DISCOVERING SPANISH LANDSCAPES

Changes in the natural environment

https://visualizadores.ign.es/comparador_pnoa/

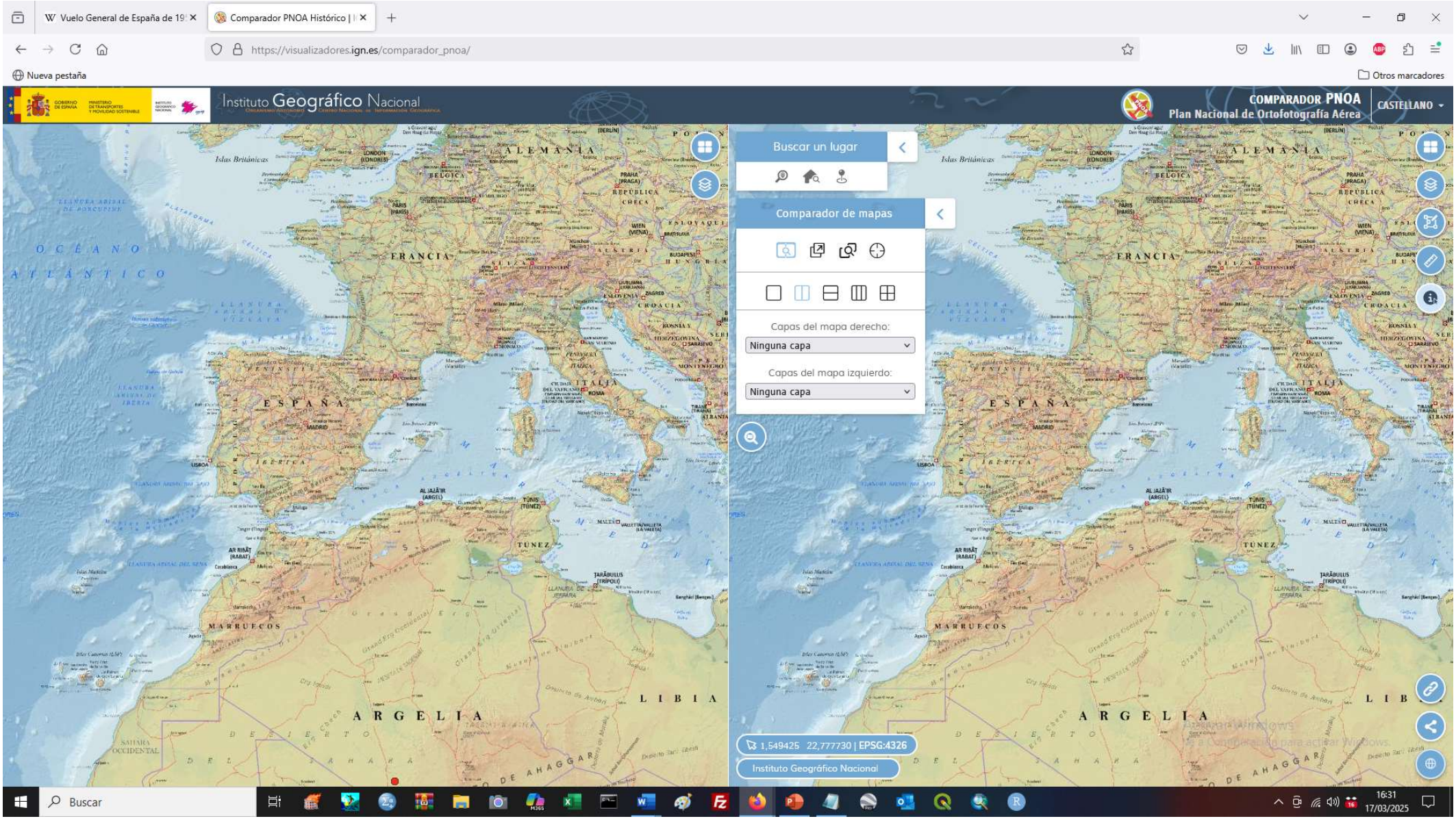


Fig. 1. Vista de Alcalá de Henares desde la barquilla de un globo. Esta imagen fue obtenida a finales del siglo XIX, y sería, según el *Estudio histórico del Cuerpo de Ingenieros* (1911), la primera fotografía aérea que se tomó en España.

The first aerial photographs of Spain were taken from hot air balloons.

