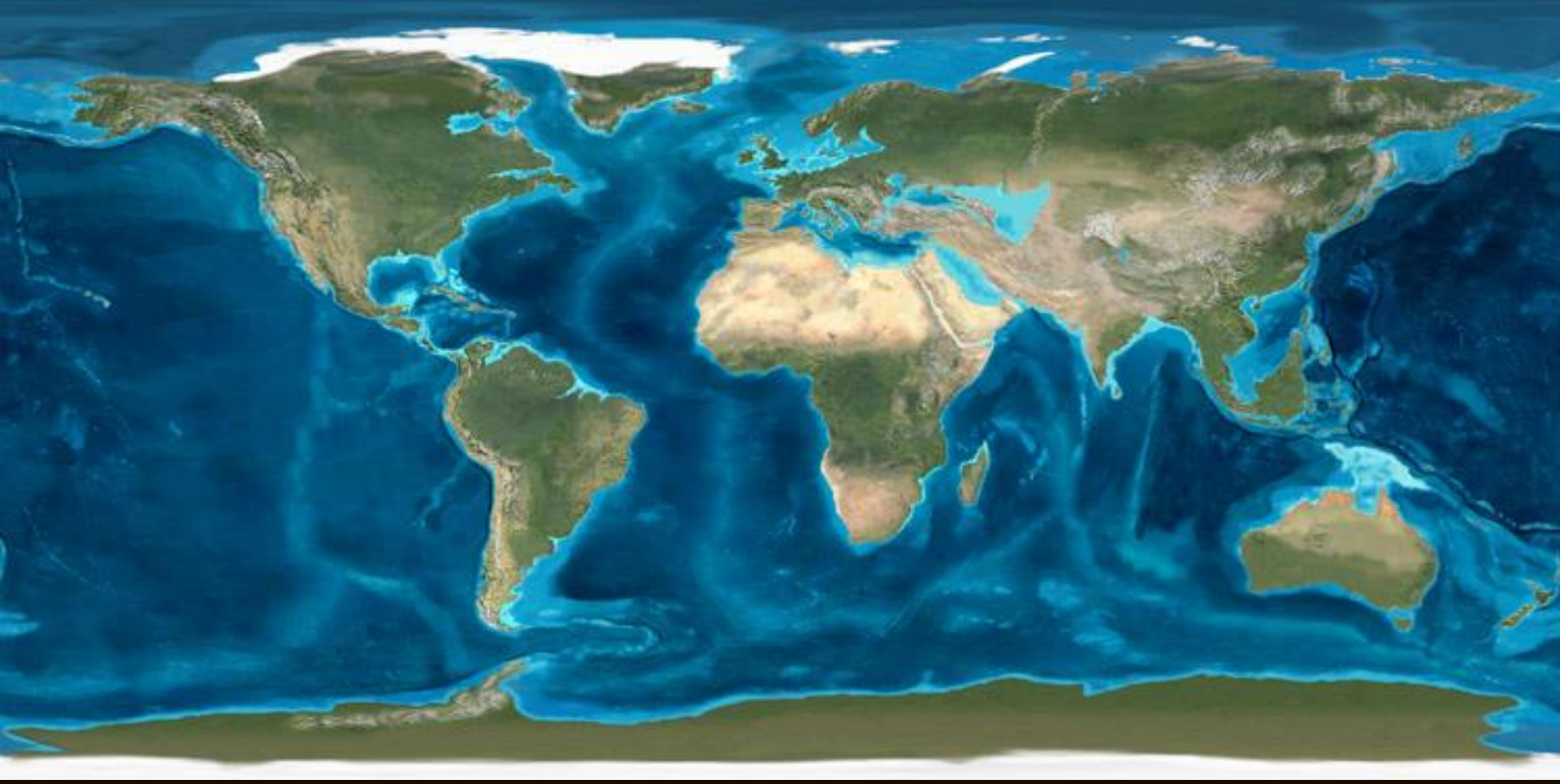
Cretaceous – Tertiary (-65 Ma)



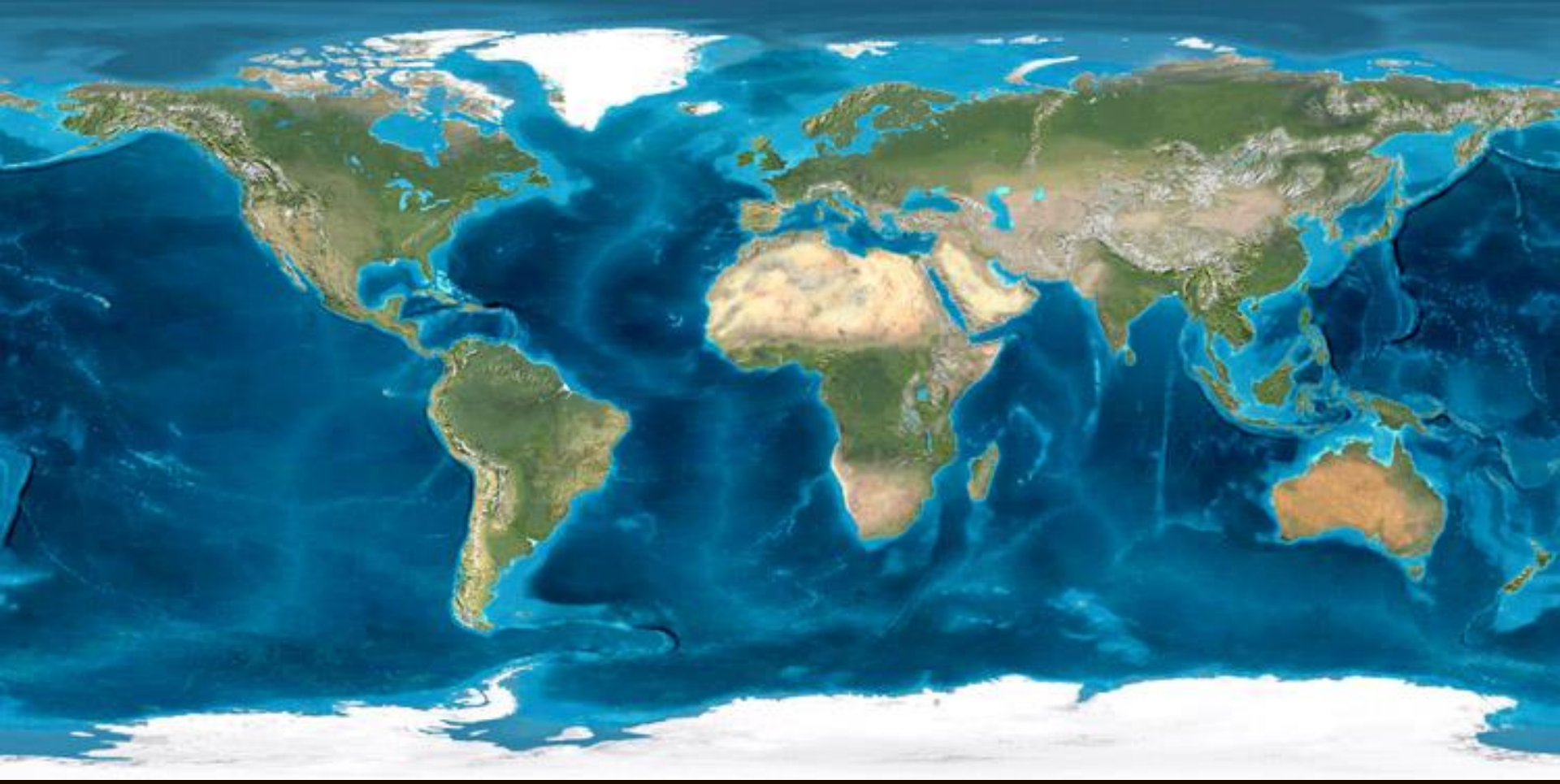
Eocene (-53 Ma – 34 Ma)



Oligocene (-34 – 23.5 Ma)



Miocene (-23.5 -5.3 Ma)



Pliocène (-5.3 – 1.8 Ma)

Fossile - Lebanon

Gastéropodes fossiles (Crétacé – Liban)

Paléotempérature évaluée à 30°C

(KOLODNY and RAAB 1988).

Milieu du **Crétacé**,
Cénomanien
(95 Ma)

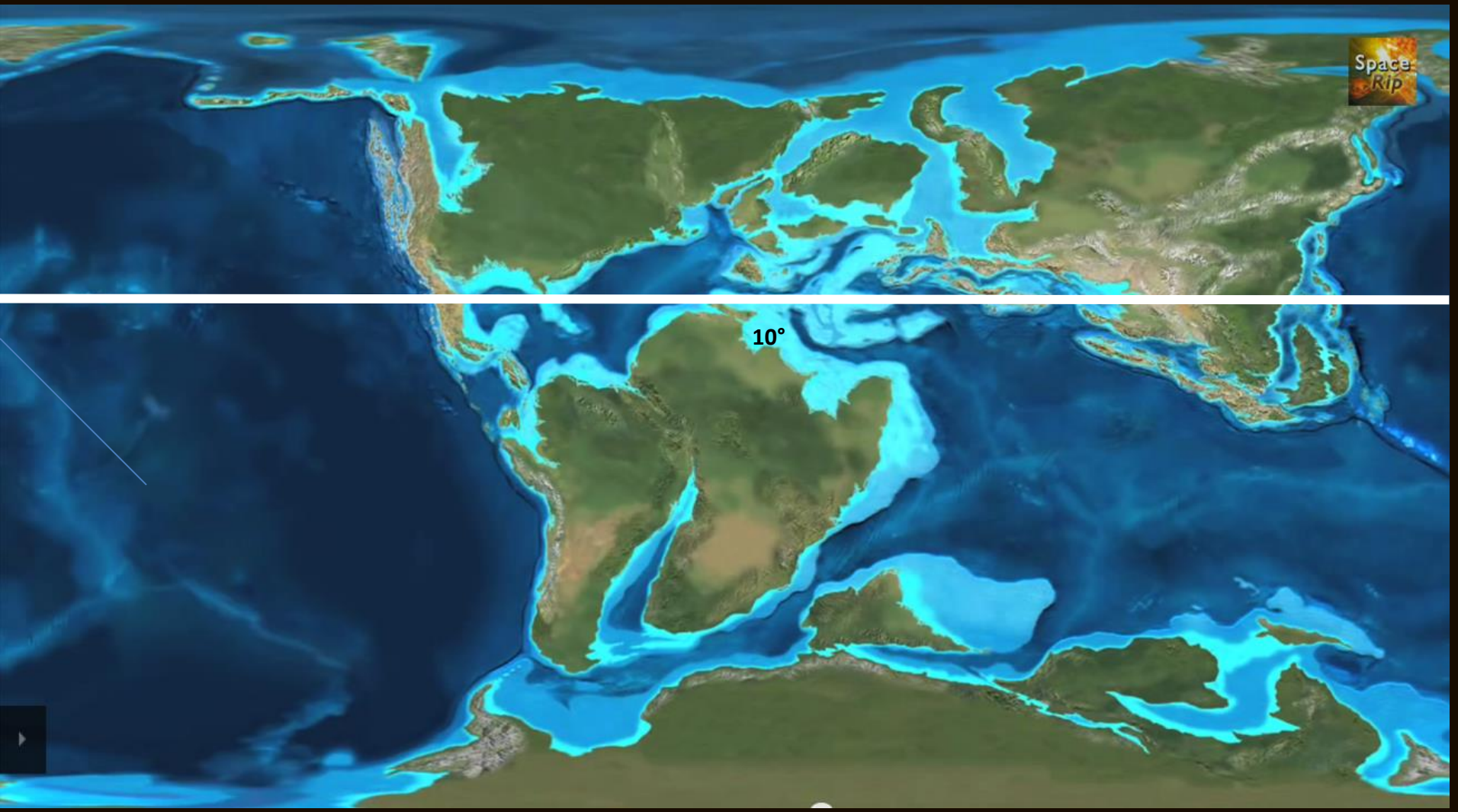
Ctenothrissa sp. (Crétacé - Liban)

Sapindaceae

Cénomanien (-93 Ma)
– En- Nammoura (Liban)

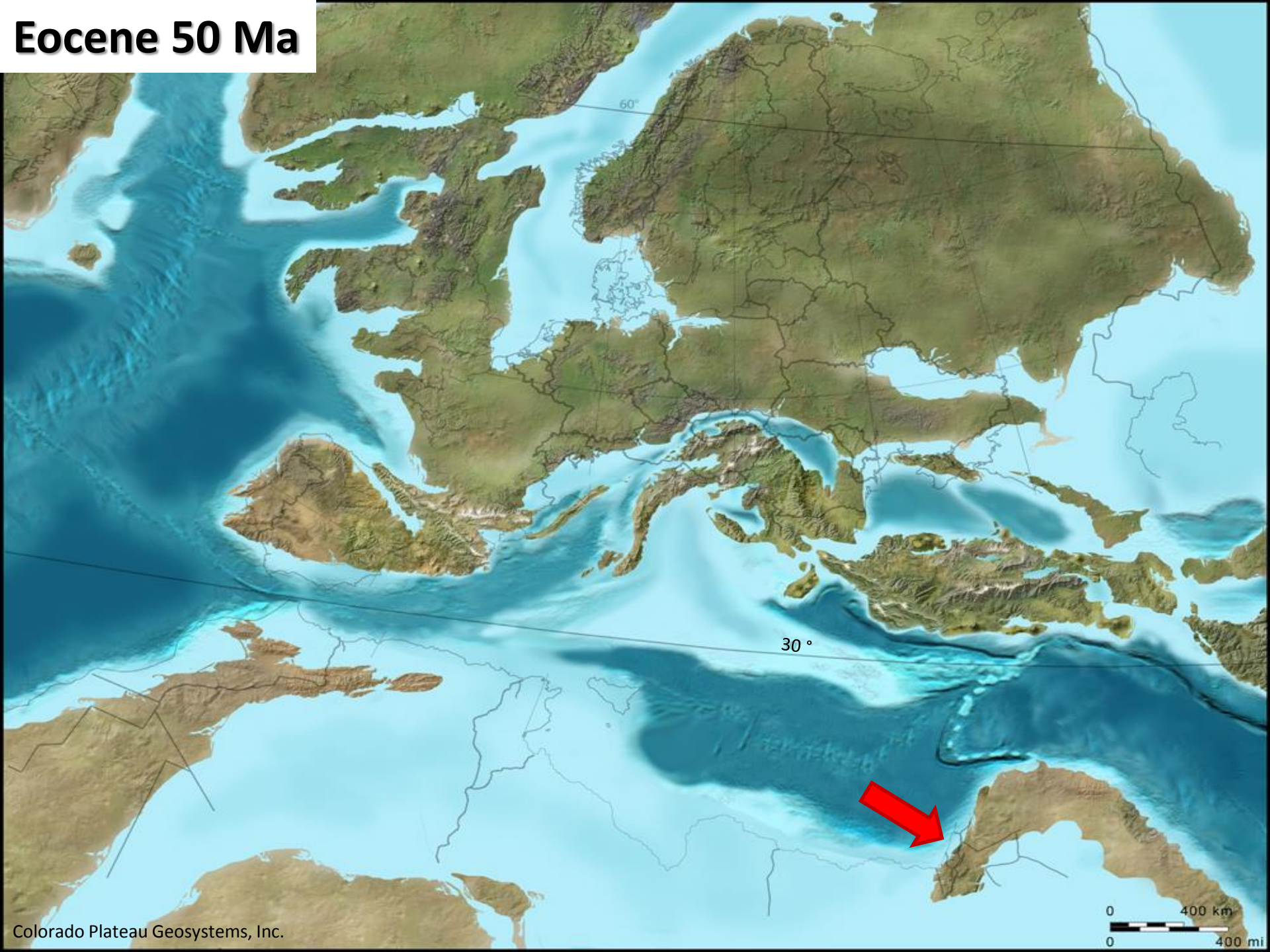
Crétacé moyen
(Aptian / Neocomian) 100 – 130 Ma

Cretaceous 120 Ma



This area of the world is believed to have been at about 10° north latitude during the Cretaceous and, based on oxygen isotopic studies of fish remains from Cenomanian sediments in EMR, the paleotemperature is thought to have been about 30 C (KOLODNYand RAAB 1988).

Eocene 50 Ma



Colorado Plateau Geosystems, Inc.

Oligocene 25 Ma

Miocene 13 Ma

Colorado Plateau Geosystems, Inc.


