Departamento de Ciencias de la Tierra
Universidad Zaragoza

Clima, paleohidrología y cambio de usos del suelo en la Cordillera Ibérica durante los últimos 1600 años:

El registro sedimentario de La Parra

(Barreiro-Lostres, F.; Moreno, A.; Giralt, S.; Caballero, M.; Valero-Garcés, B.)

Seminarios Doctorado en Geología
curso 2013-2014

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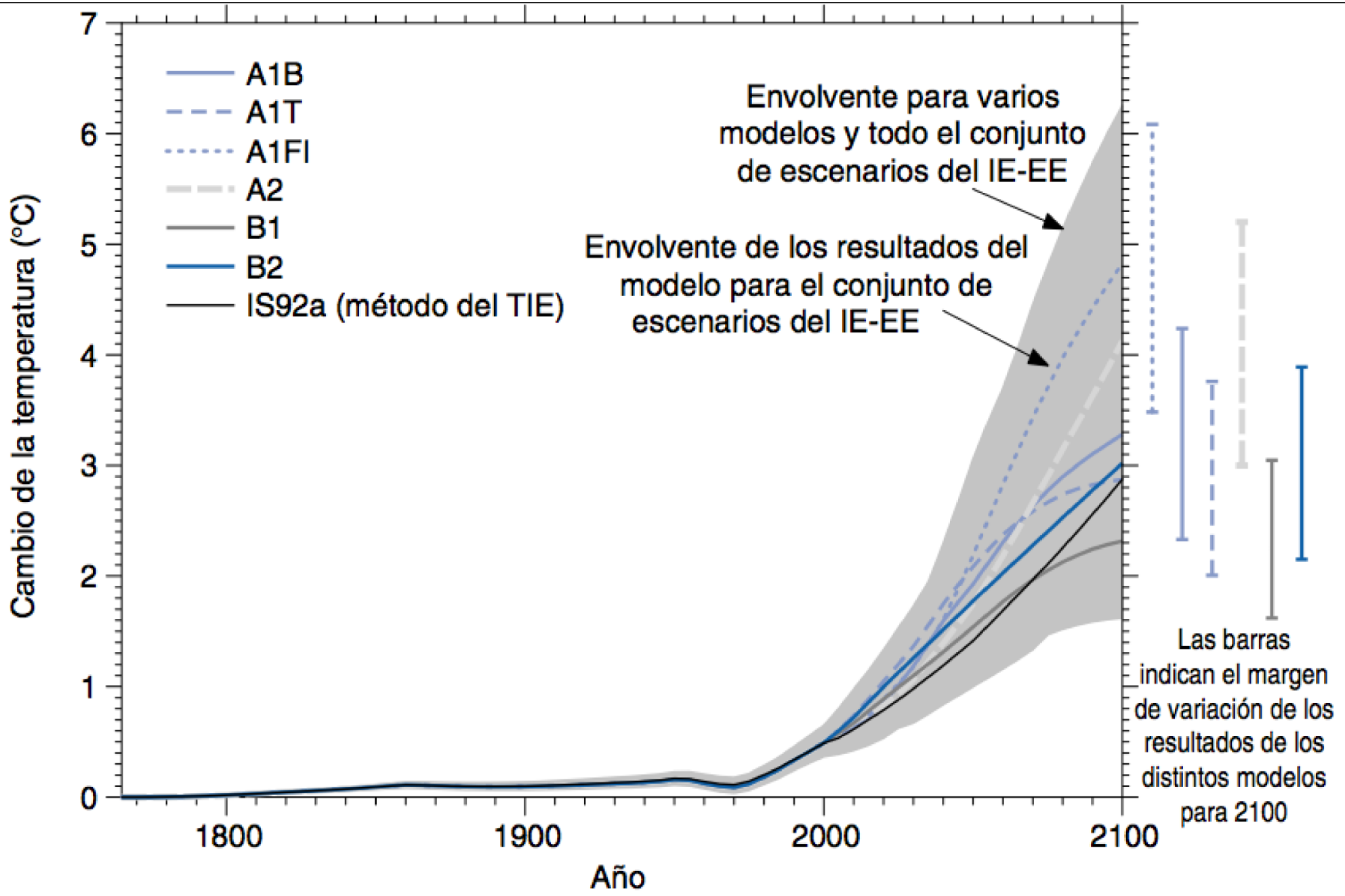
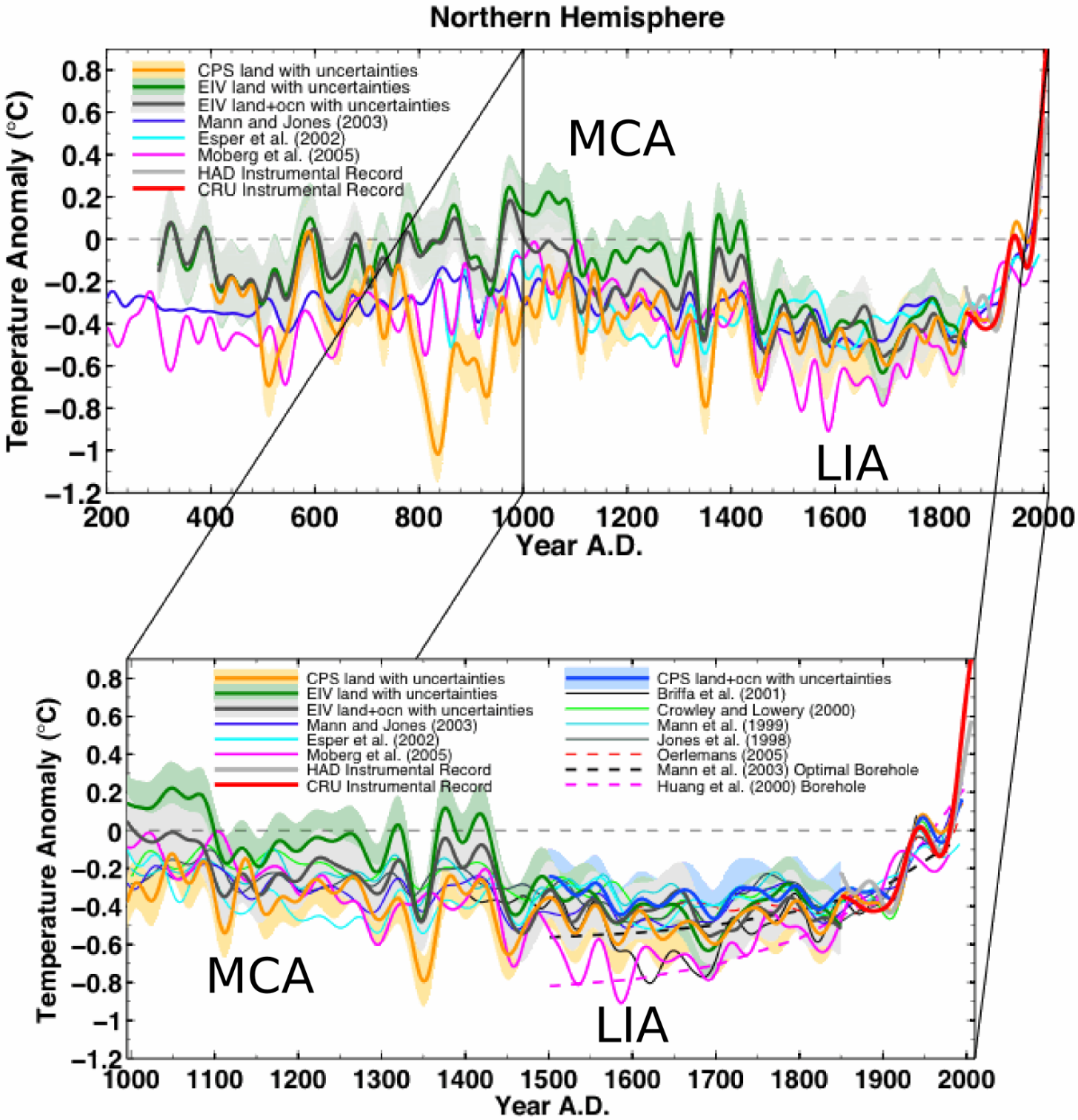
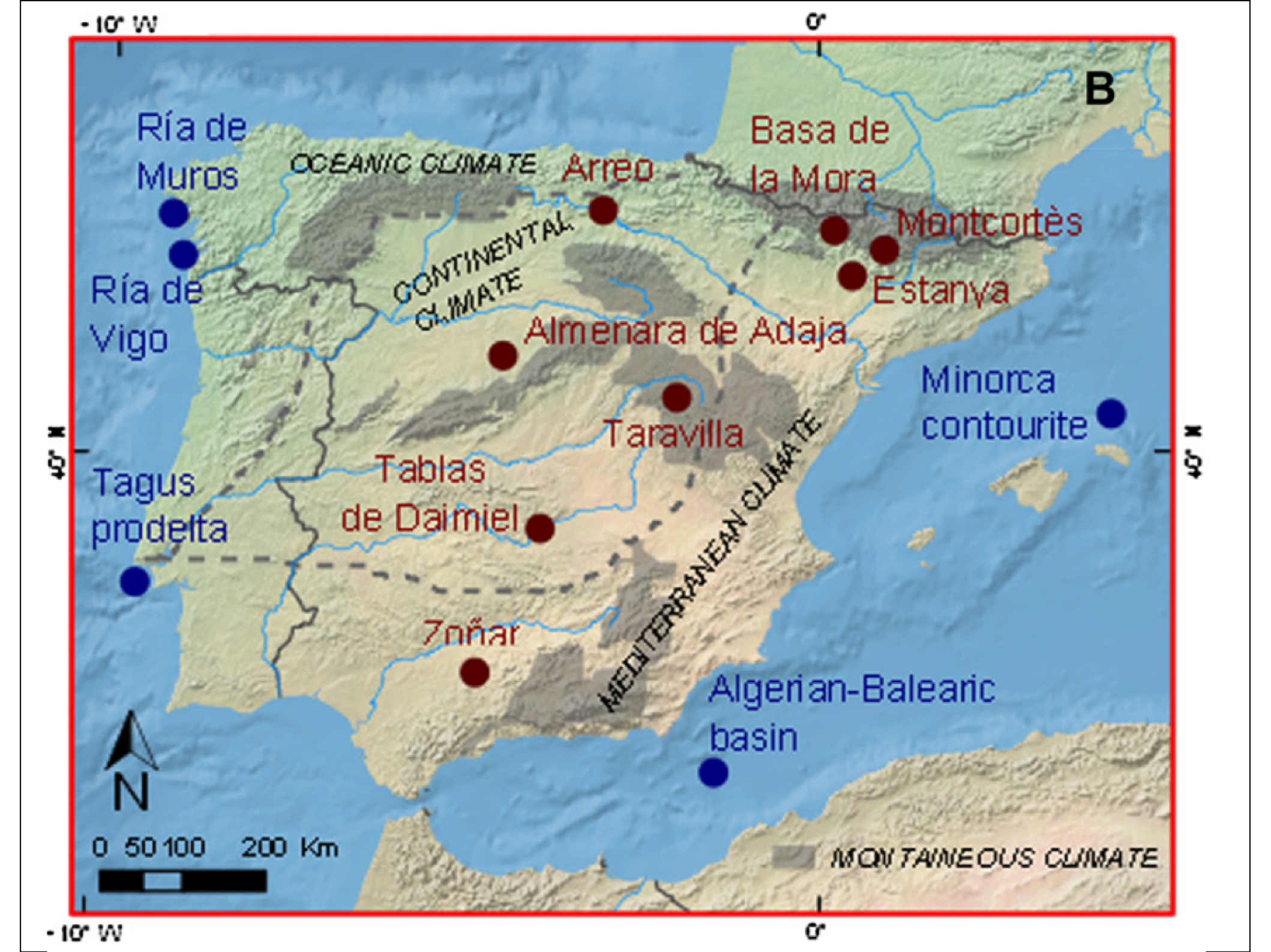
IPE
INSTITUTO PIRENAICO DE ECOLOGÍA
CSIC