The flight of Navarra was carried out betwee 928 and 1932 Rui H

The 1956 General Flight of Spain.

- Also called the 1956 American Flight, American Flight Series B, or simply American Flight (for us).

- **Importance**: it recorded most of the Spanish territory
  - 60,000 photographs.
  - Scale of 1:33,000.
  - Altitude of 5000 meters .
  - 4533 hours of flight.

- **What was it**? An aerial photography cartographic project of Spain carried out between March 1956 and September 1957 through an **agreement** between the Franco government and the United States government, through the Army Map Service.

- **What agreement**?

  - A defense agreement signed between Spain and the United States (September 23, 1953) → the Madrid Pacts.
  - USA government obtained transit and landing rights at the air bases in Morón de la Frontera, Torrejón de Ardoz, Zaragoza and the naval base of Rota.
  - Spain obtained militay equipment and weapons, as well as the modernization of its air bases
  - An updated cartography.

- What was the interest in taking photos of the Spanish territory?

  - The need to improve military cartography, based on the strategic interest of Spain during the Cold War,
  - To study the territory that was in a serious technological and economic delay.

Technical equipment

- Beechcraft RC-45 turboprop aircraft
- Fairchild T-11 photogrammetric cameras manufactured in the United States between 1952 and 1954.

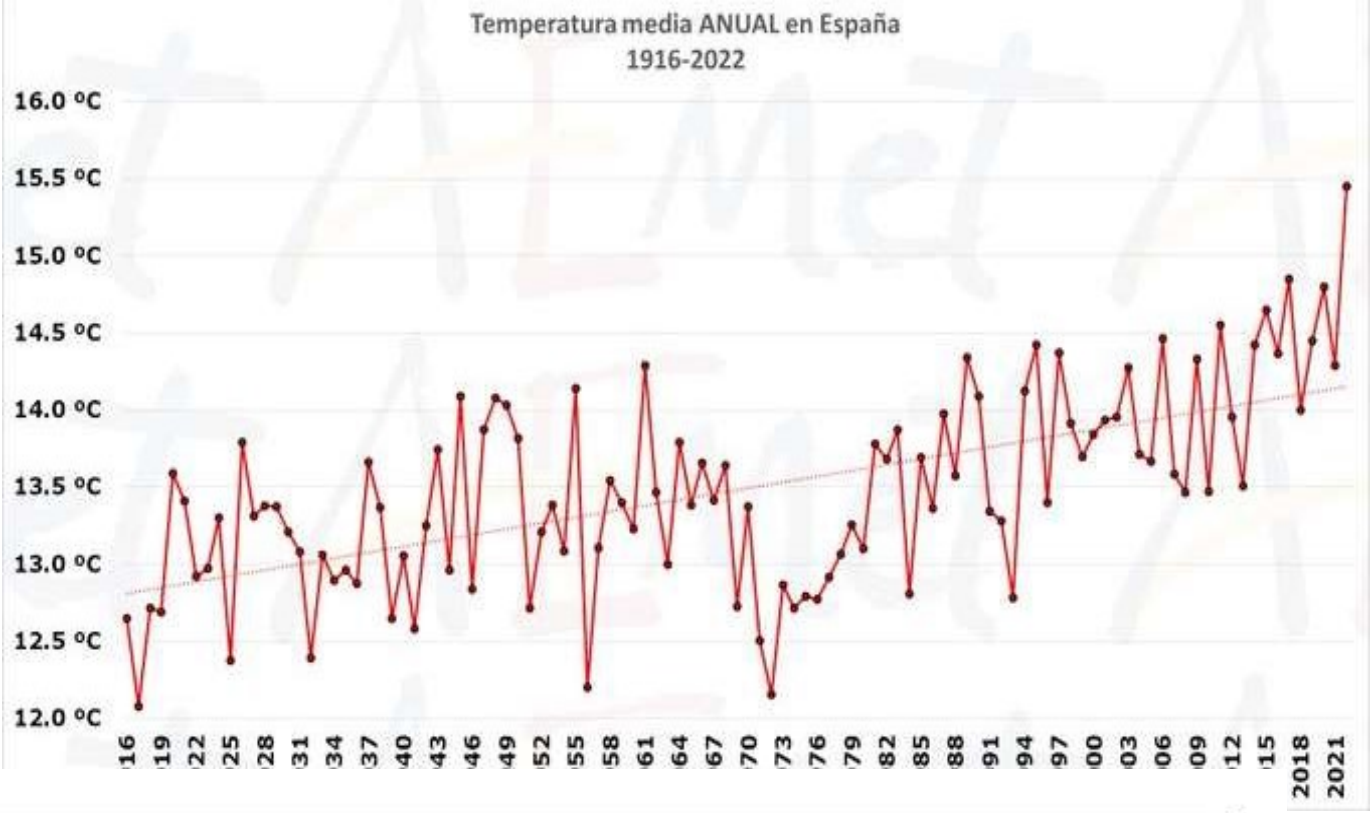
Technical equipment

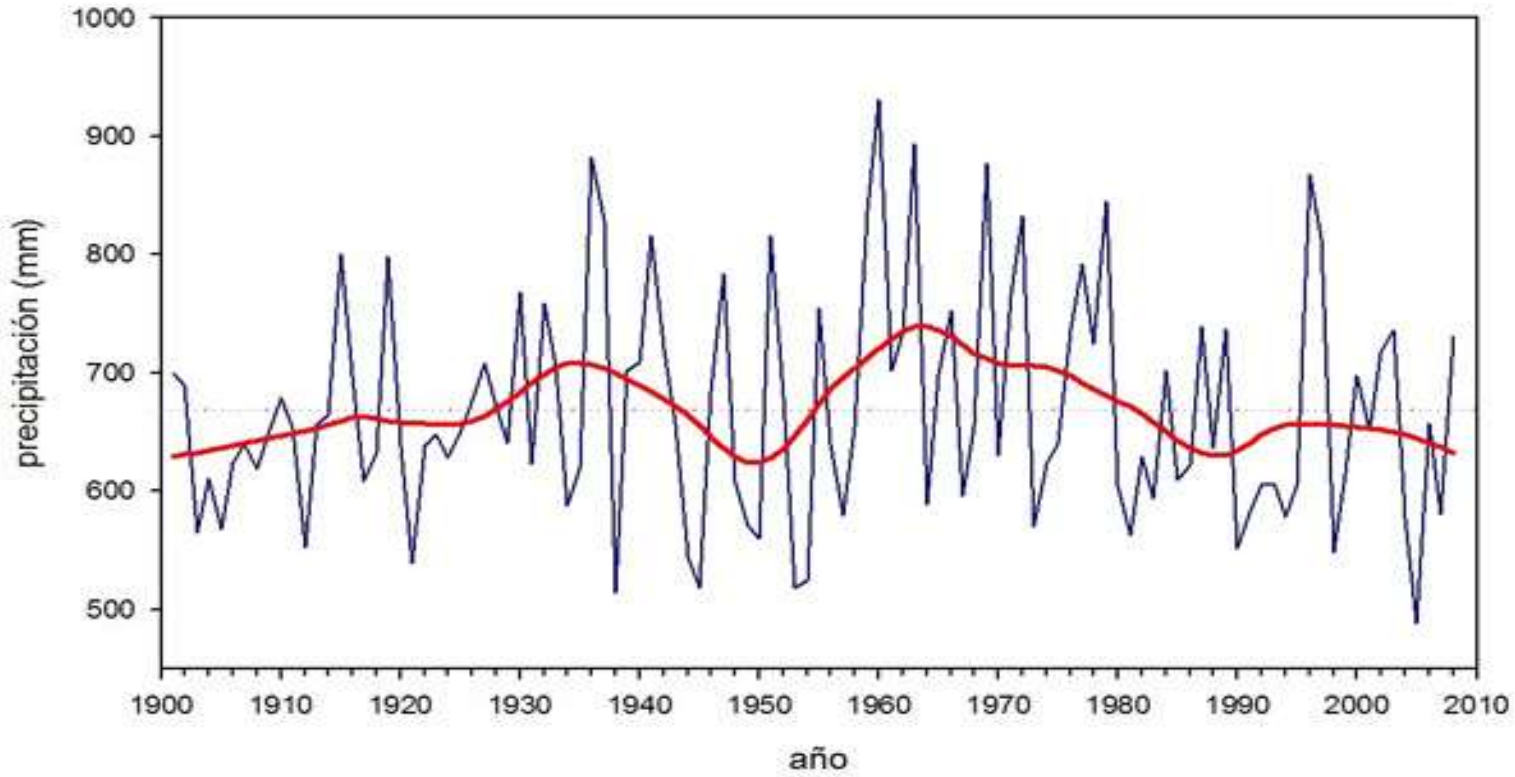
Kodak aerial cellulose acetate film (safety film)
Recorded marginal information in a side inscription on the negative

serial number of the lens

flight altitude

NATURAL LANDSCAPES


Temperatura media ANUAL en España
1916-2022
16.0 ºC
15.5 ºC
15.0 ºC
14.5 ºC
14.0 ºC
13.5 ºC
13.0 ºC
12.5 ºC
12.0 ºC
2018
2021


precipitación (mm)
1000
900
800
700
600
500
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
año