7 Ma
from Latin ***mediterraneus*** "midland;"
"**sea in the middle of the earth**"
Extinction of tropical elements
0
400 km
0
400 mi

Seasons


A BREATHING EARTH
the annual pulse of vegetation and ice
John Nelson | @JohnNelsonIDV | uxblog.idvsolutions.com
IDV Solutions | @IDVSolutions | idvsolutions.com
Data | NASA Blue Marble | visibleearth.nasa.gov
J
F
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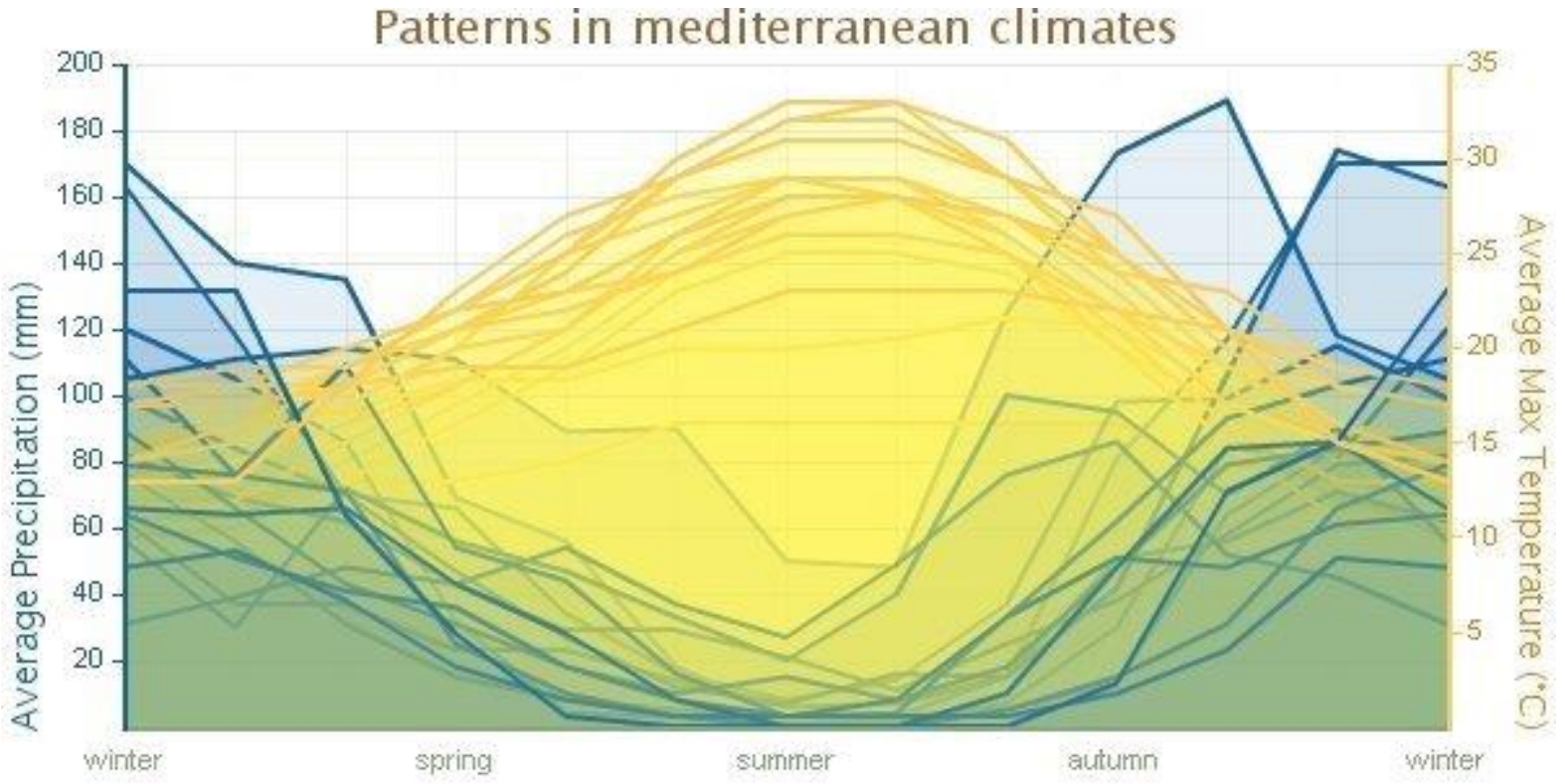
Mediterranean climate



The Mediterranean climate imposes a double constraint on plant growth, lack of moisture in summer and cold temperatures in winter.

The **blue areas** of the chart shows the average rainfall received in one of various mediterranean climate cities, and the overlap of these areas creates a deeper blue. The **yellow areas** show the average maximum temperature of the same cities, deepening with their corresponding overlaps. From left to right the seasons progress — mid-winter, spring, summer, autumn, mid-winter.

Green areas can be thought of as the seasons in which conditions are best for growing things.

http://gimcw.org/climate/data-precip-temp.cfm

Messenian Salinity crisis - 5.6 Million years

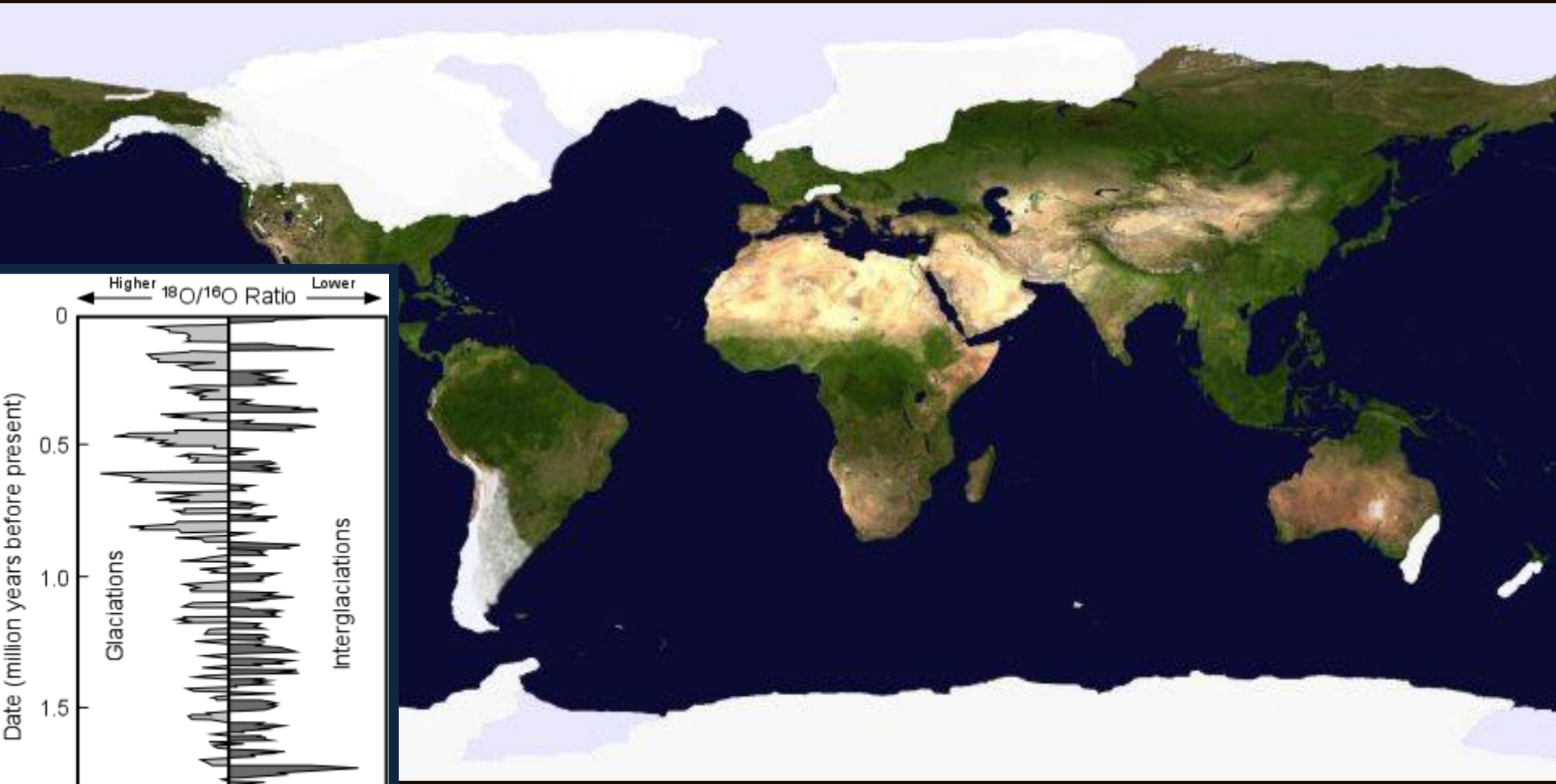
Garcia-Castellanos D., et al. 2009. **Catastrophic flood of the Mediterranean after the Messinian salinity crisis** Nature, **volume 462 Number 7274**

Zanclean flood – 5.33 million years

The Atlantic waters found a way through the present Gibraltar Strait and rapidly refilled the Mediterranean **5.33 million years ago** in an event known as the **Zanclean flood**

This extremely abrupt flood may have involved peak rates of sea level rise in the Mediterranean of more than **10 m/day**.

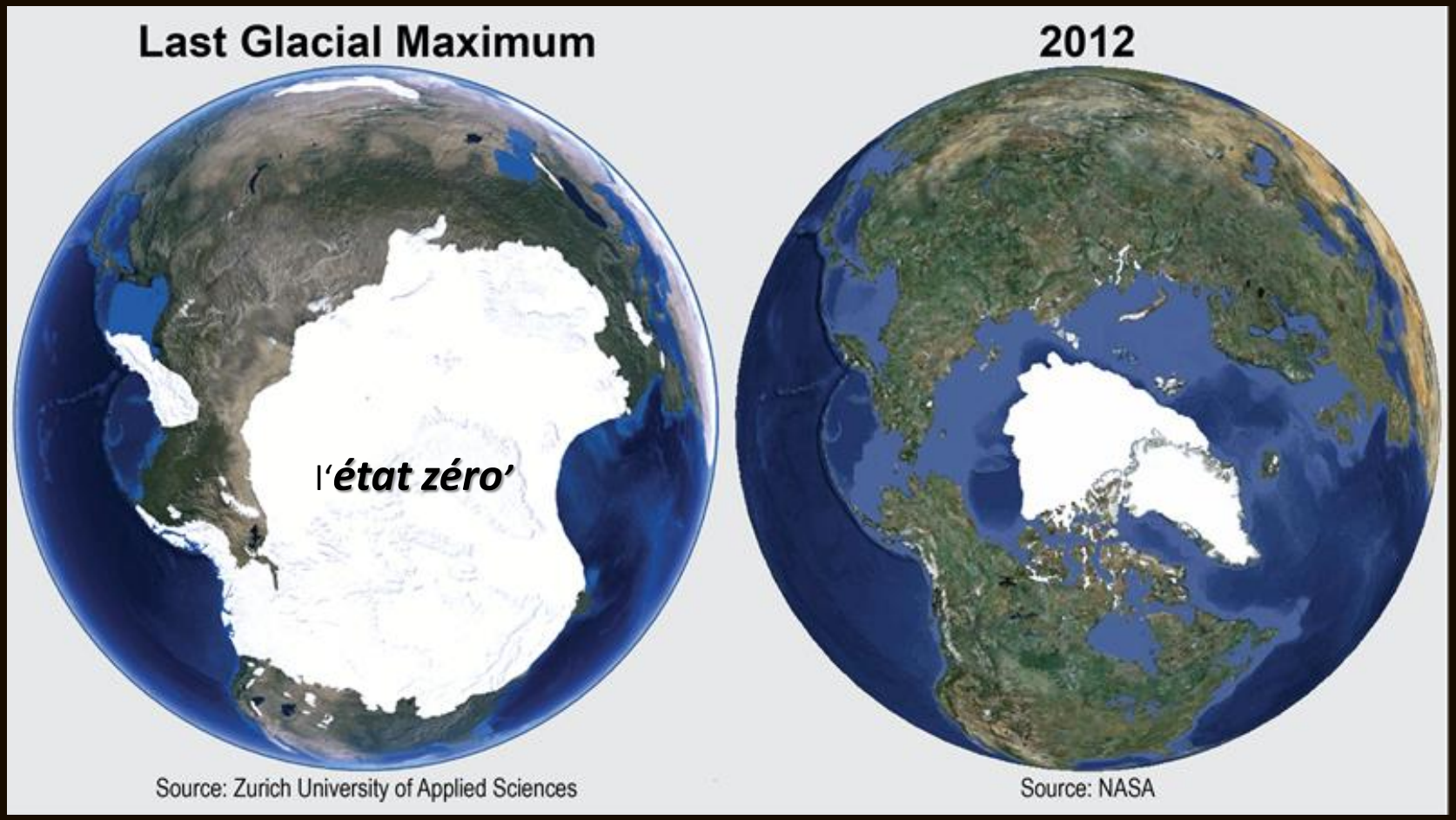
Glaciation cycles



Oscillations

During the glaciations, aridity, associated with reduced temperature, was thus a key factor causing what was to be a third wave of enhanced extinction rates !

Northern view



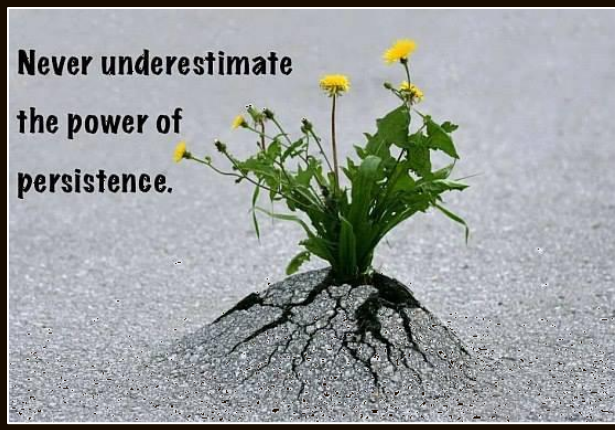
Le maximum glaciaire au Sud de l'Europe est survenu il y a 20 000 ans. La vegetation a connu un moment dramatique le declin vers l'***état zéro' (Pons 1984).*** *Diminution de la temperature de 5 a 7 C.*

It’s not about the circumstances,
but rather what you are made of….

Species response to habitat disturbance

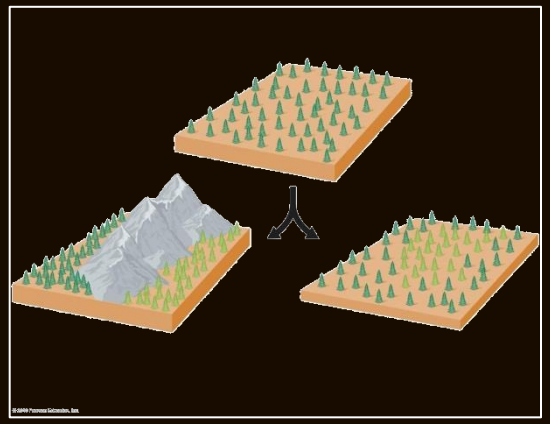
3 main evolutionary scenarios (Schluter, 2001)

- **Persistance**



- Extinction

- Speciation



Same place

After

Extinction de masse de la fin du Permien (-250 Ma)

Before

En surexploitant nos ressources naturelles, c’est avant tout nous mêmes que nous pénalisons.

La Nature, elle, s’en remettra!

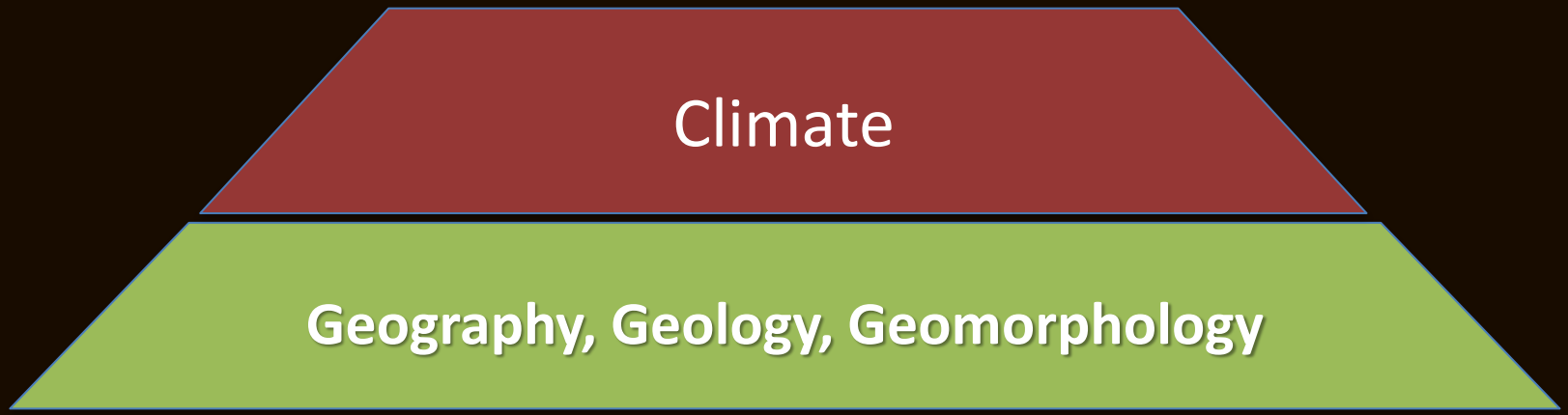
Facteurs d'influence sur la répartition des êtres vivants sont discernées :

1- période antérieure au milieu du Pliocène (>3 Ma)

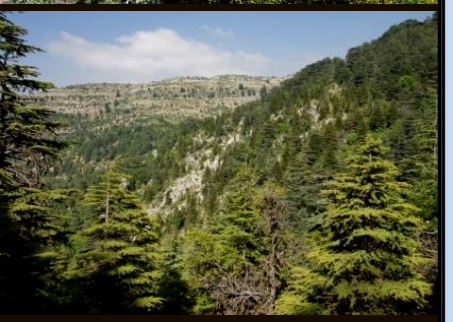
2- Altérations du cycle été-chaud/hiver-froid associées aux glaciations

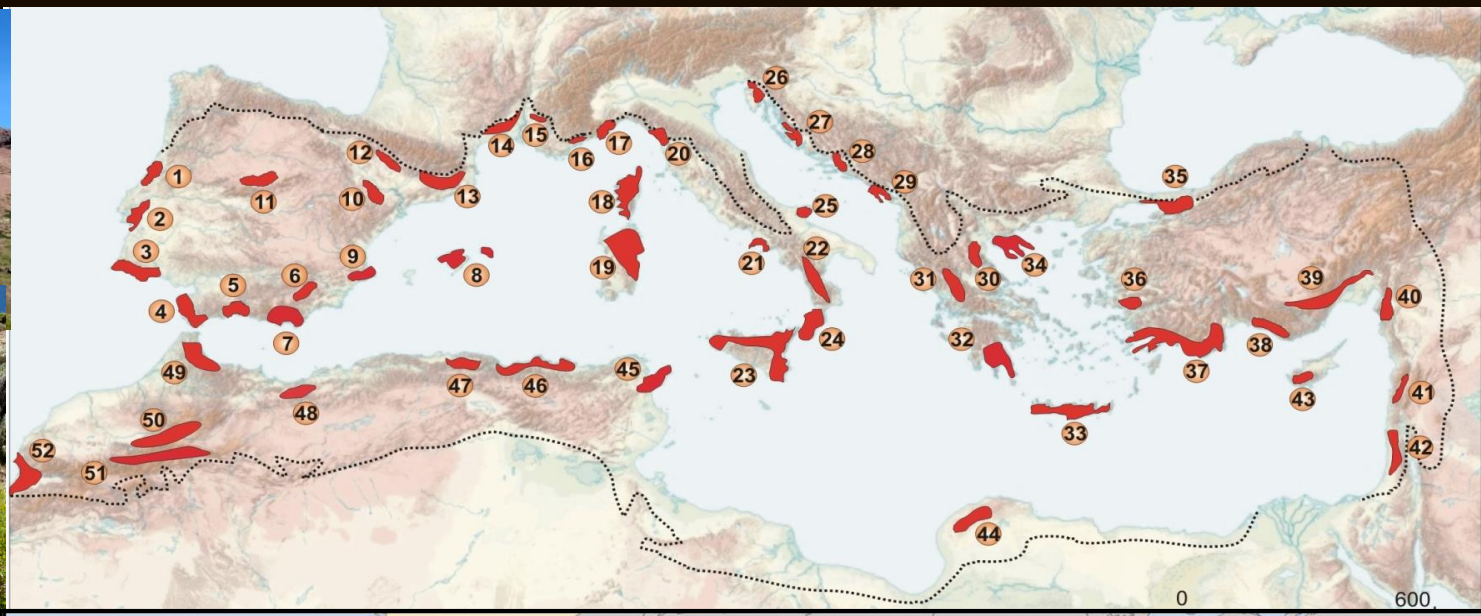
3- changements climatiques dus aux activités humaines depuis la dernière glaciation.