Tercer Informe de Evaluación Cambio Climático 2001

Mann et al., 2008




- 10° W
0°
B
Ría de Muros
Ría de Vigo
OCEANIC CLIMATE
Arreo
Basa de la Mora
Montcortès
Estanya
CONTINENTAL CLIMATE
Almenara de Adaja
Minorca contourite
Taravilla
Tablas de Daimiel
Tagus prodelta
MEDITERRANEAN CLIMATE
Zoñar
Algerian-Balearic basin
N
0 50 100 200 Km
MONTANEOUS CLIMATE
45° N
- 10° W
0°

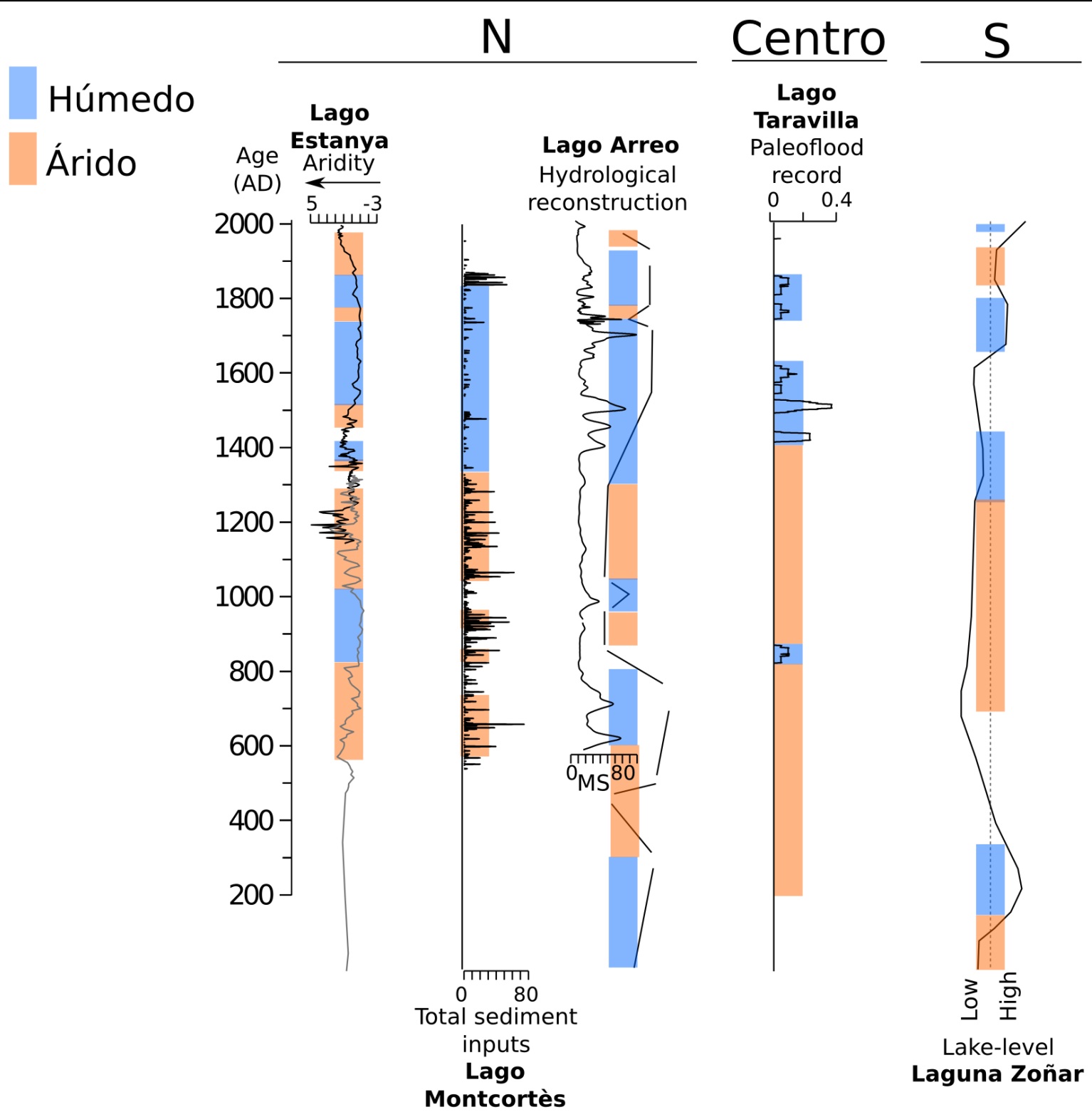
Cambios climáticos Holocenos tardío más importantes en la Península:

Periodo Húmedo Ibero-Romano (IRHP, -650 - 300 AD)

Anomalía Climática Medieval (1000-1300 AD)

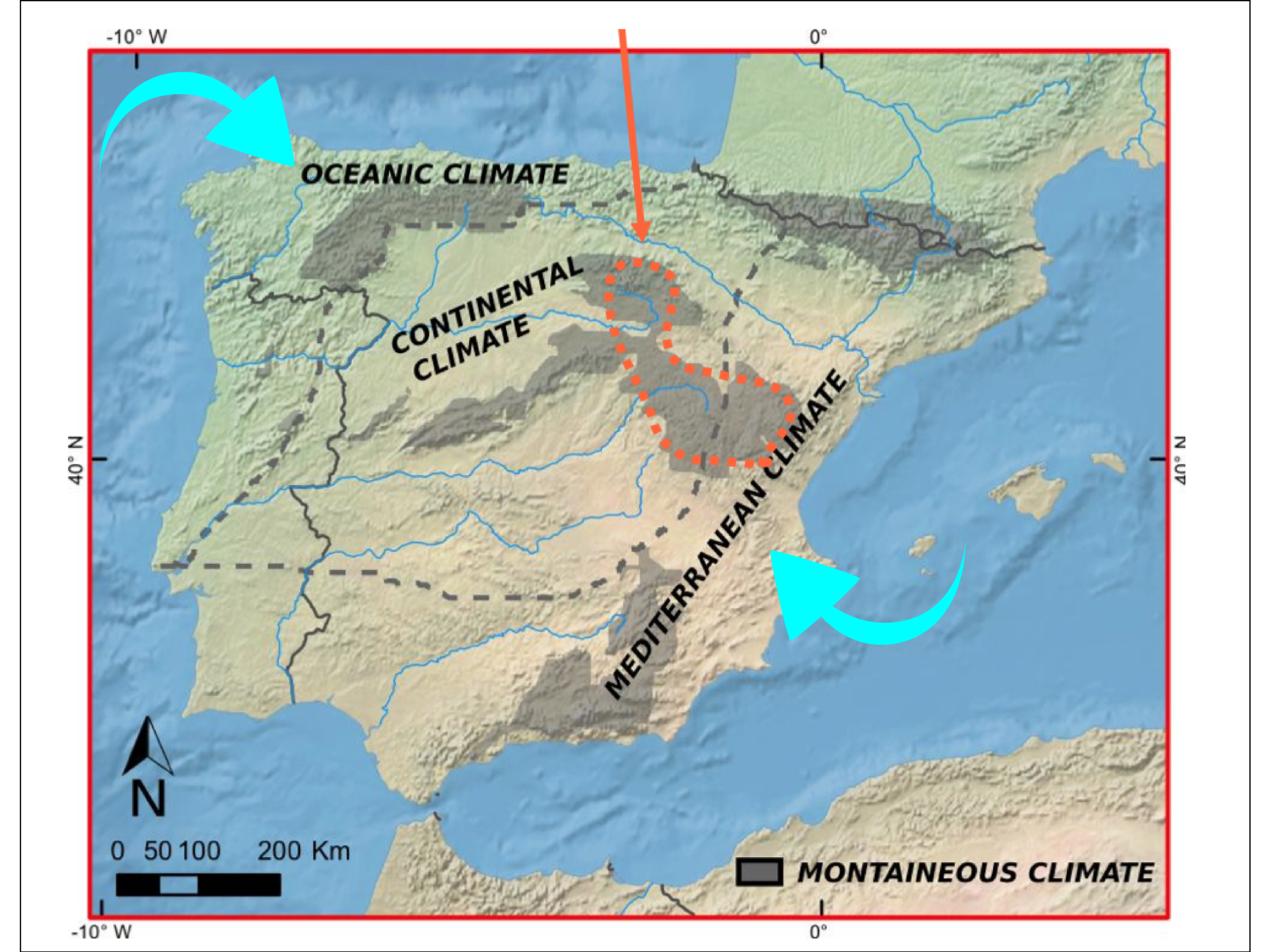
La Pequeña Edad de Hielo (1300-1850 AD)