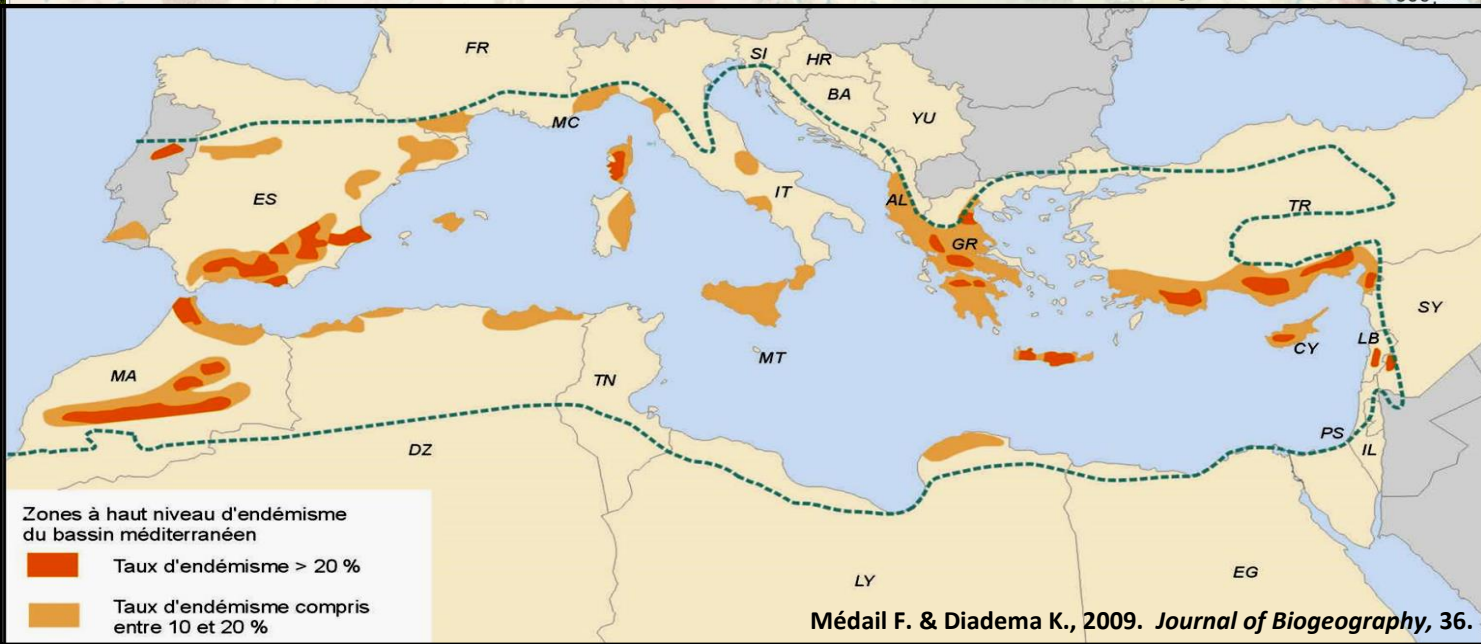
White F. & Léonard J., 2001. *Flora et Vegetatio Mundi*, 9.



Glacial refuge and endemism zones



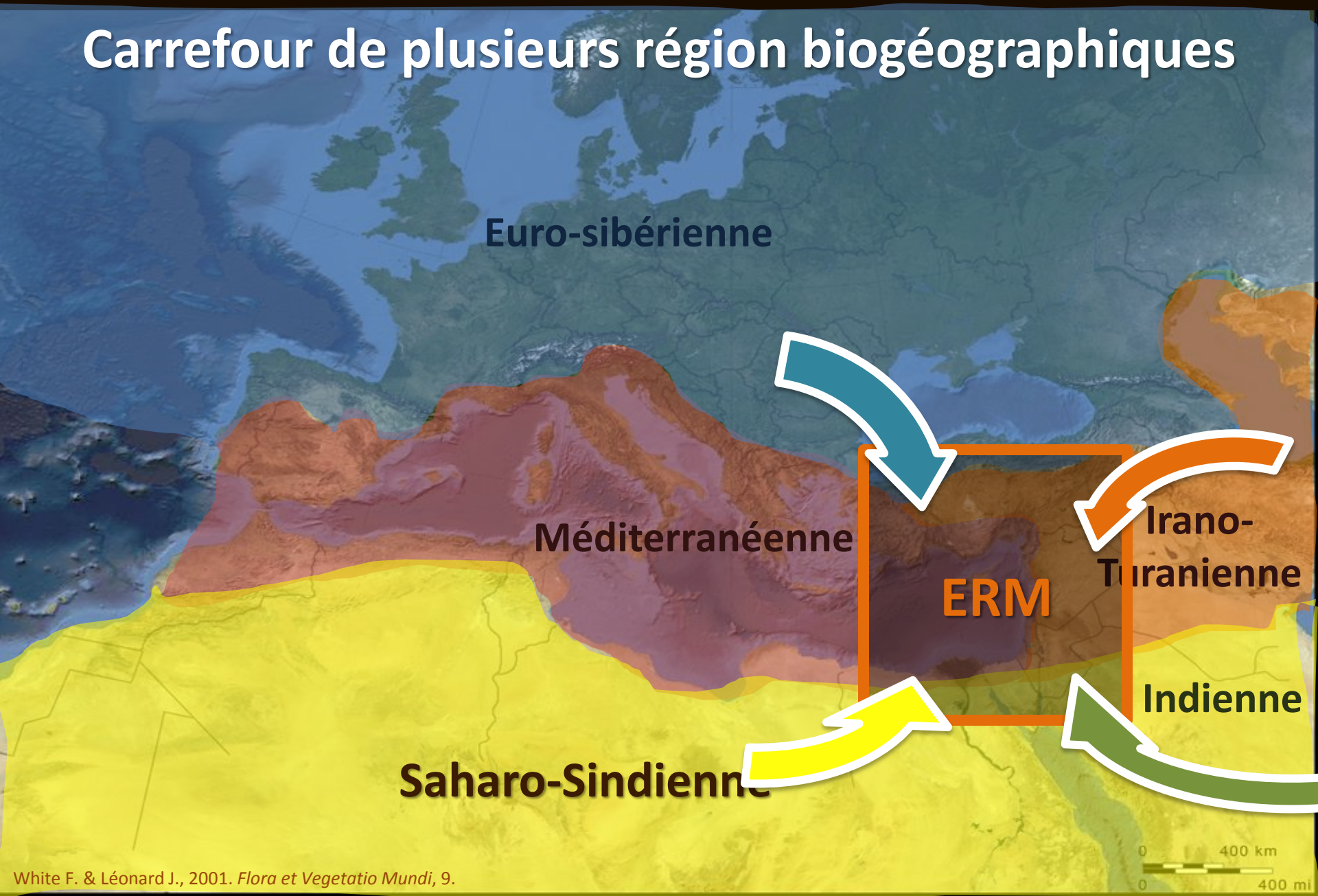




Médail F. & Diadema K., 2009. *Journal of Biogeography*, 36.

Colorado Plateau Geosystems, Inc.

Carrefour de plusieurs région biogéographiques



White F. & Léonard J., 2001. *Flora et Vegetatio Mundi*, 9.

Origin : Euro-Syberian phytogeographic region


Fagus orientalis


Tilia


Acer


Rhododendron

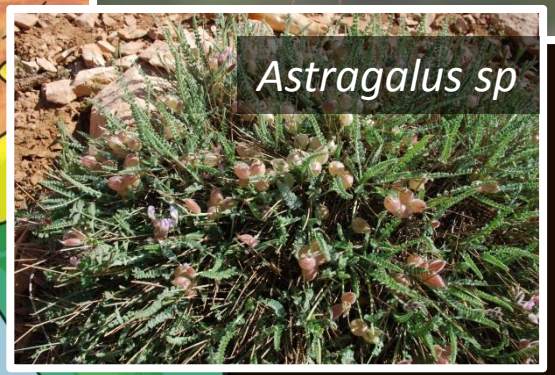

Sorbus

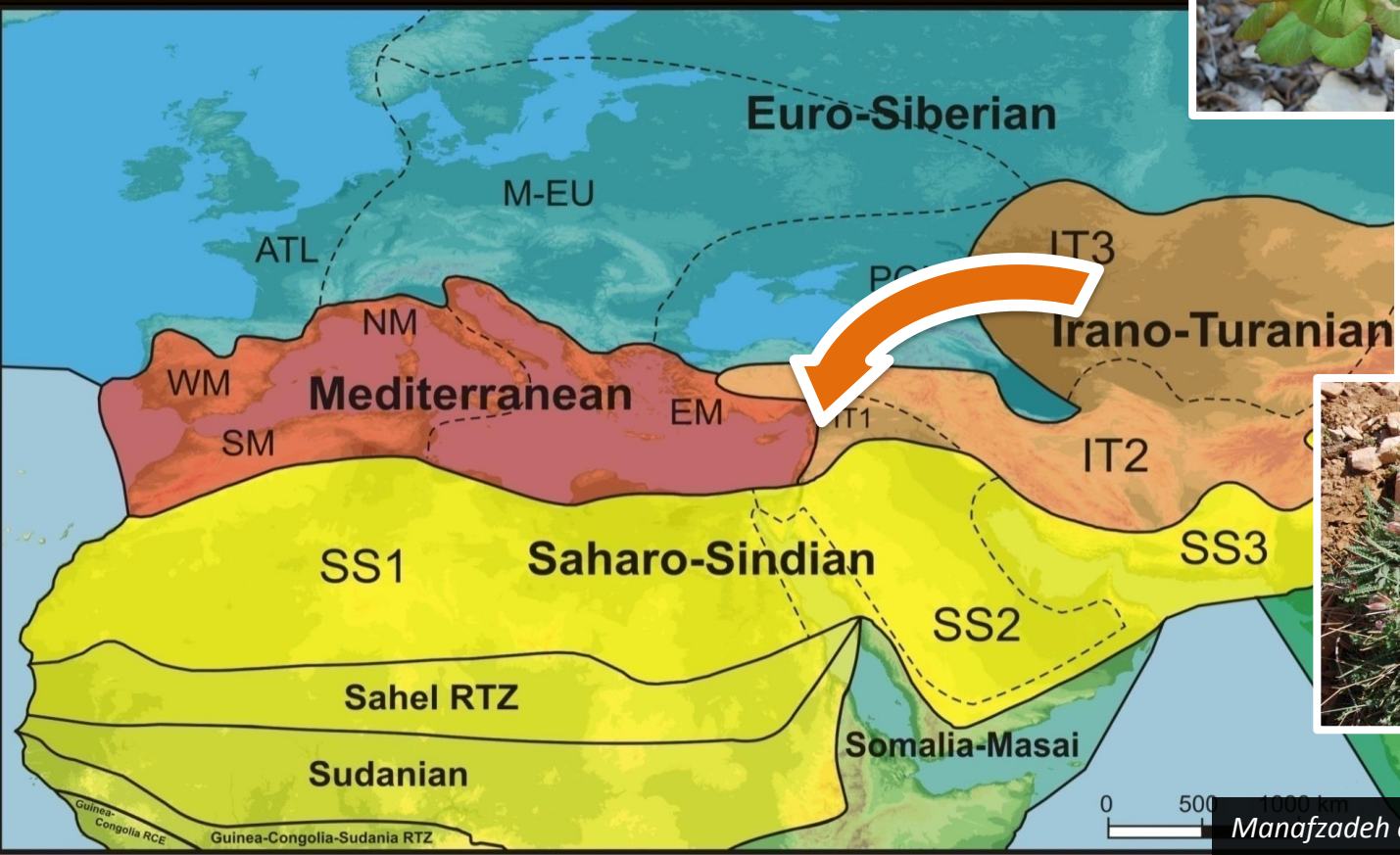
Atalay 1987; Nahal 1962

Origin : Saharo-Sindian phytogeographic region

Eig 1931-1932

Origin : Irano-Turanian phytogeographic region





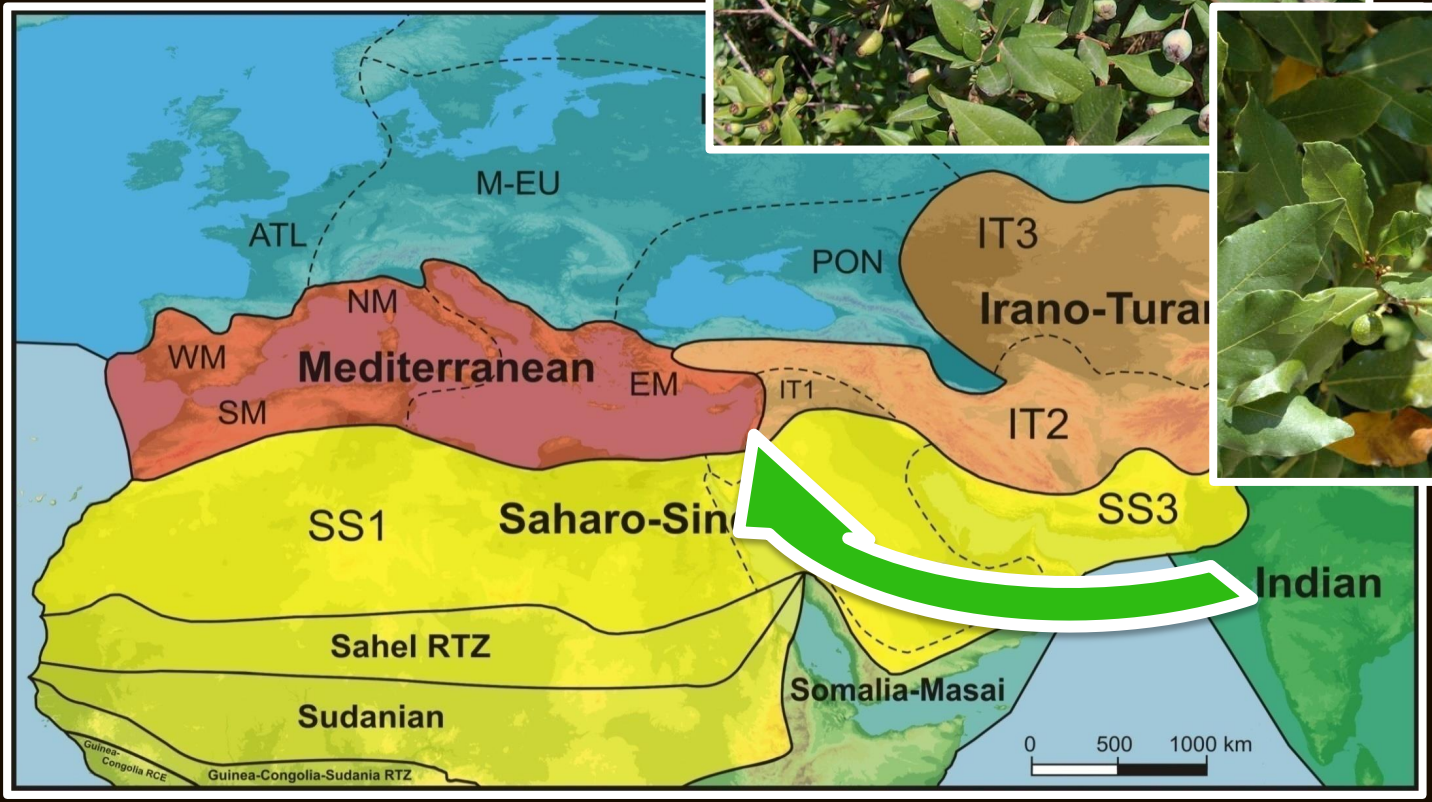
Manafzadeh et al. 2013; Abdel Samad et al. 2014