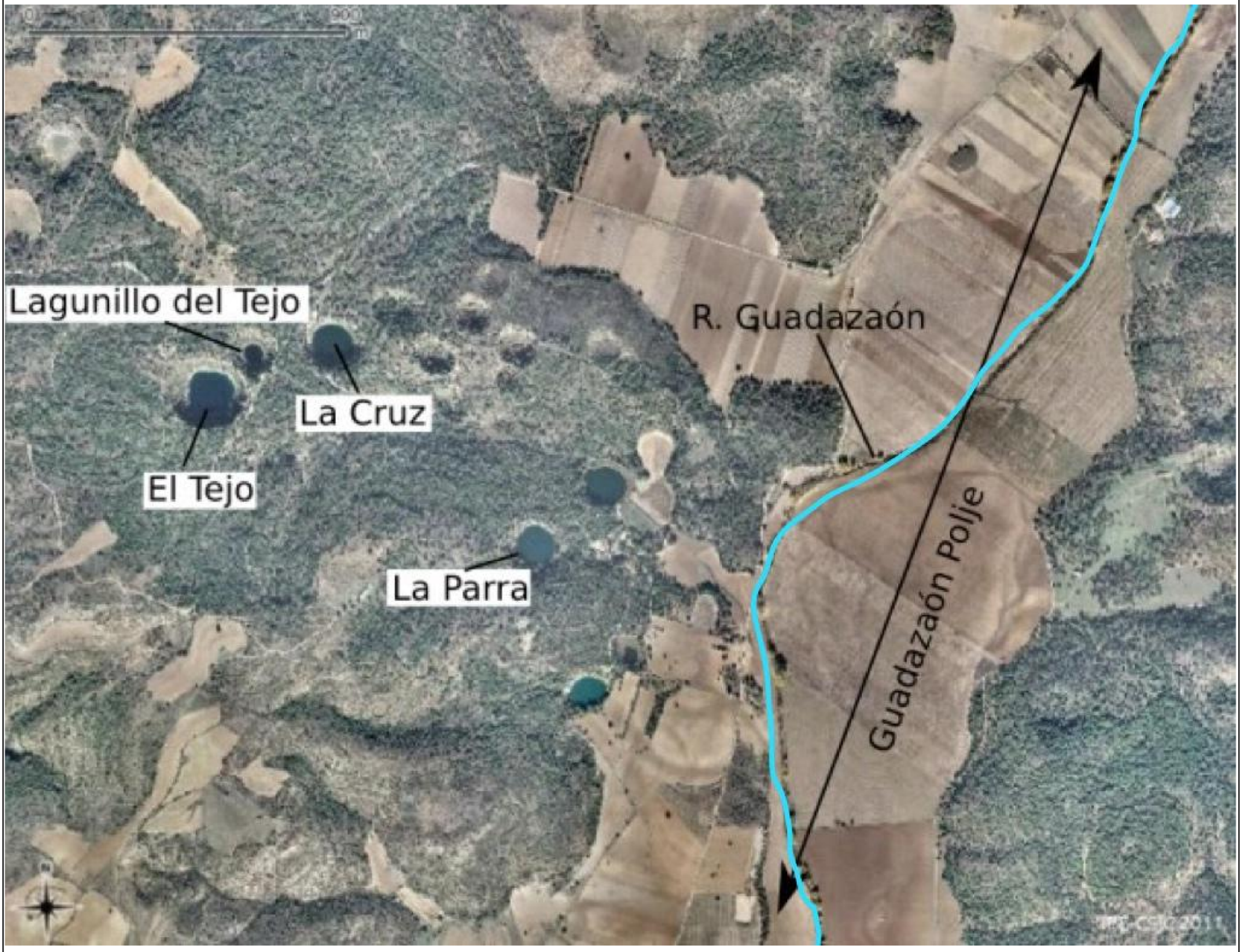
Actualidad

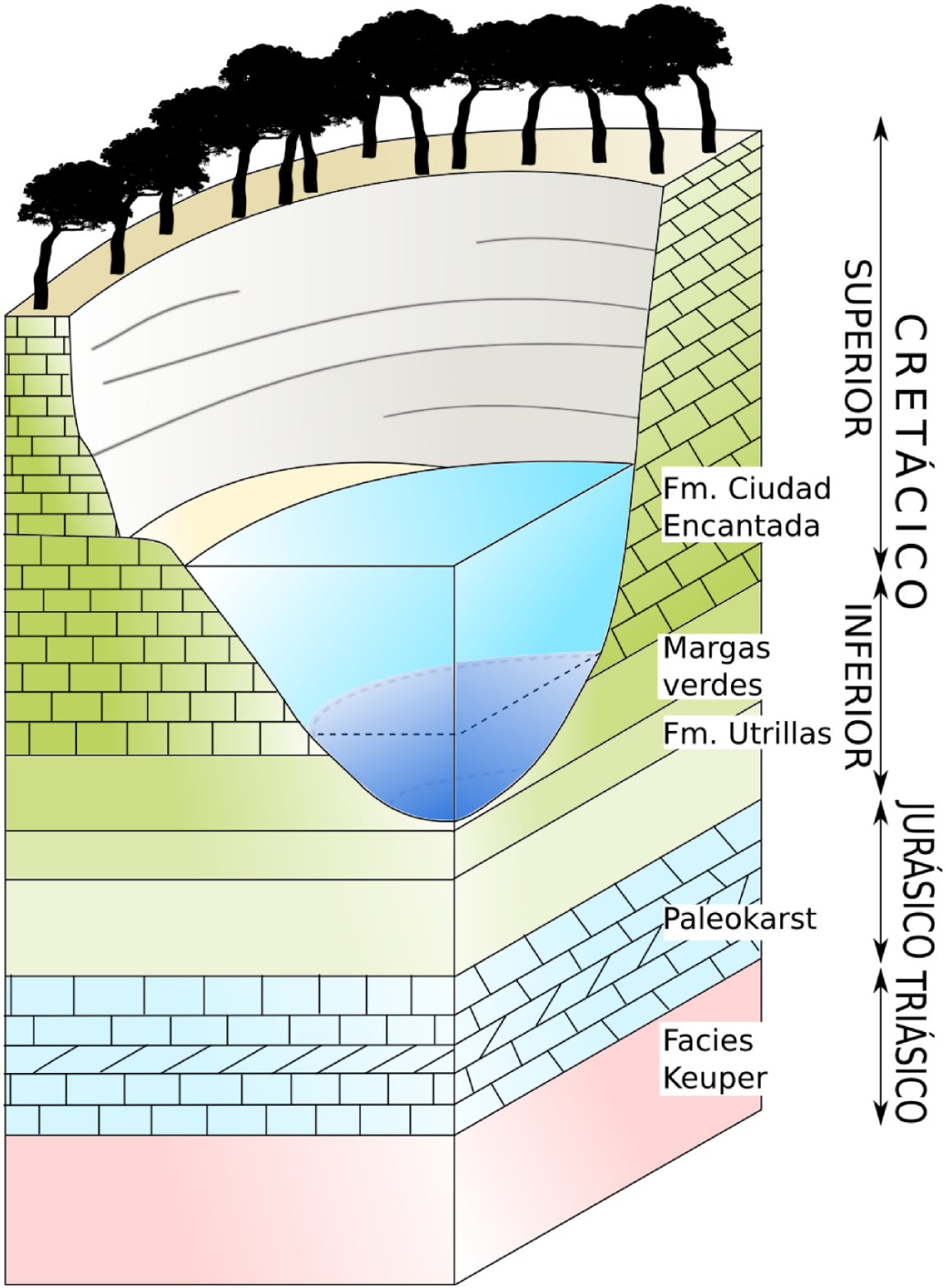

N
Centro
S
Húmedo
Árido
Lago Estanya
Age (AD)
Aridity
5
-3
2000
1800
1600
1400
1200
1000
800
600
400
200
0
80
Total sediment inputs
Lago Montcortès
Lago Arreo
Hydrological reconstruction
0
MS
80
Lago Taravilla
Paleoflood record
0
0.4
Low
High
Lake-level
Laguna Zoñar

- Diferente **sensibilidad** del lago

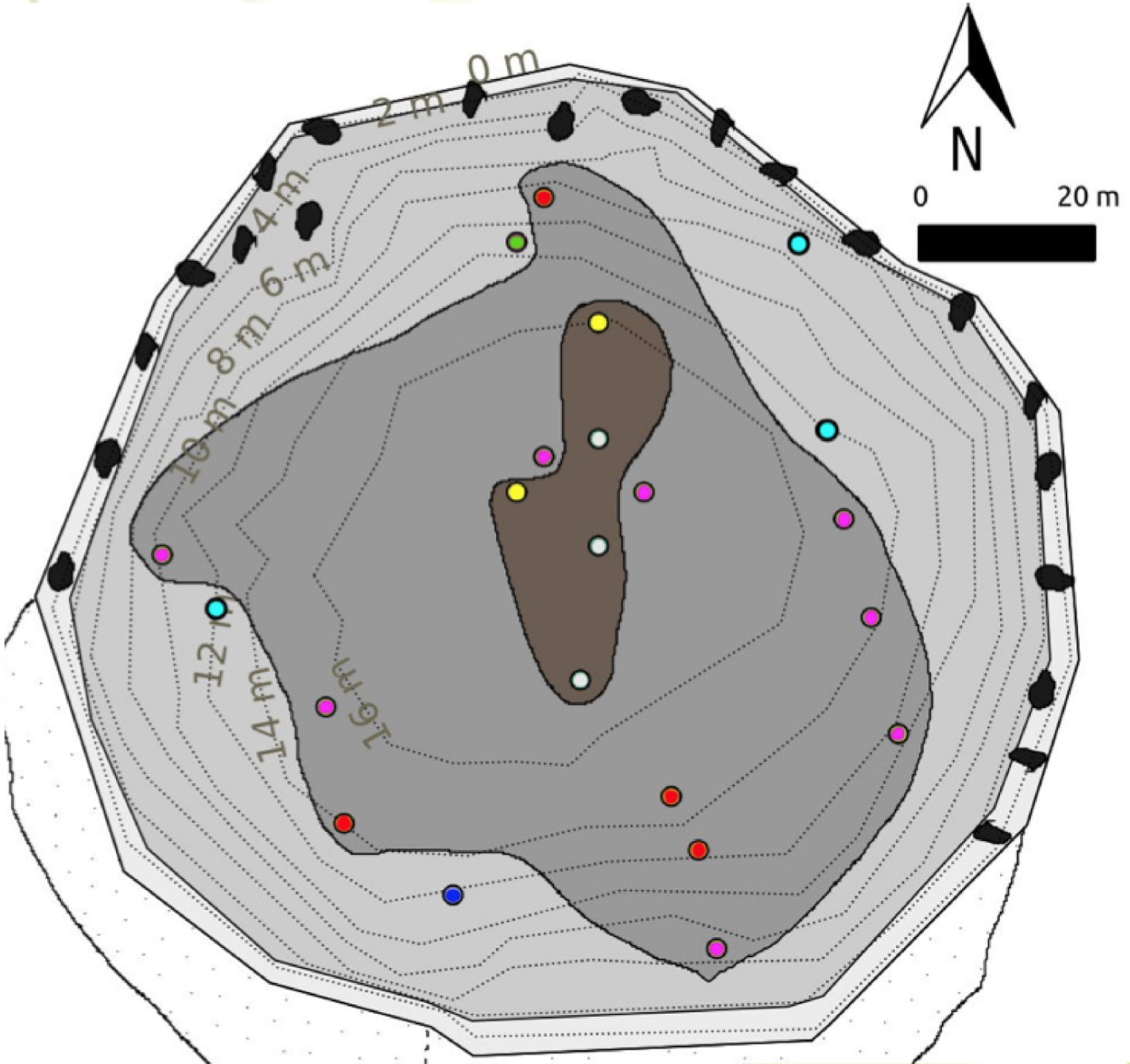
- Diferente resolución **modelos edad**


-10° W
0°
40° N
OCEANIC CLIMATE
CONTINENTAL CLIMATE
MEDITERRANEAN CLIMATE
N
0 50 100 200 Km
MONTAINEOUS CLIMATE


Lagunillo del Tejo
La Cruz
El Tejo
La Parra
R. Guadazaón
Guadazaón Poljе


CRETÁCICO
SUPERIOR
INFERIOR
JURÁSICO TRIÁSICO
Fm. Ciudad Encantada
Margas verdes
Fm. Utrillas
Paleokarst
Facies Keuper

Malla sondeos cortos



Apertura sondeos

MISCROSCOPÍA

MINERALOGÍA (DRX)

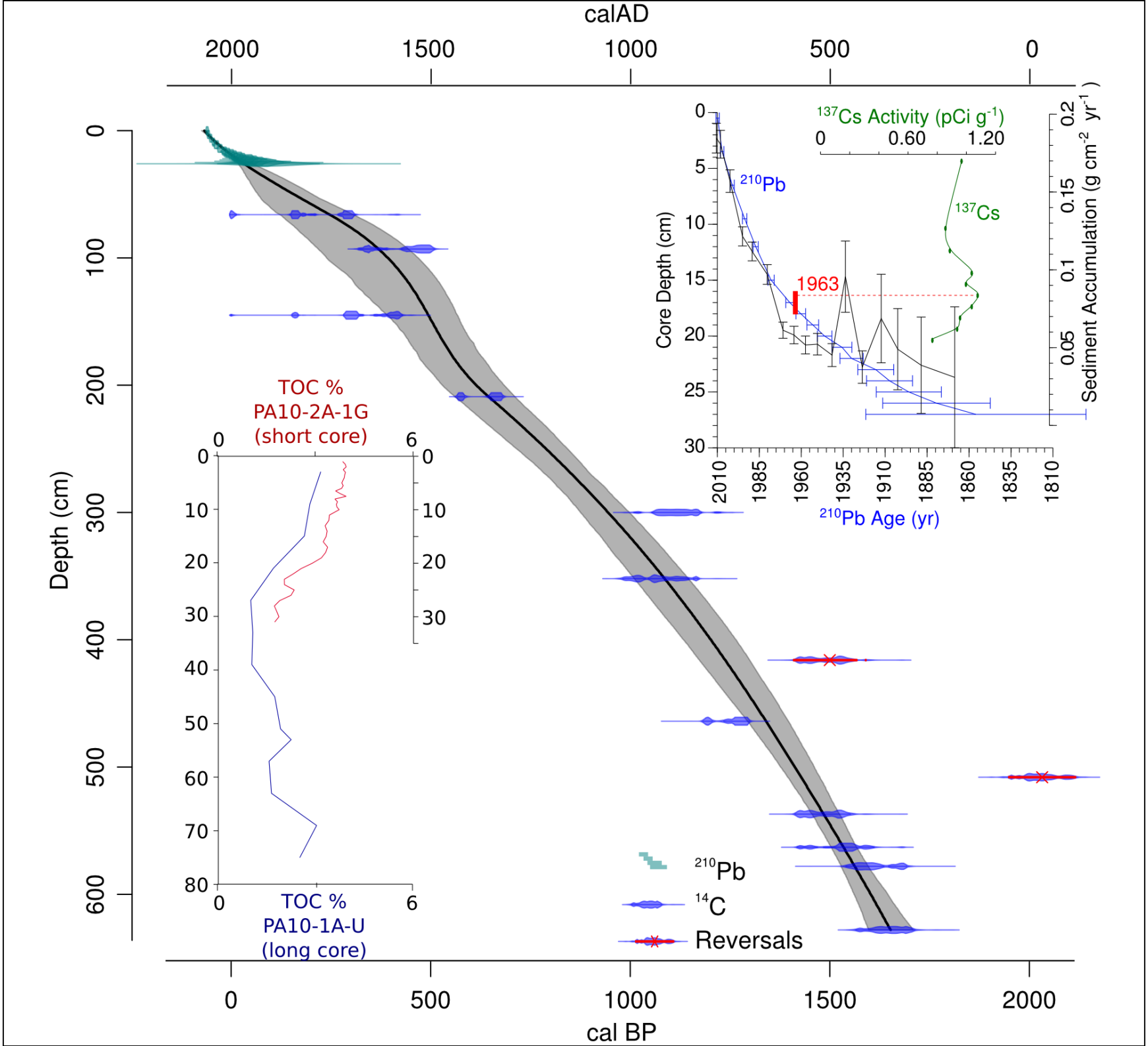
TIC, TOC, TN

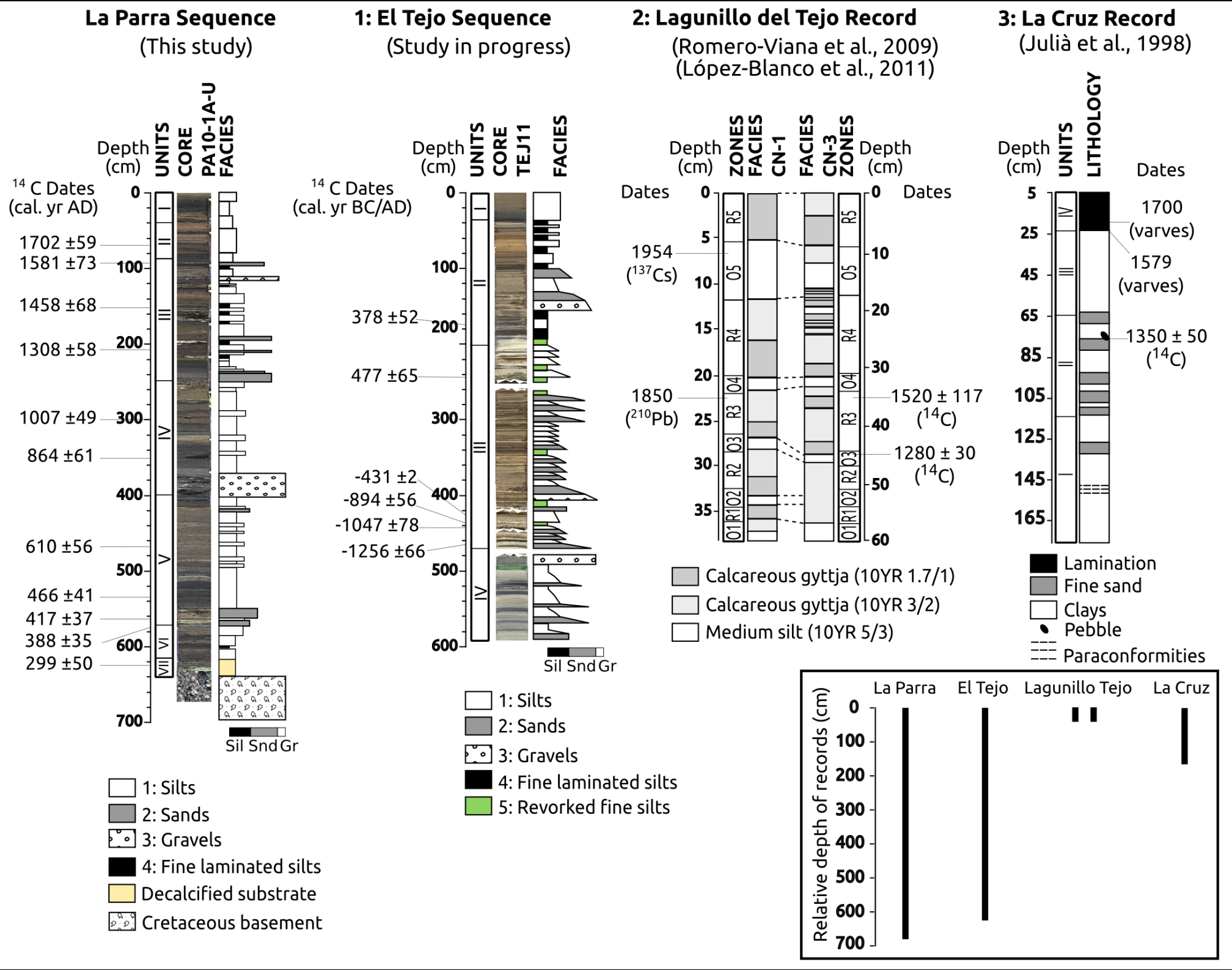
ICP

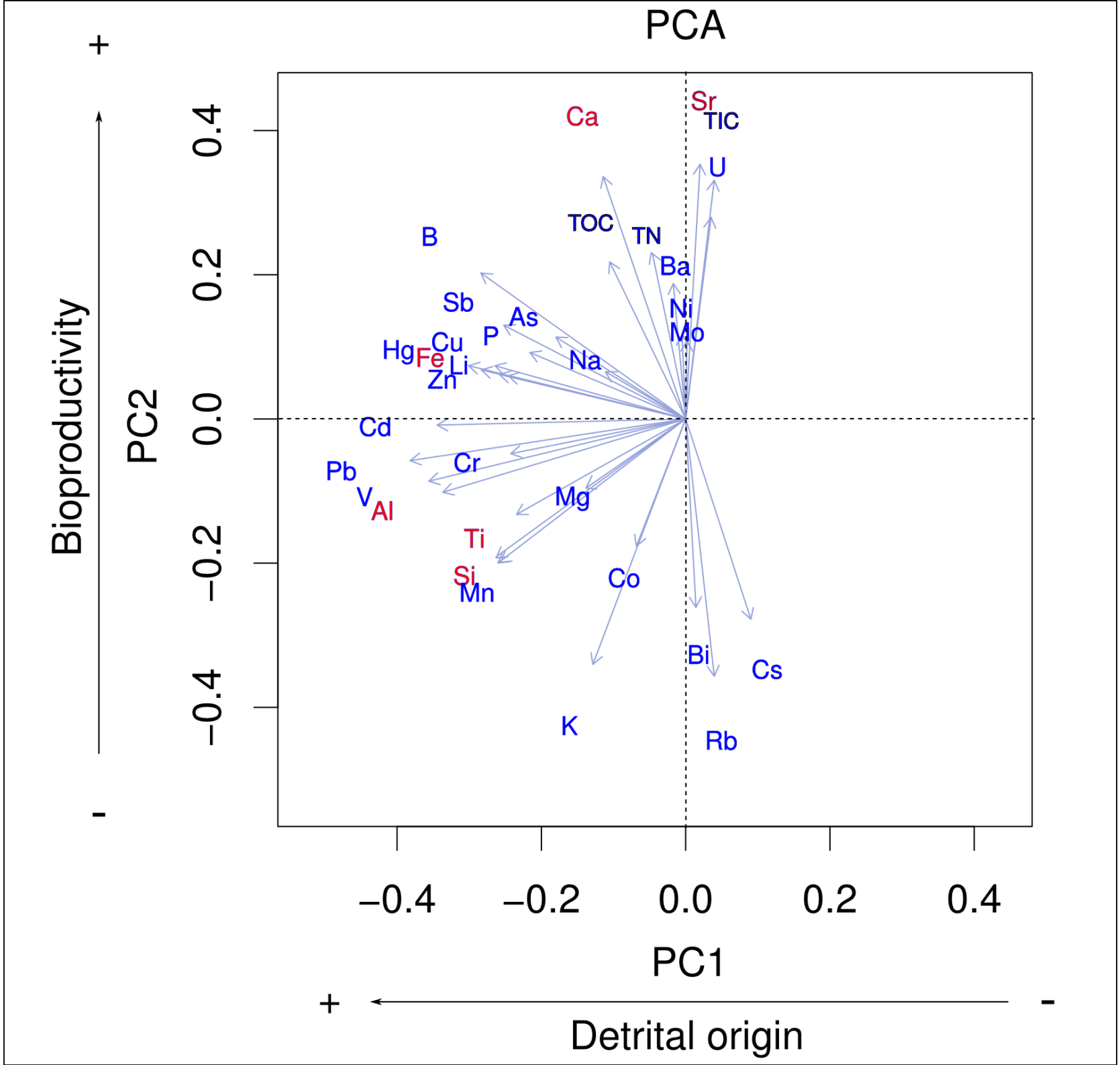
GEOQUÍMICA

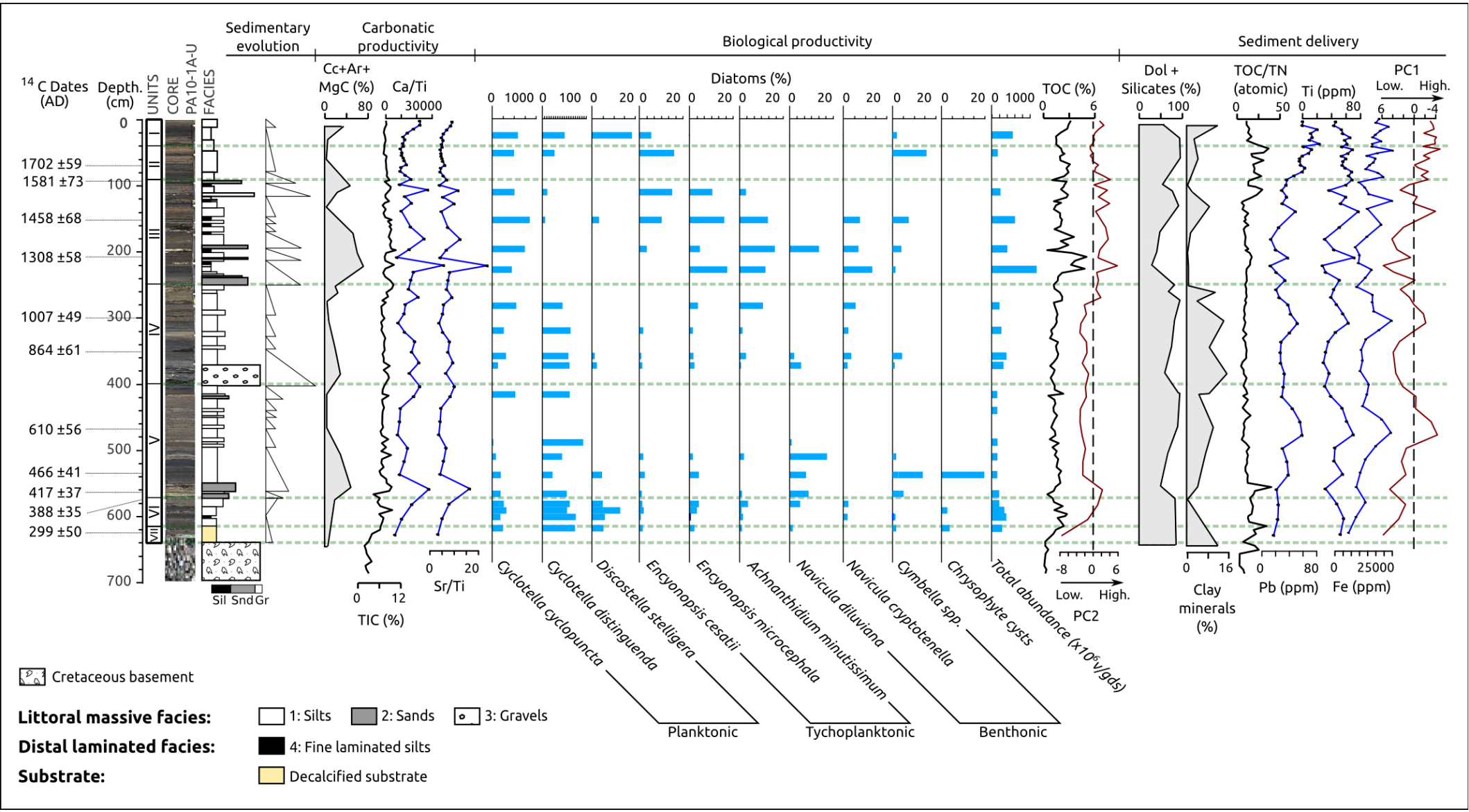
DIATOMEAS

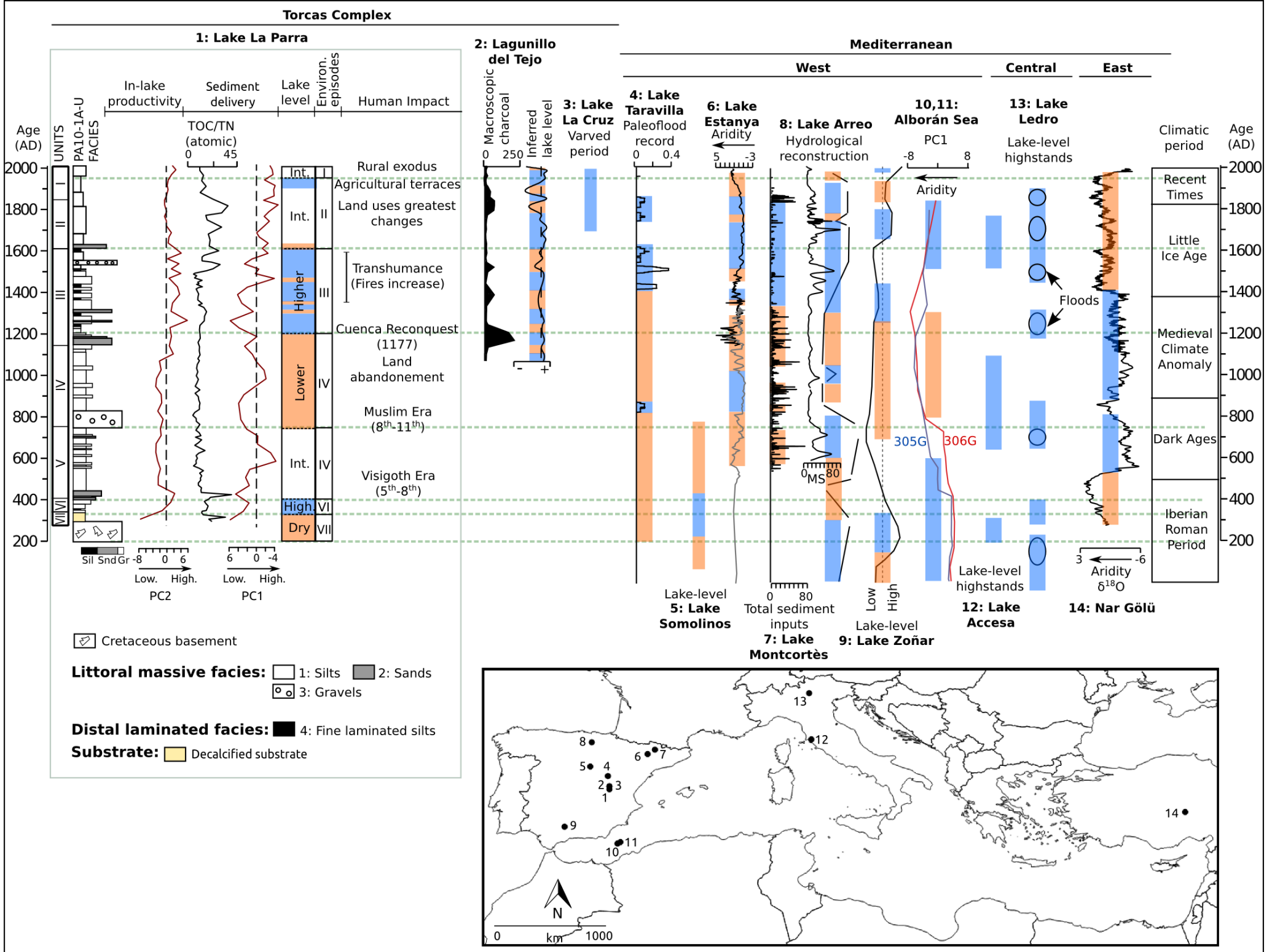
DATACIONES


calAD
2000
1500
1000
500
0
Depth (cm)
0
100
200
300
400
500
600
cal BP
0
500
1000
1500
2000
^{210}Pb
^{14}C
Reversals
TOC %
PA10-2A-1G
(short core)
TOC %
PA10-1A-U
(long core)
^{137}Cs Activity (pCi g^{-1})
0
0.60
1.20
^{210}Pb
^{137}Cs
1963
Core Depth (cm)
Sediment Accumulation (g cm^{-2} yr^{-1})
^{210}Pb Age (yr)
2010
1985
1960
1935
1910
1885
1860
1835
1810


La Parra Sequence
(This study)
1: El Tejo Sequence
(Study in progress)
2: Lagunillo del Tejo Record
(Romero-Viana et al., 2009)
(López-Blanco et al., 2011)
3: La Cruz Record
(Julià et al., 1998)
Depth (cm)
UNITS
CORE PA10-1A-U
FACIES
14 C Dates (cal. yr AD)
1702 ±59
1581 ±73
1458 ±68
1308 ±58
1007 ±49
864 ±61
610 ±56
466 ±41
417 ±37
388 ±35
299 ±50
Sil Snd Gr
1: Silts
2: Sands
3: Gravels
4: Fine laminated silts
Decalcified substrate
Cretaceous basement
14 C Dates (cal. yr BC/AD)
CORE TEJ11
378 ±52
477 ±65
-431 ±2
-894 ±56
-1047 ±78
-1256 ±66
5: Revorked fine silts
ZONES
FACIES
CN-1
CN-3
Dates