Origin : xerotropical Indo-Malesian flora

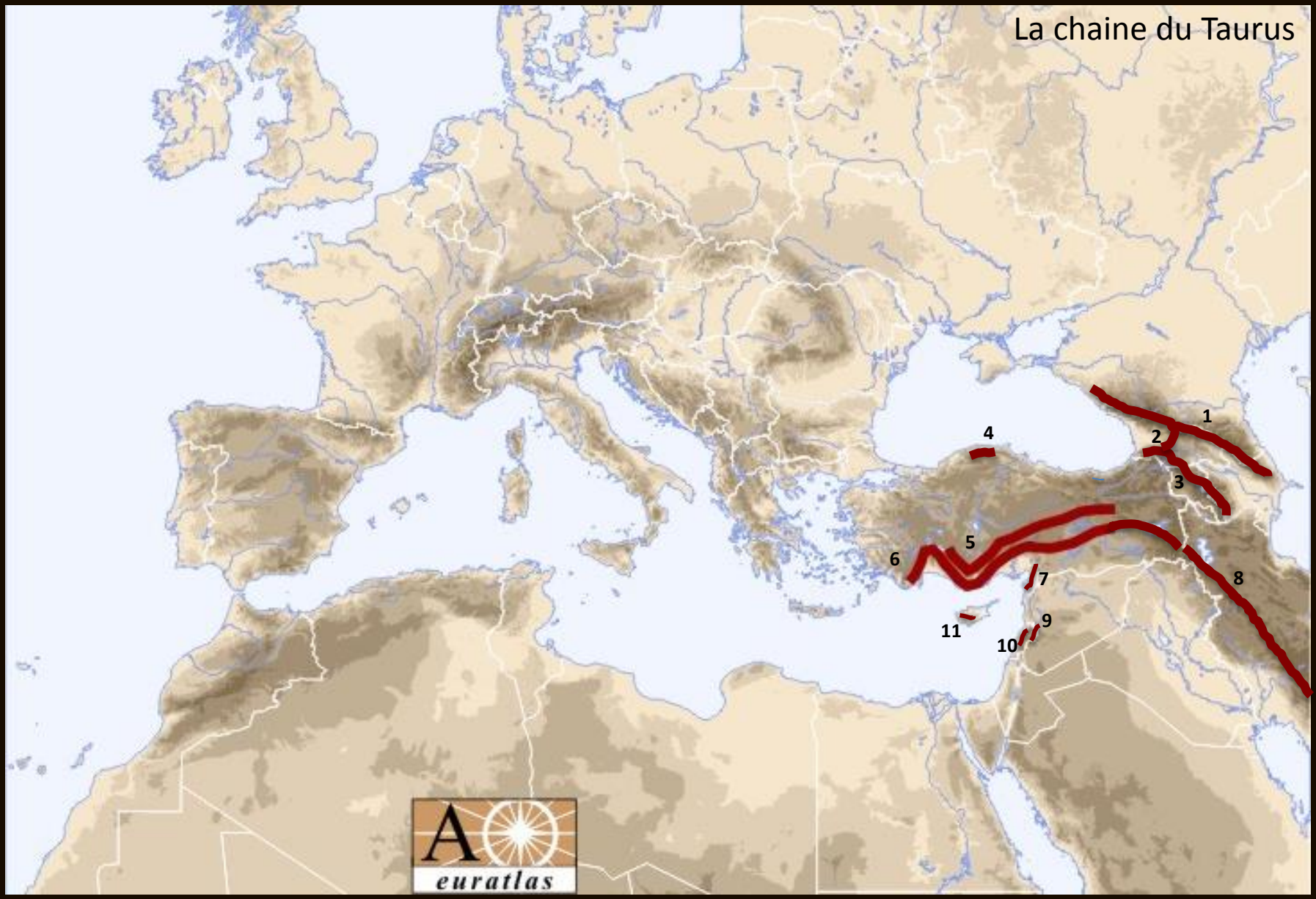
Ceratonia siliqua

Myrtus communis

Laurus nobilis



Zohary (1973), Migliore et al.2012


La chaine du Taurus
1
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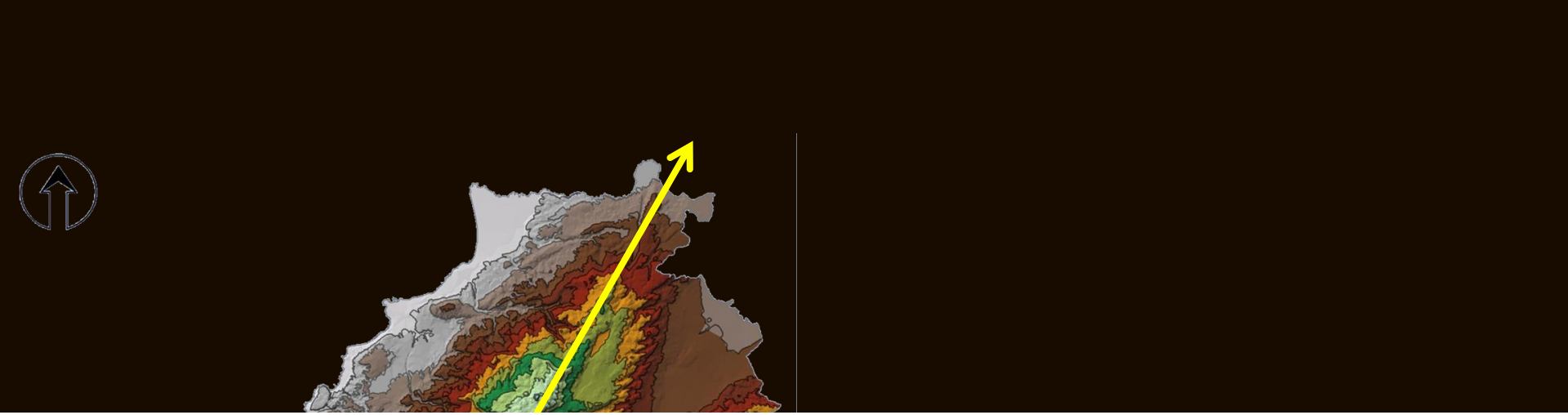
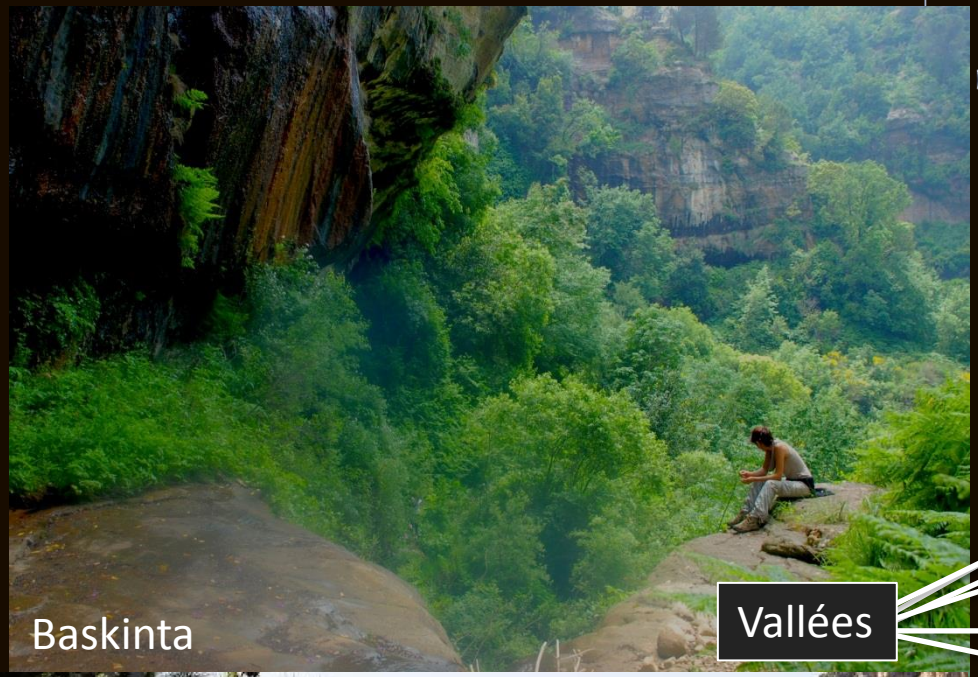
10
11
euratlas


CLEMENT TANNOURI
CHASSEUR D'INSTANTS
Copyright © www.clementtannouri.com
La chaîne du Mont-Liban
Liban: Sur la terre comme au ciel
Lebanon: On Earth As It Is In Heaven


Méditerranée
Mont Liban
Vallee de la Bequaa
Clement Tannoury
Liban: Sur la terre comme au ciel
Lebanon: On Earth As It Is In Heaven
La chaîne du Mont-Liban



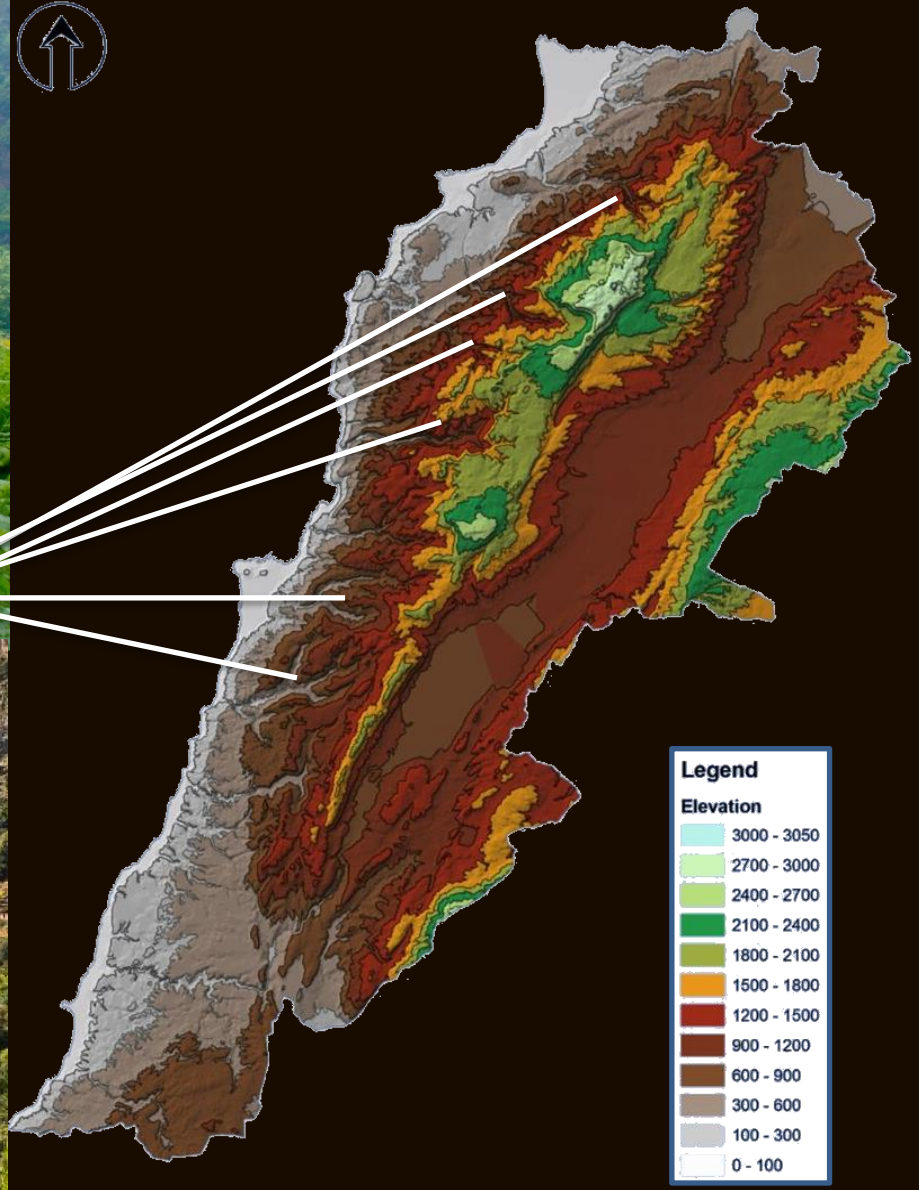
Coupe longitudinale du Mont Liban montrant sommets montagneux et vallées.



Baskinta

Vallées

Quadisha valley



Southern-most edge populations of many “northern” species

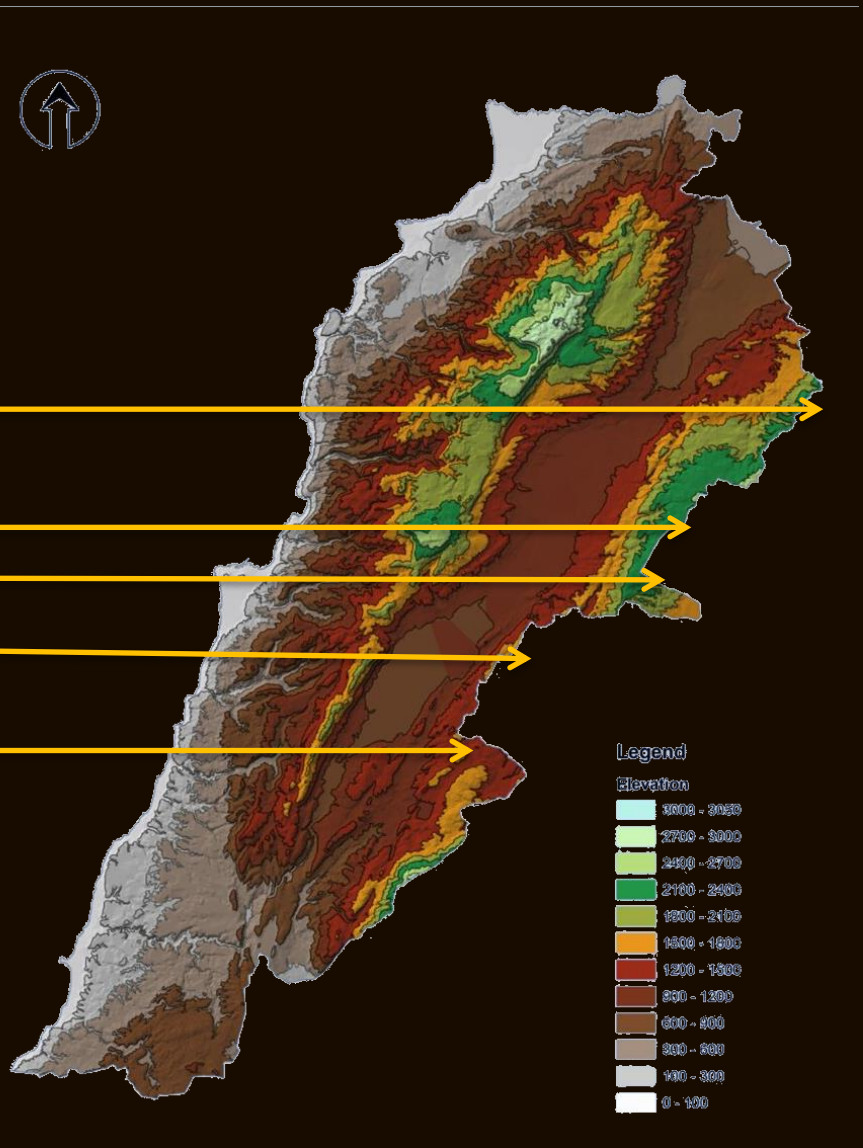
Abies cilicica

Juniperus drupaceae

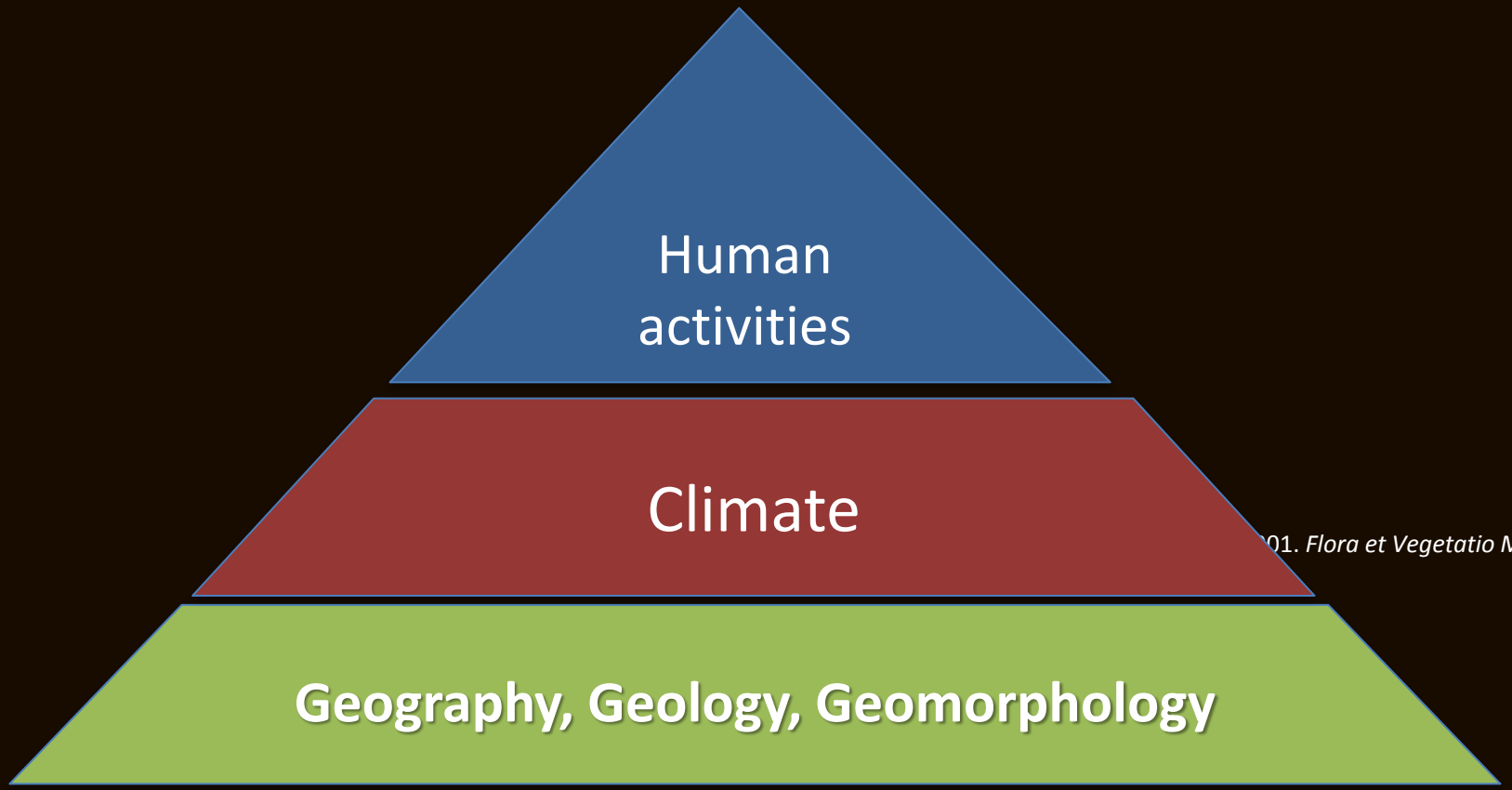
Malus trilobata

Juniperus excelsa

Cedrus libani



Geology, climate, and human activities:
the mould and sculptors of plant diversity

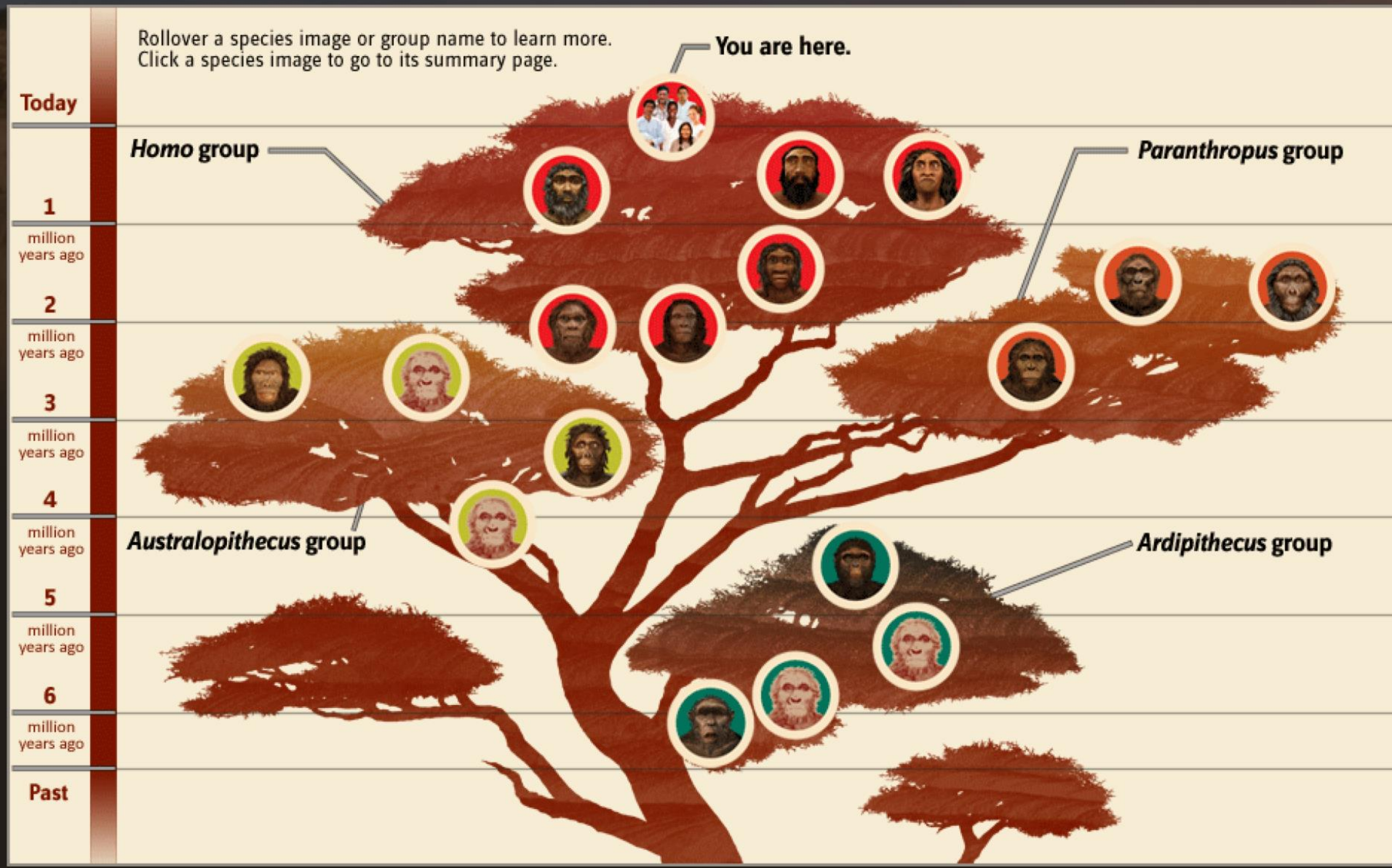


01. *Flora et Vegetatio Mundi*, 9.