1954 (137Cs)
1850 (210Pb)
1520 ± 117 (14C)
1280 ± 30 (14C)
Calcareous gyttja (10YR 1.7/1)
Calcareous gyttja (10YR 3/2)
Medium silt (10YR 5/3)
LITHOLOGY
1700 (varves)
1579 (varves)
1350 ± 50 (14C)
Lamination
Fine sand
Clays
Pebble
Paraconformities
Relative depth of records (cm)
La Parra
El Tejo
Lagunillo Tejo
La Cruz


PCA
Sr
Ca
TIC
U
TOC
TN
B
Ba
Sb
Ni
As
Mo
P
Cu
Hg
Fe
Li
Na
Zn
Cd
Cr
Pb
V
Mg
Al
Ti
Si
Co
Mn
Bi
Cs
K
Rb
0.4
0.2
0.0
−0.2
−0.4
PC2
Bioproductivity
+
-
−0.4
−0.2
0.0
0.2
0.4
PC1
+
-
Detrital origin


Sedimentary evolution
Carbonatic productivity
Biological productivity
Sediment delivery
14 C Dates (AD)
Depth. (cm)
UNITS
CORE
PA10-1A-U
FACIES
1702 ±59
1581 ±73
1458 ±68
1308 ±58
1007 ±49
864 ±61
610 ±56
466 ±41
417 ±37
388 ±35
299 ±50
Sil Snd Gr
Cc+Ar+ MgC (%)
Ca/Ti
TIC (%)
Sr/Ti
Diatoms (%)
Cyclotella cyclopuncta
Cyclotella distinguenda
Discostella stelligera
Encyonopsis cesatii
Encyonopsis microcephala
Achnanthidium minutissimum
Navicula diluviana
Navicula cryptotenella
Cymbella spp.
Chrysophyte cysts
Total abundance (x10⁶ v/gds)
Planktonic
Tychoplanktonic
Benthonic
TOC (%)
PC2
Low.
High.
Dol + Silicates (%)
Clay minerals (%)
TOC/TN (atomic)
Ti (ppm)
Pb (ppm)
Fe (ppm)
PC1
Cretaceous basement
Littoral massive facies:
1: Silts
2: Sands
3: Gravels
Distal laminated facies:
4: Fine laminated silts
Substrate:
Decalcified substrate


Torcas Complex
1: Lake La Parra
In-lake productivity
Sediment delivery
Lake level
Environ. episodes
Human Impact
Age (AD)
UNITS
PA10-1A-U FACIES
TOC/TN (atomic)
0 45
Int.
Higher
Lower
Int.
High.
Dry
Rural exodus
Agricultural terraces
Land uses greatest changes
Transhumance (Fires increase)
Cuenca Reconquest (1177)
Land abandonement
Muslim Era (8th-11th)
Visigoth Era (5th-8th)
Sil Snd Gr
-8 0 6
Low. High.
PC2
6 0 -4
Low. High.
PC1
Cretaceous basement
Littoral massive facies: 1: Silts 2: Sands 3: Gravels
Distal laminated facies: 4: Fine laminated silts
Substrate: Decalcified substrate
2: Lagunillo del Tejo
Macroscopic charcoal
0 250
Inferred lake level
3: Lake La Cruz
Varved period
Mediterranean
West
Central
East
4: Lake Taravilla
Paleoflood record
0 0.4
6: Lake Estanya
Aridity
5 -3
8: Lake Arreo
Hydrological reconstruction
10,11: Alborán Sea
PC1
-8 8
Aridity
13: Lake Ledro
Lake-level highstands
Floods
305G
306G
0 MS 80
Lake-level
5: Lake Somolinos
0 80
Total sediment inputs
7: Lake Montcortès
Low High
Lake-level
9: Lake Zoñar
Lake-level highstands
12: Lake Accesa
3 -6
Aridity
δ18O
14: Nar Gölü
Climatic period
Recent Times
Little Ice Age
Medieval Climate Anomaly
Dark Ages
Iberian Roman Period
13
12
8
6
7
5
4
2
3
1
14
9
10
11
N
0
km
1000