Human impact

The Mediterranean is also the home of many human civilizations.

Human activities have been modifying natural habitats and the spatial distribution of species for thousands of years and have thus played a key role in shaping recent and contemporary evolutionary pressures in natural populations.

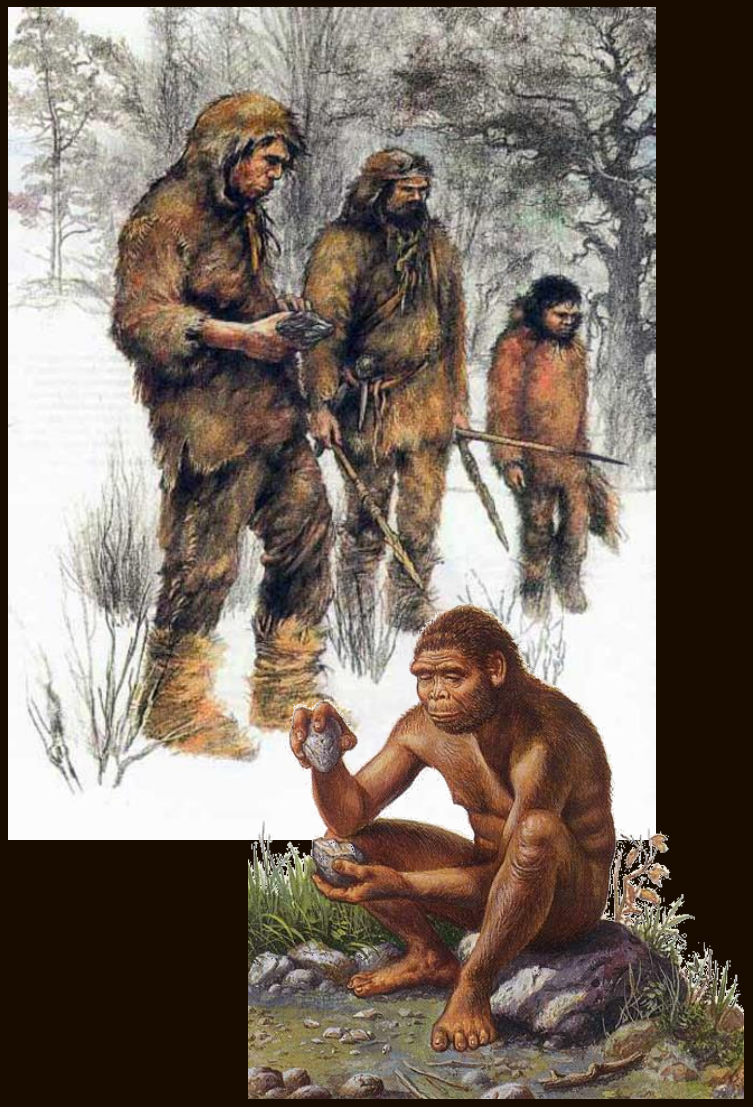


http://humanorigins.si.edu/evidence/human-family-tree

Homo spp.

Welcome *Homo sapiens* …

1- Hunter gatherer



Genèse 1 : 26

« … Faisons l'homme à notre image, selon notre ressemblance, et **qu'il domine sur les poissons de la mer, sur les oiseaux du ciel, sur le bétail, sur toute la terre, et sur tous les reptiles qui rampent sur la terre** ».

Welcome *Homo sapiens* …

2- Agriculture, domestication and settlement,

sedentarisation in *human society*

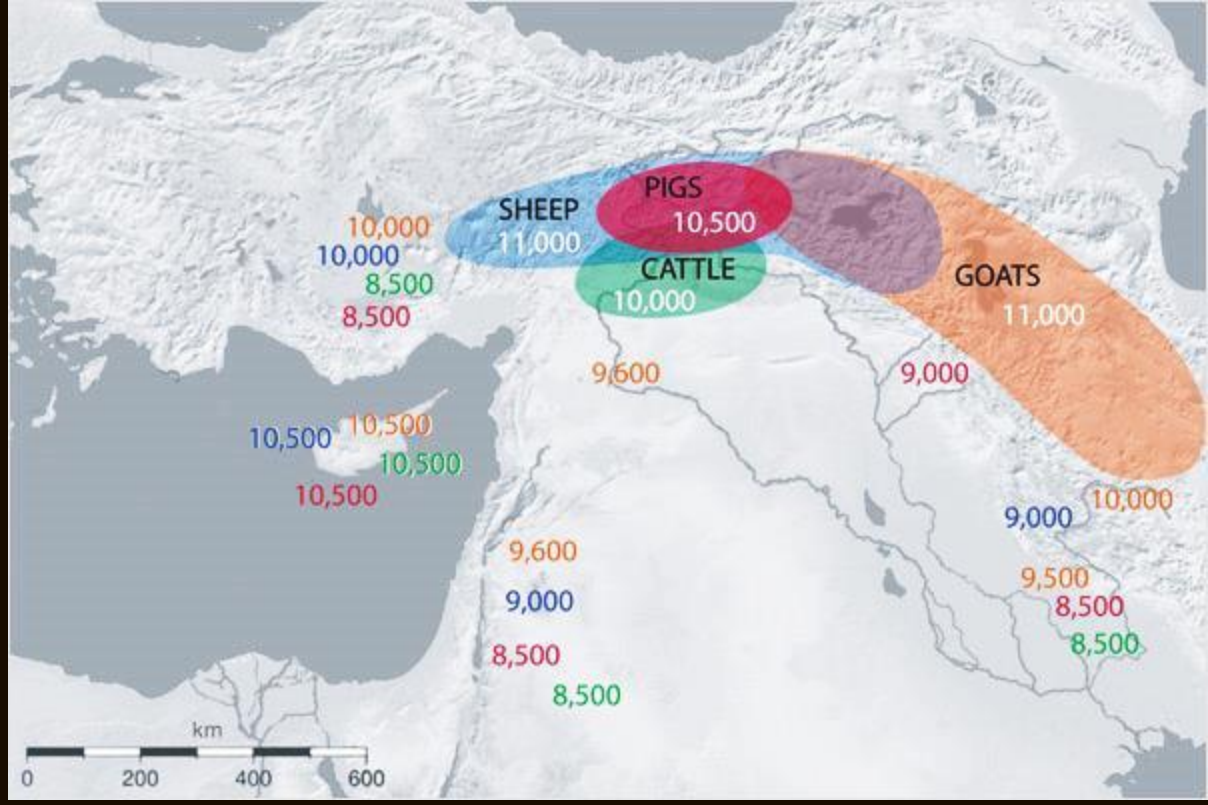
Fertile cressent

“the Fertile Crescent is regarded as the birthplace of agriculture, urbanization, writing, trade, science, history and organized religion and was first populated c.10,000 BCE when agriculture and the domestication of animals began in the region.

Brown et al. 2008 Trends in ecology and evolution

Agriculture and the domestication of animals

Domestication and early agriculture in the Mediterranean Basin: Origins, diffusion, and impact
(Zeder, 2008)



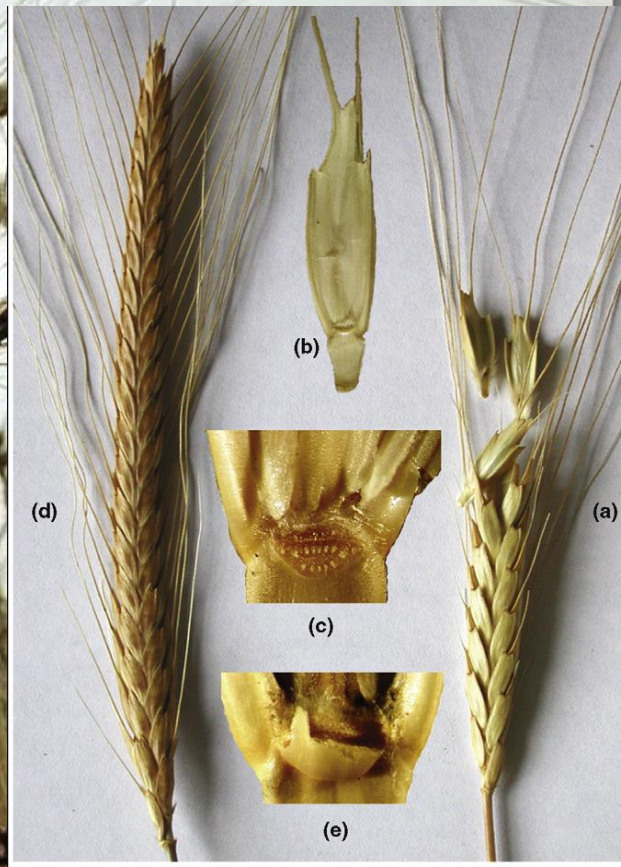
Human and dogs

Dog

The skeletons of a human and dog (*upper left*) discovered underneath a 12,000-year-old home in northern Israel are early evidence of the human-canine bond.

Domestication du **chien** -15 000 a JC - Avant la sédentarisation

Wheat's-eye view. Crop plants adapted slowly to human cultivation, evolving on a time scale of millennia rather than centuries.

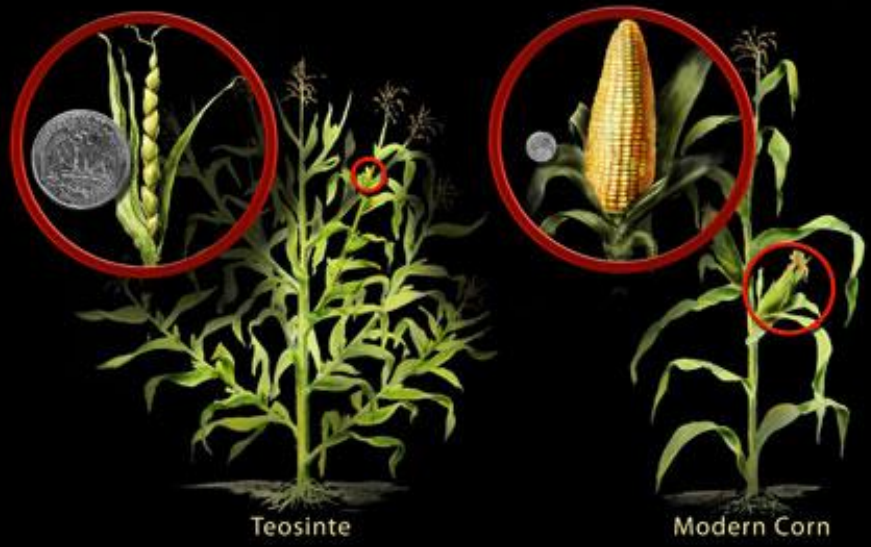


TRENDS in Ecology & Evolution

BALTER M.2007. Seeking Agriculture's Ancient Roots. SCIENCE (New Focus). VOL 316.

Wheat diversity

All in the family. Maize and its wild ancestor teosinte (*left*) are closely related despite their differences.



BALTER M.2007. Seeking Agriculture's Ancient Roots. SCIENCE (New Focus). VOL 316.

Demography evolution

By 2050, the population is expected to total between
8.3 and 10.9 billion.

10 milliards
8
6
4
2
1 milliard
8
6
4
2
100 millions
8
6
4
2
10 millions
8
6
4
2
1 million
8
6
4
2
1

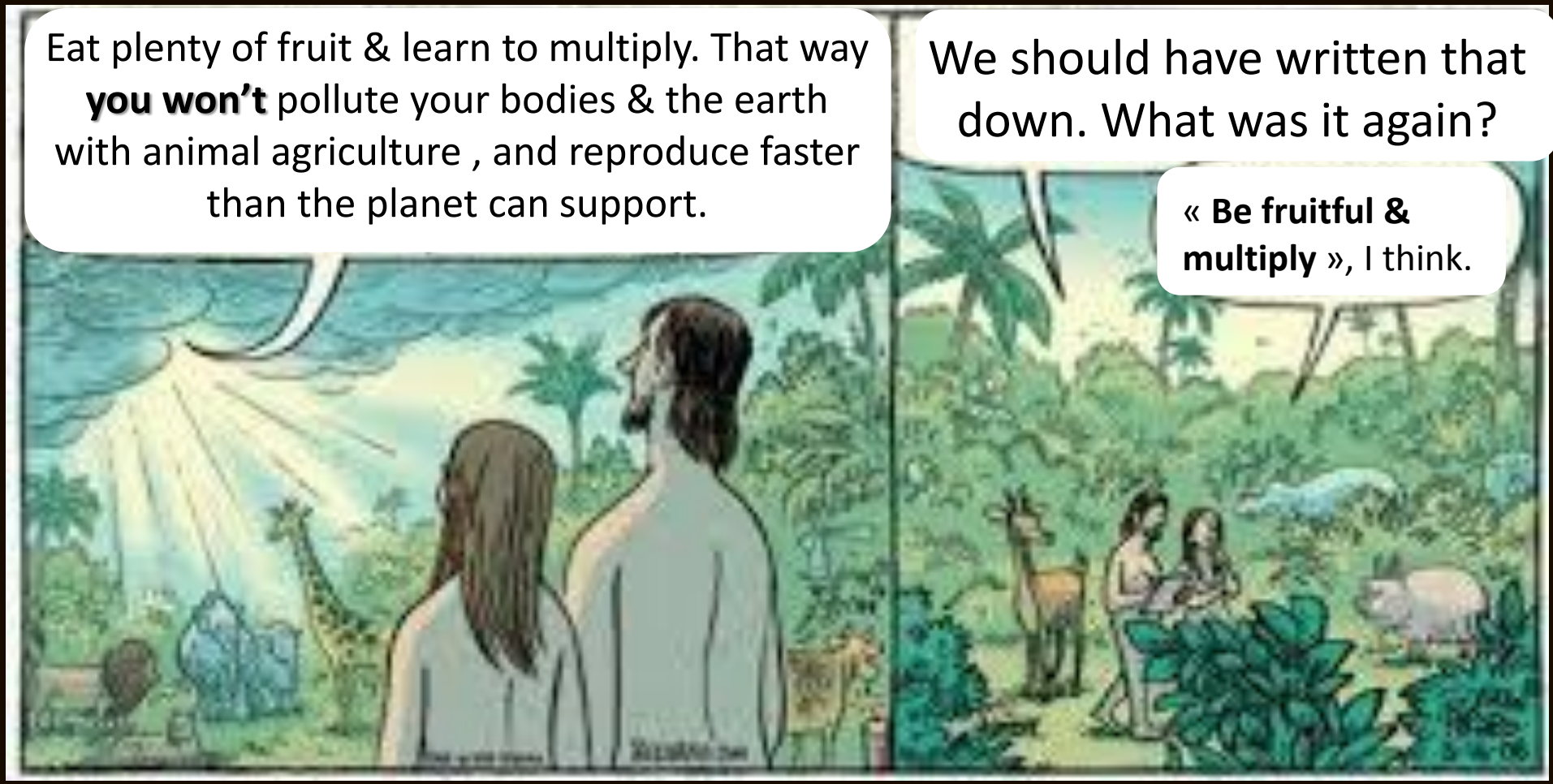
Haut Moyen Âge (épidémies et grandes invasions)
Peste Noire
Âge du Fer (invasions, guerres)
Âge du Bronze (invasions, guerres)
Révolution industrielle
Aléas climatiques
Révolution néolithique
Aléas climatiques
Innovations techniques du Paléolithique supérieur
Peuplement de nouveaux territoires : Australie
Amérique
Afrique du Nord (2e vague)
Afrique du Nord
Amérique (2e vague)