1) Alta sensibilidad a los cambios **hidrológicos**

2) Rápida respuesta a los cambios **antrópicos**

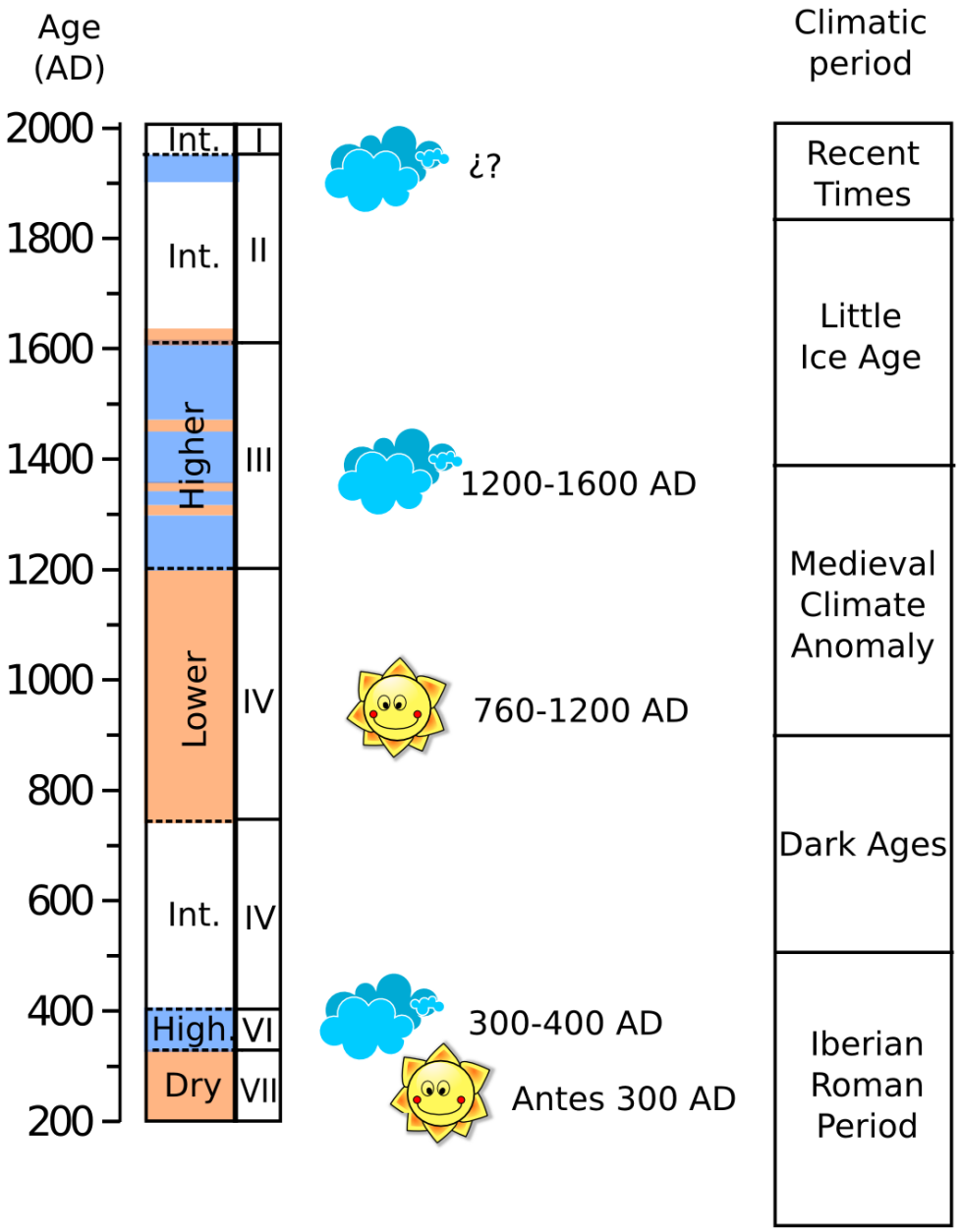
1) Interfase Visigodos-Árabes (550-750 AD)

2) Abandono de tierras (1000 AD)

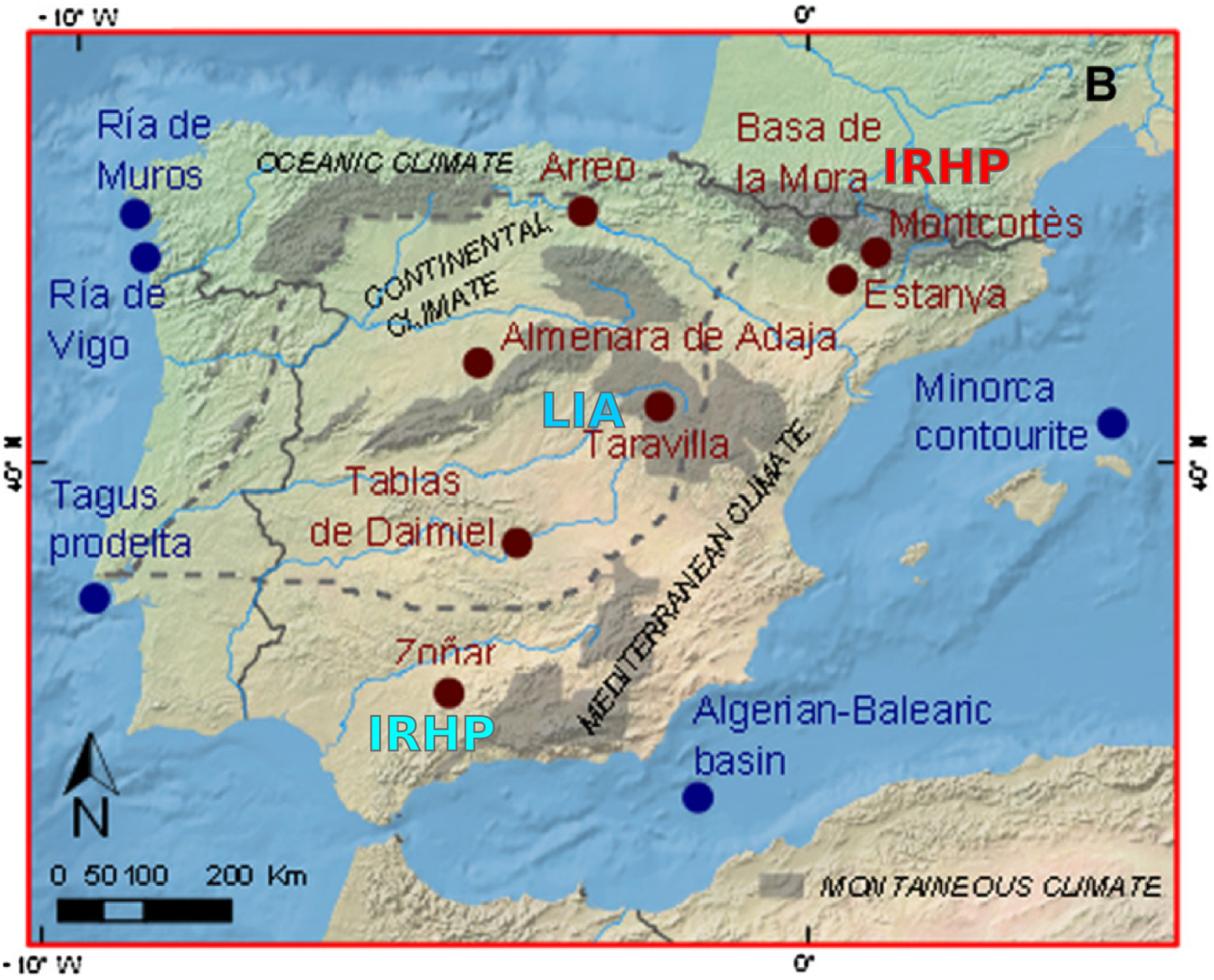
3) Aumento trasumancia (1400-1500 AD)

4) Guerras, desamortizaciones, desarrollo agrícola (1600 AD - Actualidad)

3) Reconstrucción coherente durante los últimos 1600 años:



4) Sostiene gradiente latitudinal Península



5) Sostiene paleoclima opuesto W-E Mediterráneo (NAO dinámica)

Gran heterogeneidad espaciotemporal:

Necesidad de integrar las diferencias regionales en síntesis globales

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¡¡Muchas gracias!!

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