-65 000 -60 000 -55 000 -50 000 -45 000 -40 000 -35 000 -30 000 -25 000 -20 000 -15 000 -10 000 -5 000 JC 5 000

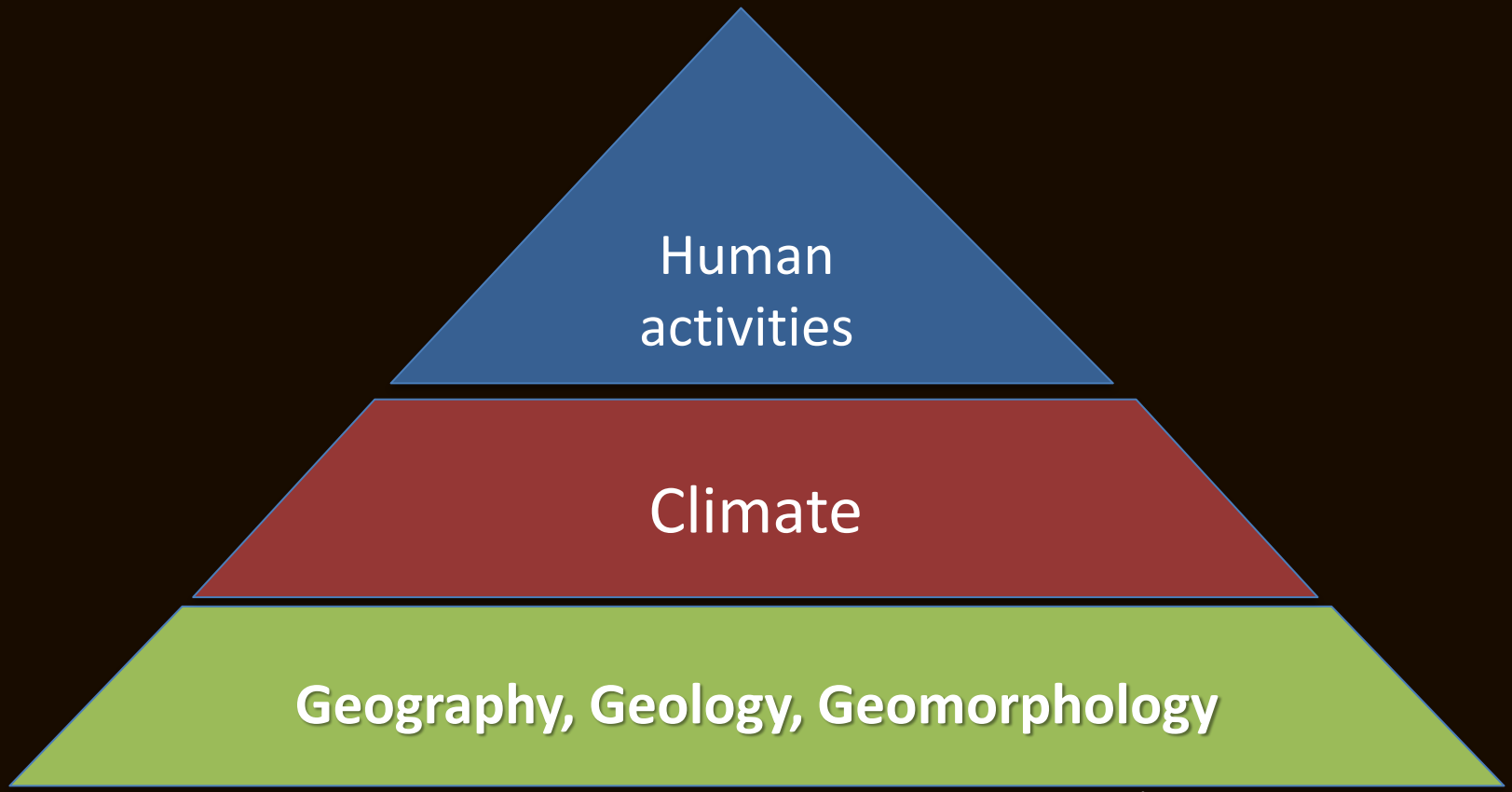
Recul et extinction de l'Homme de Java devant les Homo sapiens sapiens

Recul et extinction de l'Homme de Néandertal devant les Homo sapiens sapiens

INED
41403


Eat plenty of fruit & learn to multiply. That way **you won't** pollute your bodies & the earth with animal agriculture , and reproduce faster than the planet can support.
We should have written that down. What was it again?
« **Be fruitful & multiply** », I think.

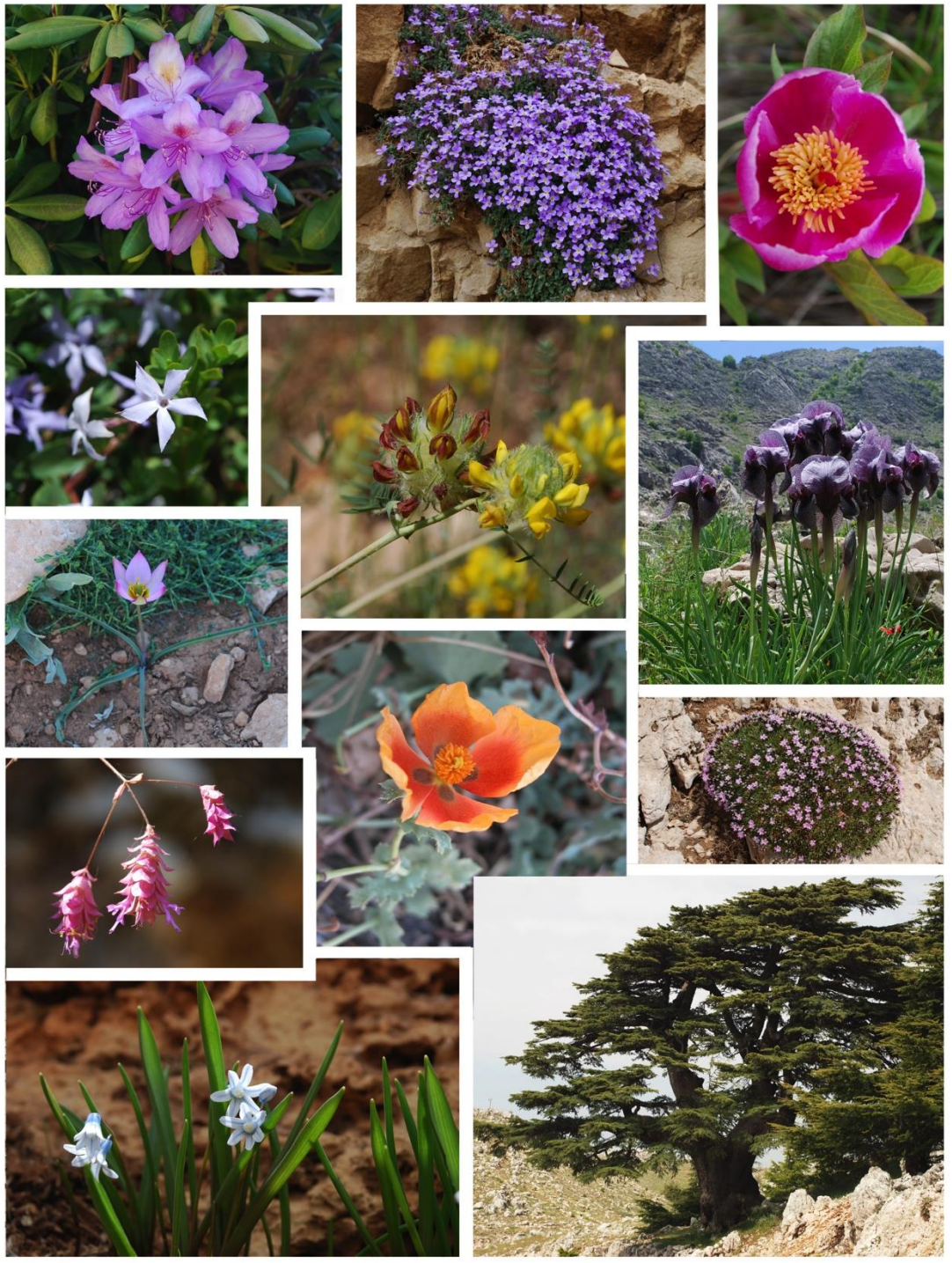
Geology, climate, and human activities:
the mould and sculptors of plant diversity



White F. & Léonard J., 2001. *Flora et Vegetatio Mundi*, 9.

Each flora is UNIQUE

Result of different evolutions pathways over millions of years….



The Global Transportation System

human-mediated dispersal of species into new regions

Exotic species

Non Indigenous Species (NIS)

Alien species

Introduced species

?

Pizza Hut

Domino's Pizza

BURGER KING

KFC

SUBWAY eat fresh.

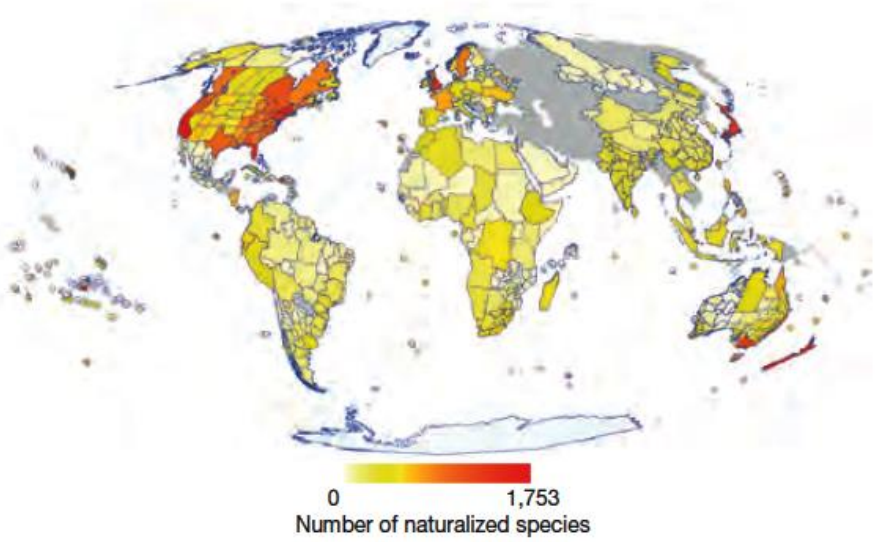
LETTER

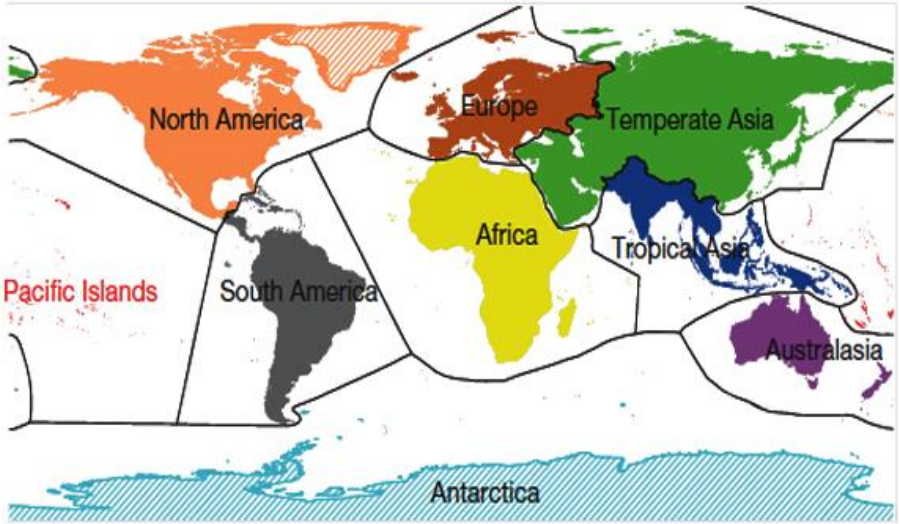
Nature, 2015

doi:10.1038/nature14910

Global exchange and accumulation of non-native plants

Mark van Kleunen[1], Wayne Dawson[1], Franz Essl[2], Jan Pergl[3], Marten Winter[4], Ewald Weber[5], Holger Kreft[6], Patrick Weigelt[6], John Kartesz[7], Misako Nishino[7], Liubov A. Antonova[8], Julie F. Barcelona[9], Francisco J. Cabezas[10], Dairon Cárdenas[11], Juliana Cárdenas-Toro[12,13], Nicolás Castaño[11], Eduardo Chacón[2,14], Cyrille Chatelain[15], Aleksandr L. Ebel[16], Estrela Figueiredo[17,18], Nicol Fuentes[19], Quentin J. Groom[20], Lesley Henderson[21], Inderjit[22], Andrey Kupriyanov[23], Silvana Masciadri[24,25], Jan Meerman[26], Olga Morozova[27], Dietmar Moser[2], Daniel L. Nickrent[28], Annette Patzelt[29], Pieter B. Pelser[9], María P. Baptiste[12], Manop Poopath[30], Maria Schulze[31], Hanno Seebens[32], Wen-sheng Shu[33], Jacob Thomas[34], Mauricio Velayos[10], Jan J. Wieringa[35,36] & Petr Pyšek[3,37,38]





In total **13,168** plant species corresponding to **3,9 %** of the extant global vasular flora have become naturalised somewhere on the globe as a result of human activity.

Approximately the size of the Native European flora

NO - NO - NO

For Biotic homogenization

Native plant communities are vital components of ecosystems.

In order to be healthy and sustainable, an ecosystem needs to be filled with a wide array of plants and animals indigenous to the area.

Native plants are valued for their economic, ecological, genetic, and aesthetic benefits in addition to the growing societal belief in their intrinsic value as living species.

Advantages of native plants:

- add beauty to the landscape and preserve our natural heritage
- provide food and habitat for native wildlife
- serve as an important genetic resource for future food crops or other plant-derived products
- help slow down the spread of fire by staying greener longer
- decrease the amount of water needed for landscape maintenance
- require very little long-term maintenance if they are properly planted and established
- protect water quality by controlling soil erosion and moderating floods and droughts

Using native plants to restore the landscape or as a substitute for exotic ornamental plantings can help to reverse the trend of species loss.

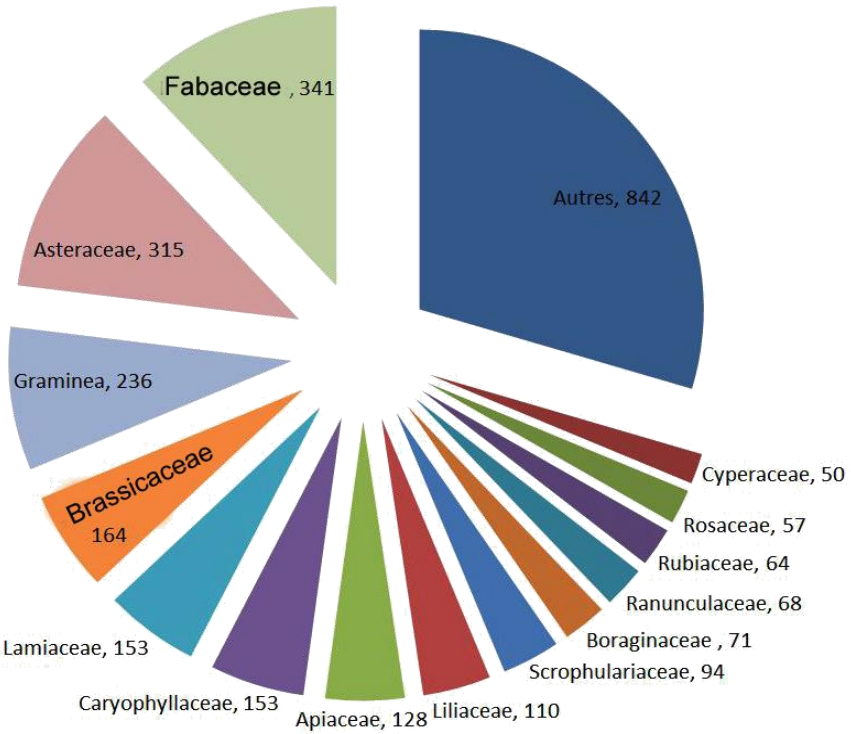
Lebanon flora in a glance!

131 Families

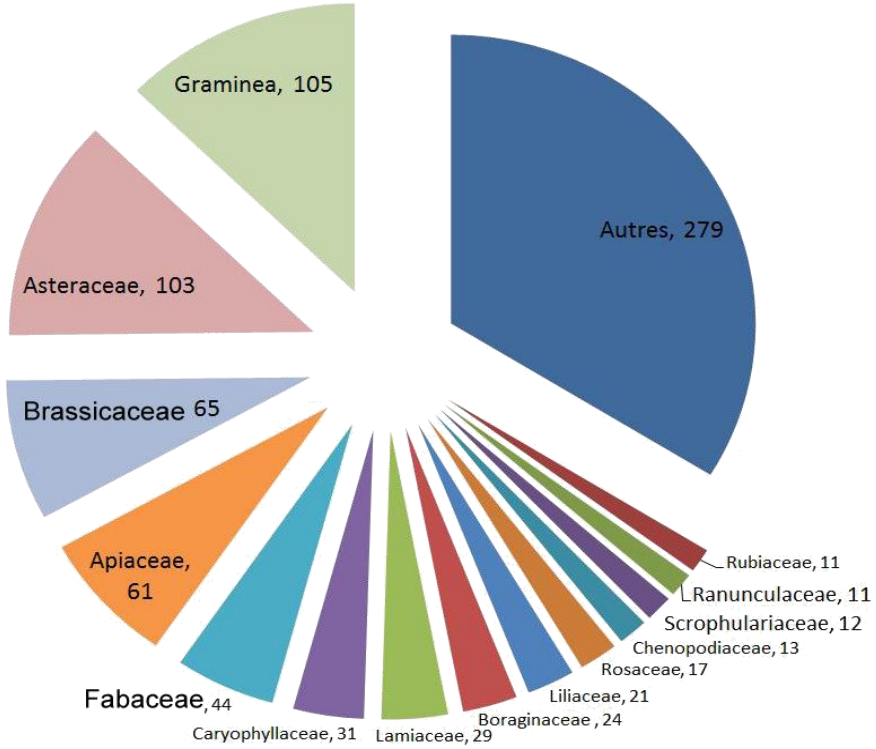
826 Genera

2845 Taxa

Species richness per Family.



Genus richness per family

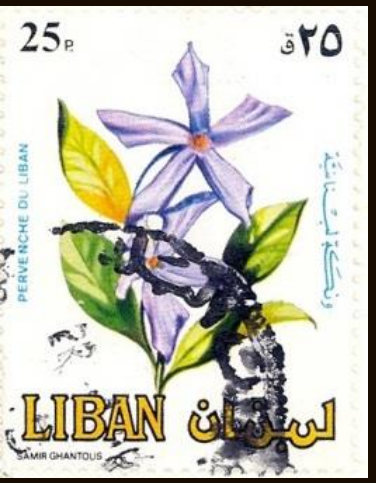


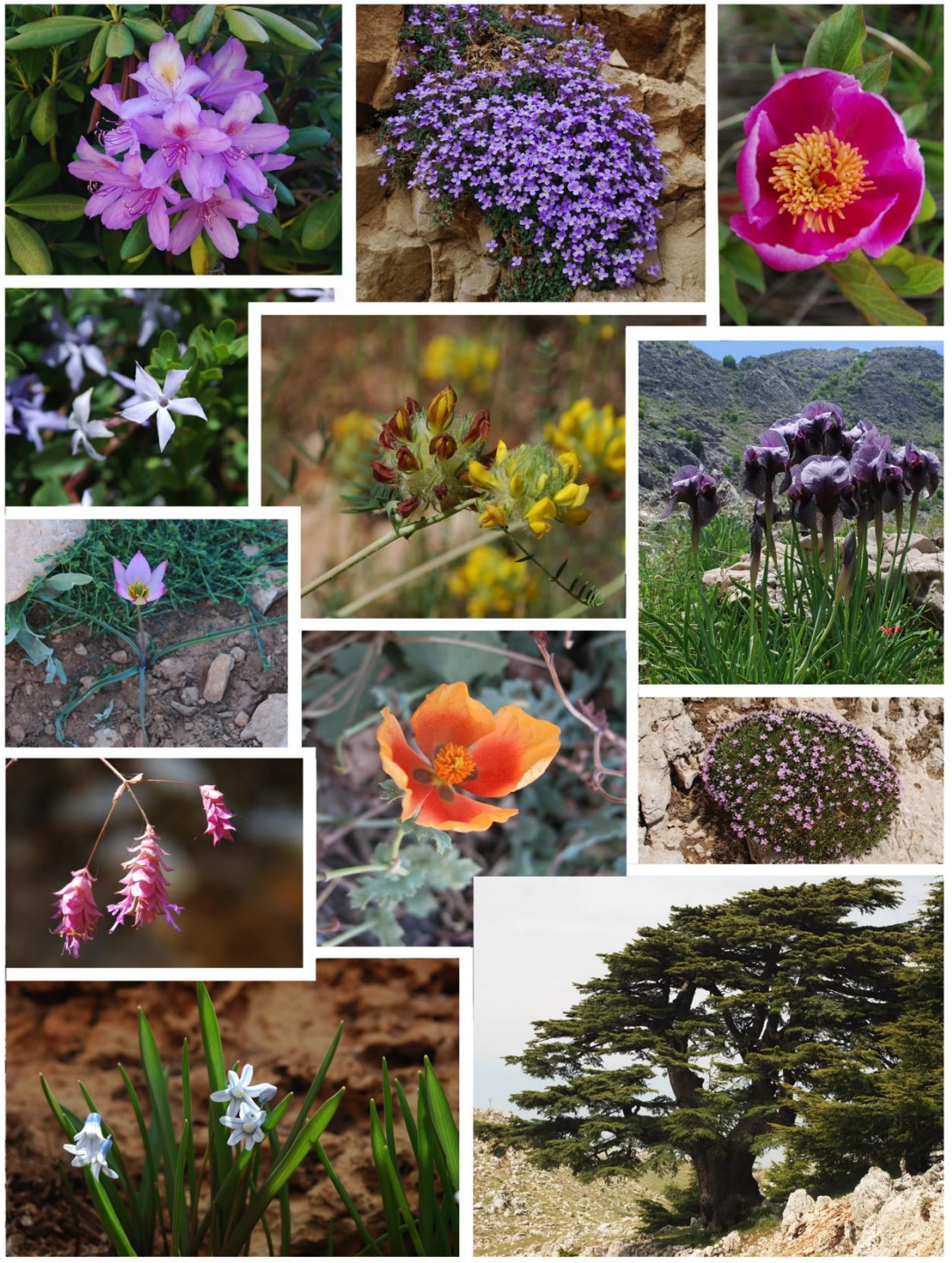
Bou Dagher Kharrat M. *et al.*, en préparation.

Aubrieta libanotica

Each flora is UNIQUE

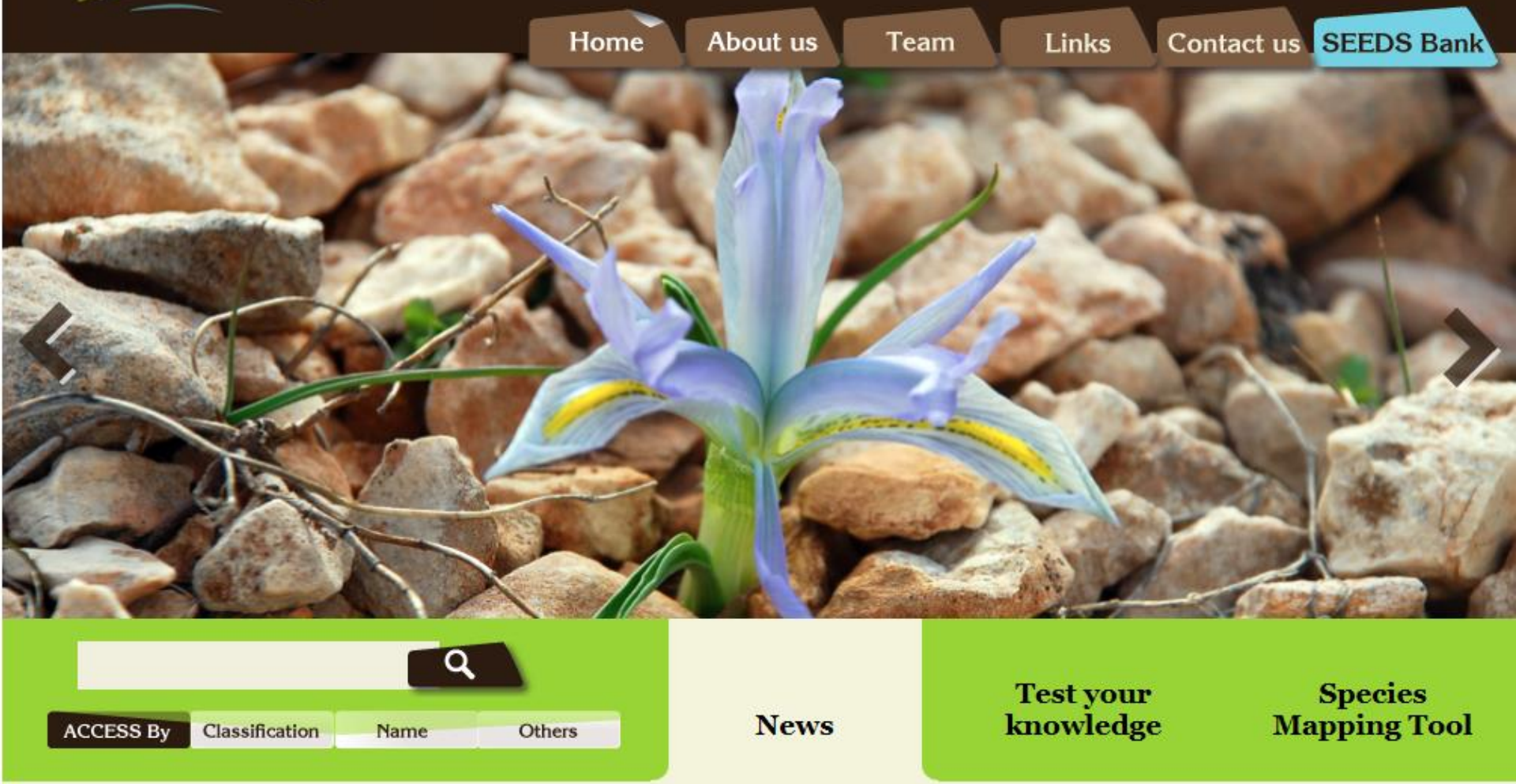
Result of different evolutions pathways over millions of years….

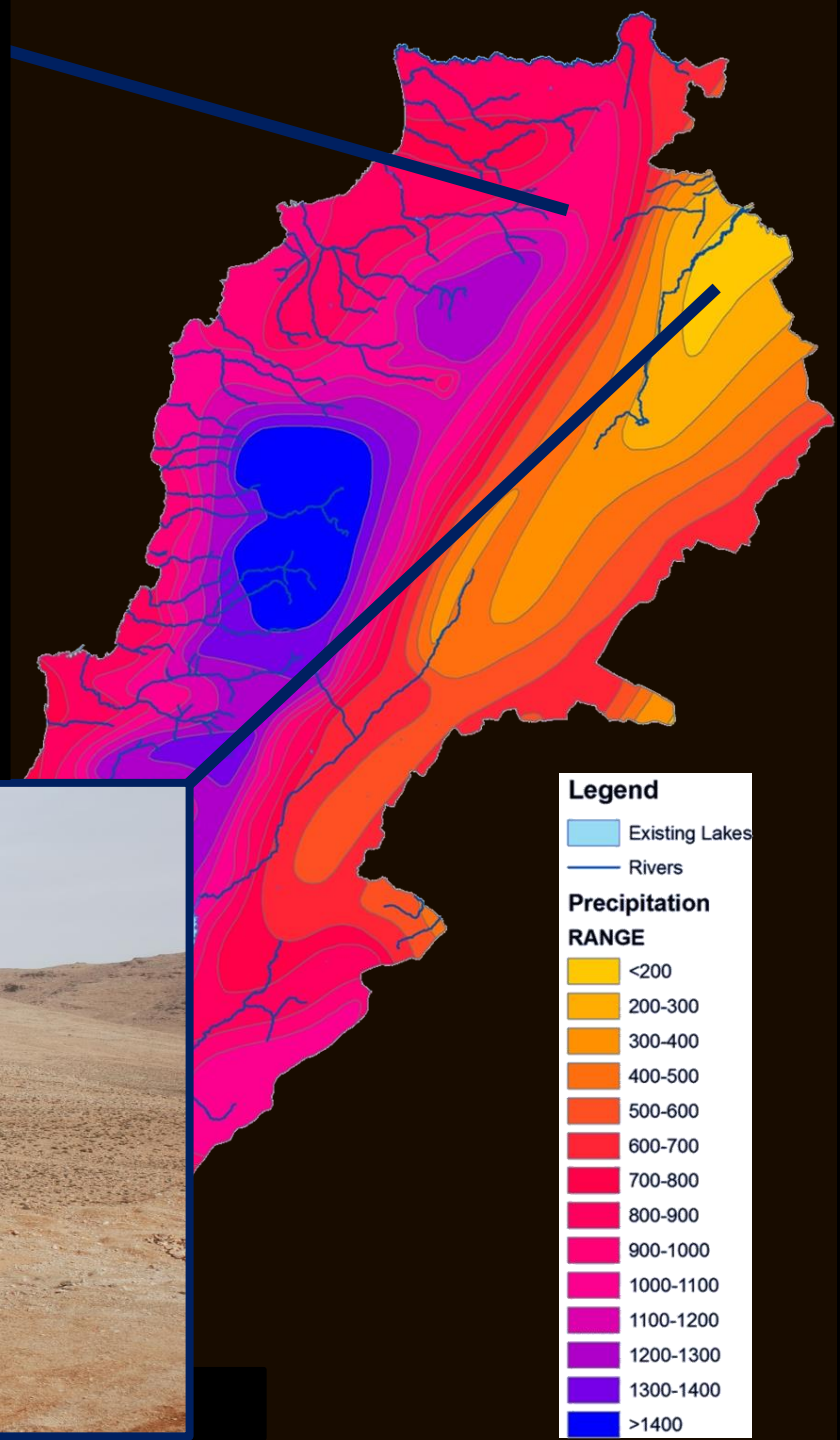


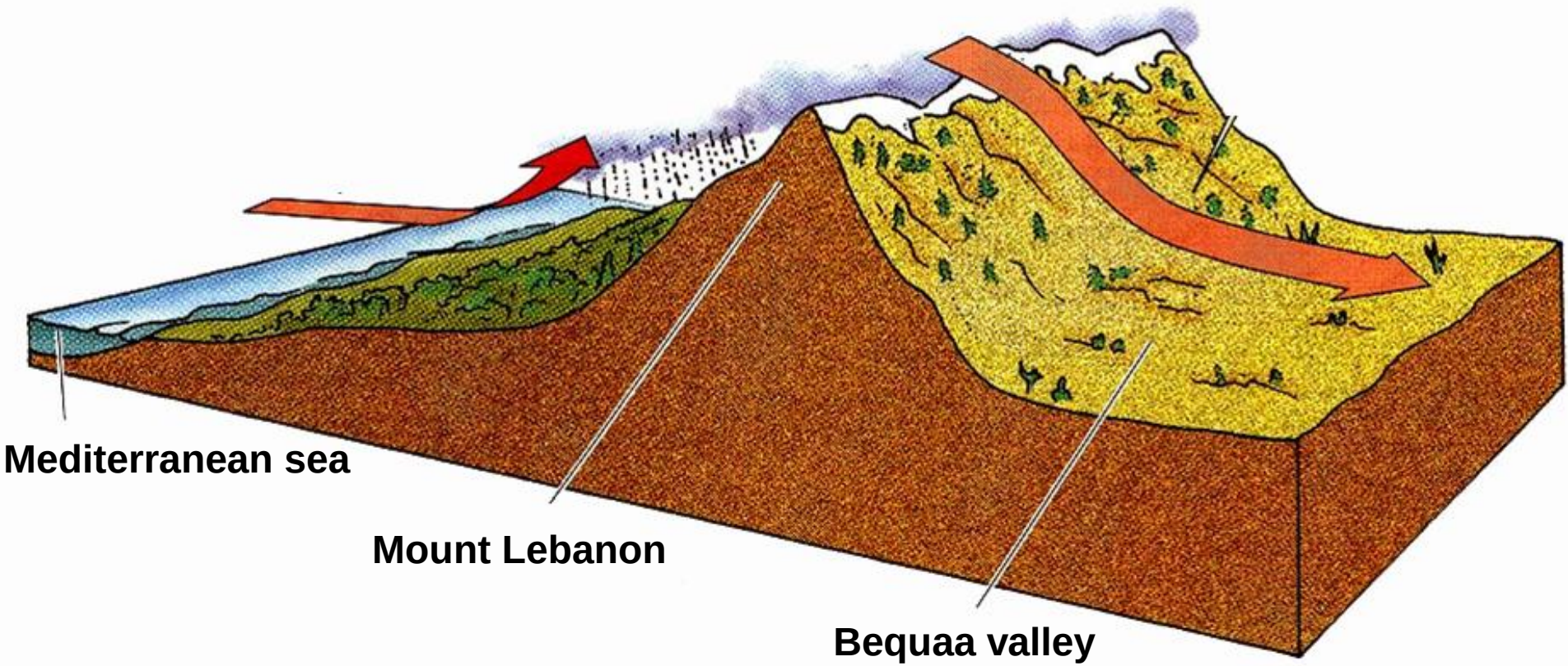


virtual data base for Plants

http://www.lebanon-flora.org/




Legend
Existing Lakes
Rivers
Precipitation
RANGE
<200
200-300
300-400
400-500
500-600
600-700
700-800
800-900
900-1000
1000-1100
1100-1200
1200-1300
1300-1400
>1400


Mediterranean sea
Mount Lebanon
Bequaa valley

Bioclimatic zones

The singularity of geomorphological regions give rise to different **bio-climatic zones and several types of habitats,** including several distinct semi-natural habitats that have evolved and adapted to anthropogenic activities and pressures.

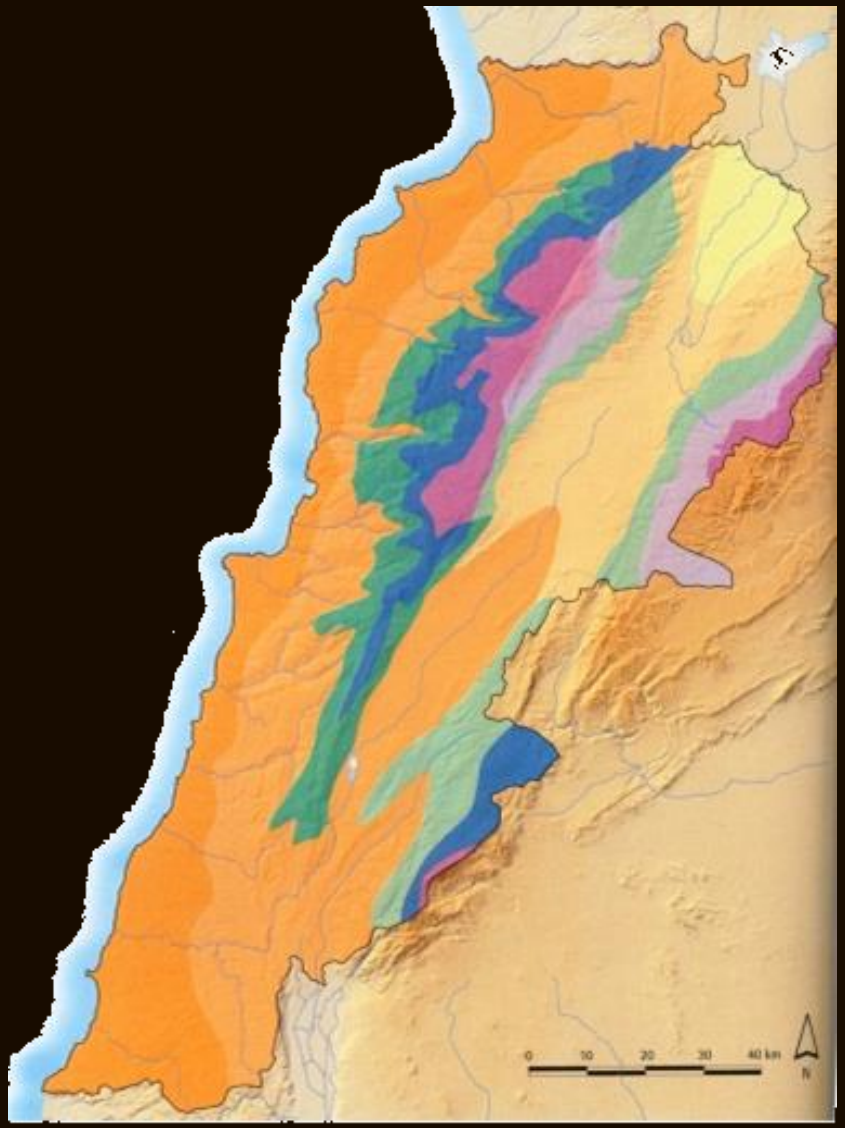
Altitude (m)

Mediterranean

- 0 – 500 — Thermomediterranean
- 500-1000 — Eumediterranean
- 1000 - 1500 — Supramediterranean
- 1500 - 2000 — Montagnard mediterranean
- > 2000 — Oromediterranean

Pre steppic mediterrannean

- 1000 - 1500 — Mediterranean
- 1400 - 1800 — Supramediterranean
- 1800 - 2400 — Montagnard mediterranean
- > 2400 — Oromediterranean



(Abi Saleh 1978, Atlas du Liban 2006)


Taanayel lac


Ouyoun Ourghosh,
2800 m


Horsh Ehden natural reserve

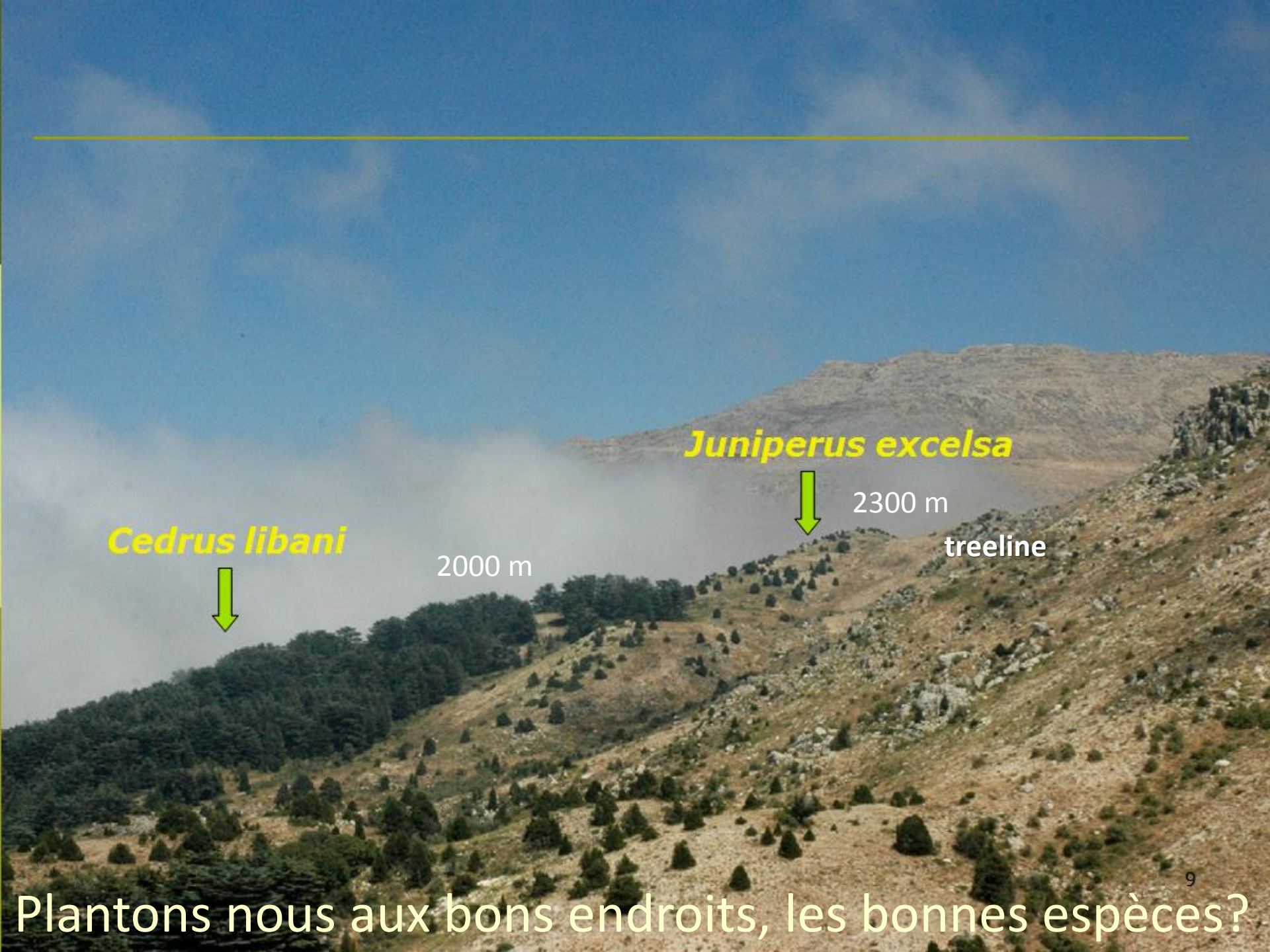

Aarsal Anti-Liban


Barqua


Jabal el Kneisseh


Quercus cerris pseudocerris Quammouah

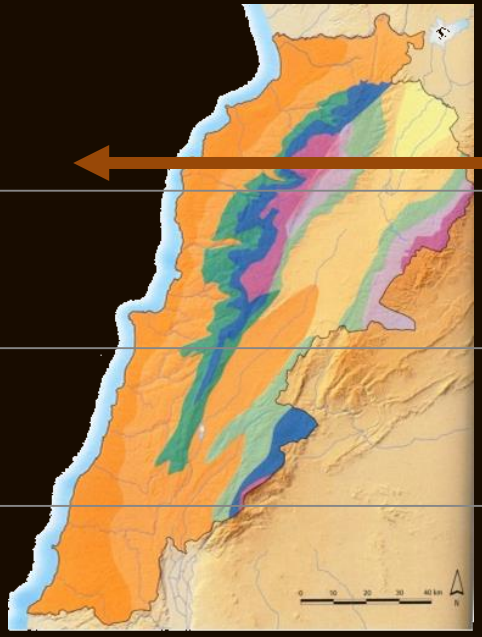

Jroud Danniyeh



Plantons nous aux bons endroits, les bonnes espèces?

2000 m – Oyoun orghoch

Juniperus foetidissima



Altitude

3500

3000

2500

2000

1500

1000

500

0

Cryooromediterranean

Oromediterranean

J. excelsa, J. foetidissima

Montagnard mediterranean

Cedrus libani, Abies cilicica, Juniperus excelsa

Supramediterranean

Q. calliprinos, Q. infectoria, P. brutia, P. pinea

Eumediterranean

Quercus caliprinos, P. palestina, Pinus pinea, P. brutia

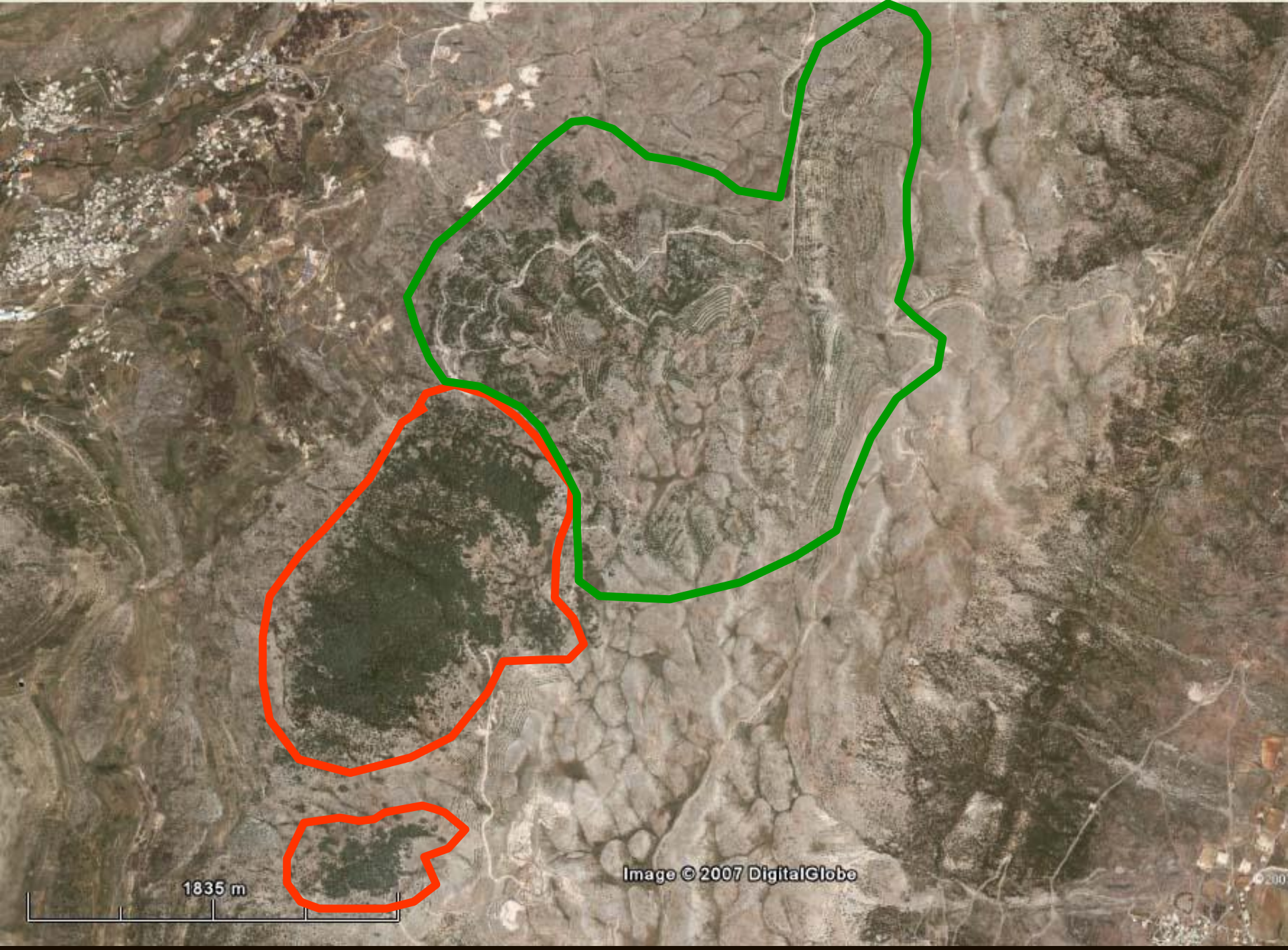
Thermomediterranean

Ceratonia siliqua, Pistacia lentiscus, P. palestina

The presence of strong altitudinal gradients around the shores of the Mediterranean may have allowed different associations to locally persist and thus rapidly track climate change.

A New Development Goal for Lebanon: the 40 Million Forest Trees

Plantation campaigns


1835 m
Image © 2007 DigitalGlobe

Reforestation *vs* Ecosystem restoration

Boisement monospécifique avec *Pinus pinea* aux alentours de Jezzine.

جذور لبنان
jouzourloubnan.org

Ecosystème forestier très diversifié dans la réserve naturelle de Ehden.

Ecological restoration of high altitude forest ecosystems

جذور لبنان
jouzourloubnan.org

EcoplantMed

Project funded by the EUROPEAN UNION

ENPI CBCMED
CROSS-BORDER COOPERATION IN THE MEDITERRANEAN

ECOlogical use of native PLANTs for environmental restoration and sustainable development in the MEDiterranean region

WP6 :

Tomorrow
Session 3
Perla Farhat

Effect of native nurse plant

Effect of site exposition

Effect of irriguation

Laboratory for seed germination and conservation

Ramy SAKR

جذور لبنان
jouzourloubnan.org

Germination d'une graine
de *C. libani*

EcoplantMed

مشروع ممول من
الاتحاد الأوروبي

ENPI CBCMED

ECOlogical use of native PLANTs for environmental restoration and sustainable development in the MEDiterranean region

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Early stage researcher

Perla FARHAT
Research assistant

JANVIER 2015

Merci

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- **Magda Bou Dagher Kharrat**, Saint Joseph University, Lebanon (chair)
- **Pascal Bou Nassar**, Saint Joseph University, Lebanon
- **Tony Chahine**, Jouzour Loubnan, Lebanon
- **Laure El Chamy**, Saint Joseph University, Lebanon
- **Perla Farhat**, Saint Joseph University, Lebanon
- **Panagiota Gotsiou**, Mediterranean Agronomic Institute of Chania (MAICH), Greece
- **Rhea Kahale**, Saint Joseph University, Lebanon
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- **Ramy Sakr**, Saint Joseph University, Lebanon
- **Edgard Seif**, Saint Joseph University, Lebanon
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- **Edoardo Biondi**, Marche Polytechnic University, Italy
- **Evangelia Daskalakou**, Forest Research Institute of Athens (FRIA), Greece
- **Bouchra Douaihy**, Lebanese University, Lebanon
- **Giuseppe Fenu**, Sapienza University, Italy
- **Christini Fournaraki**, Mediterranean Agronomic Institute of Chania (MAICH), Greece
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- **Graziano Rossi**, Pavia University, Italy
- **Costas Thanos**, National Kapodistrian University of Athens, Greece
- **Ramón Vallejo Calzada**, Barcelona University, Spain

Thank you!

EcoplantMed

International Conference

14-16 October, Beirut, Lebanon

Session 1

	Welcome and a brief introduction on the day topics	
	Arid and Dune Ecosystems	Chair : **Gianluigi Bacchetta** - Università degli Studi di Cagliari
	r the restoration of semiarid landscapes at different scales	**Jordi Cortina**
9:45	Actions for the conservation and restoration of coastal dunes with Juniperus spp. in Crete and the South Aegean (JUNICOAST)	Dany Ghosn CIHEAM-Mediterranean Agronomic Institute of Chania - Greece
10:00	The LIFE+ project "RES MARIS - Recovering Endangered habitats in the Capo Carbonara Marine area, Sardinia" (LIFE13 NAT/IT/000433): first year results	Francesca Meloni Università degli Studi di Cagliari - Italy
10:15	Mimicking natural processes on urban dunes	Josep Lascurain Consultora de Servicios Globales Medioambientales - Spain
10:30	Restoration Against All Odds: The Case of Coastal Sand Dunes in Ouzai, Lebanon	Joanna Sabra American University of Beirut - Lebanon
10:45	Contrasting survival and growth responses of two native species with different rooting strategy during plantation establishment under severe summer drought in the Mediterranean of central Chile	Juan Ovalle Pontificia Universidad Católica de Chile - Chile
11:00	Discussion	11:05-11:20 Coffee Break

Session 2

20 – 13:40): Forest Ecosystem		Chair: Samir SAFI - Lebanese University
	Relevance of genetic considerations in ensuring effective forest restoration	**Michele Bozzano**
12:05	Review on the historical afforestation in Rincon de Ademuz, an historical area in the province of Valencia (Spain)	Mario Romero-Vivó Dirección General de Medio Natural – Generalitat Valenciana - Spain
12:20	Bioclimatic and niche characterization; a tool for ecological restoration strategies: case study of Oak species in Lebanon	Jean Stephan Lebanese University - Lebanon
12:35	Restoration of Tilio-Acerion forests in the eastern Iberian System. The Life Renaix el Bosc project	Daniel Arizpe Ochoa Centre of Applied Forest Research (CIEF), VAERSA-Generalitat Valenciana - Spain
12:50	A review on rehabilitation and afforestation experiences of Cedrus libani A. Rich in Turkey	Sezgin Ayan Kastamonu University - Turkey
13:05	The Mediterranean Mosaics Project: Building resilience to climate change through forest landscape restoration and management in the Shouf Biosphere Reserve (Lebanon)	Nizar Hani Al-Shoulf Cedar Society, Maasser el Shouf – Lebanon
13:20	Le caroubier en Tunisie : espèce autochtone à intérêt écologique et économique	Mohamed Larbi Khouja Institut National de Recherches en Génie Rural, Eaux et Forêts - Tunisie
13:35	Discussion	**13:40-14:40** Lunch Break

Michele Bozzano

He is a Researcher at **Biodiversity International**, where he coordinates initiatives related to ecosystem restoration. Dr Bozzano has a PhD in Restoration Ecology. In 2014, biodiversity released the Thematic Study on Genetic considerations in ecosystem restoration using native tree species as part of The Food and Agriculture Organization of the UN's (FAO) first report on The State of the World's Forest Genetic Resources.

Michele Bozzano has also contributed to the development of the Forest Genetic Resources Training Guide. Dr Bozzano works at the secretariat of the European Forest Genetic Resources Programme.

Forest Genetic Resources Training Guid

Session 3

	- 16:45): Ecological Restoration Techniques and Key Parameters Chair : Evangelia Daskalakou - Institute of Med. Forest Ecosystems	
	storing ecosystems with ecological engineering techniques : se studies in Mediterranean France	**Thierry Dutoit**
15:25	Bridging nature and human priorities in Mediterranean rehabilitation projects: a case report from Qattine- Lebanon	Johnny Fenianos and Carla Khater National Council for Scientific Research - Lebanon
15:40	Back to earth: Reintroduction of native Lebanese Medicago species as a means for their in-situ conservation	Jostelle Beyrouthy Lebanese University - Lebanon
15:55	ECOPLANTMED pilot site in Lebanon : implementation and results	Perla Farhat Université Saint-Joseph - Lebanon
16:10	Ecological restoration of forest ecosystems of Lebanon, using native species	Michel Khouzami Retired FAO Forestry Expert - Lebanon
16:25	The importance of local gene banks for native plant conservation – The case of the Cretan Seed Bank	Christini Fournaraki CIHEAM - Mediterranean Agronomic Institute of Chania - Greece
16:40	Discussion	16:45-17:00 Coffee Break
	POSTER PRESENTATIONS SESSION (17:00 - 18:40)	

Thierry Dutoit

is a research director at the National Council for Scientific Research (CNRS) in France and a member of the Mediterranean Institute of Biodiversity and Ecology. As a plant ecologist, the objectives of his research are mainly on assembly rules and species-coexistence in plant communities.

He is particularly interested in the study of Mediterranean herbaceous plant communities resilience after major disturbance and he is involved in many restoration projects of Mediterranean rangelands with the use of ecological.

Thierry Dutoit holds a PhD that tackles sciences devoted to the dynamics and conservation management of dry grasslands on limestone slopes of the Seine Valley from the University of Rouen (north-western France).

Day 1 : October 16th, 2015

Supported by Holcim

Holcim Quarry Restoration Pilot Project

Horsh Ehden Nature Reserve

Day 2 : October 17th, 2015

On participants own costs

Bienvenue à l'USJ

Université Saint-Joseph
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جامعة القديس يوسف
في بيروت