CHANGES OF THE CRYOSPHERE

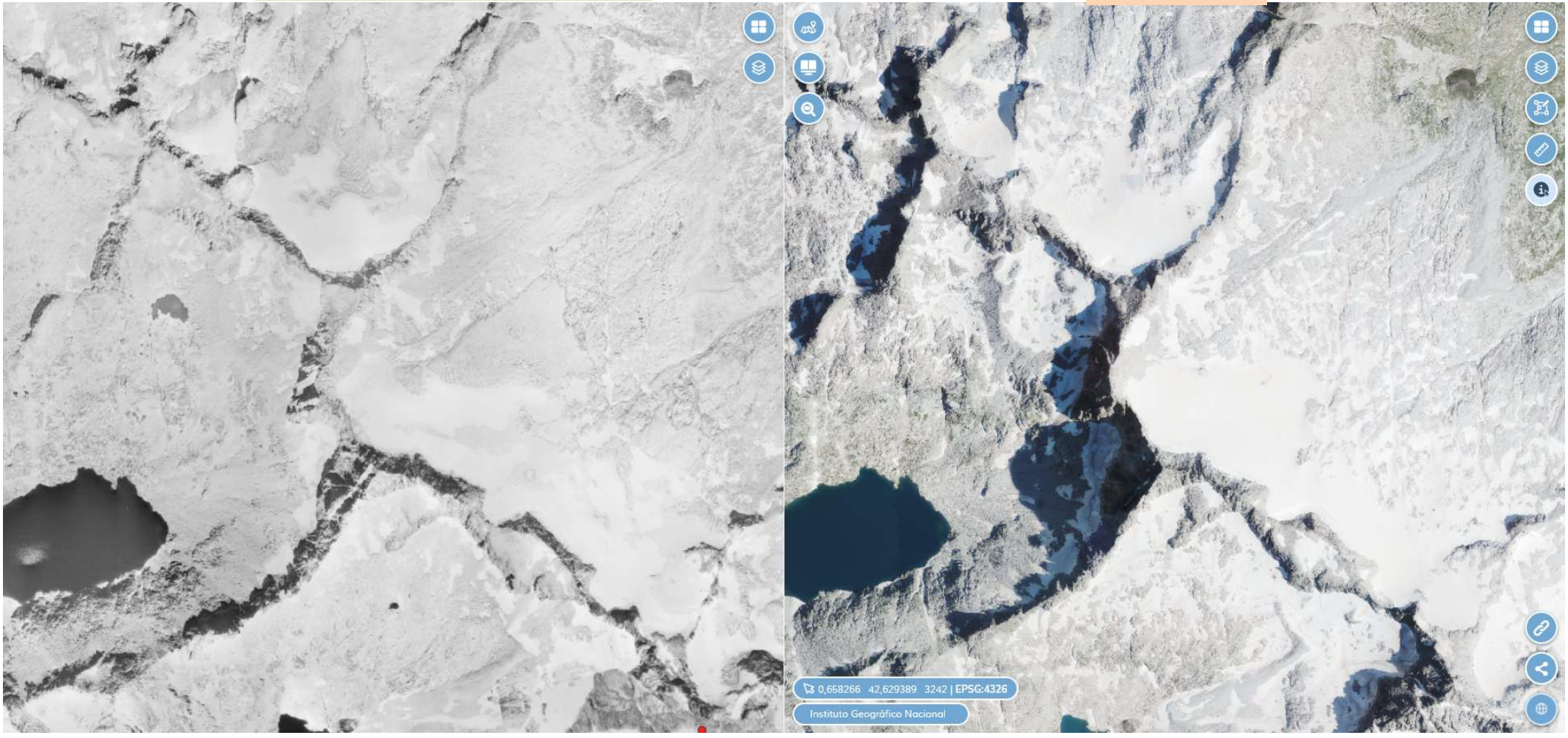
NATURAL LANDSCAPES

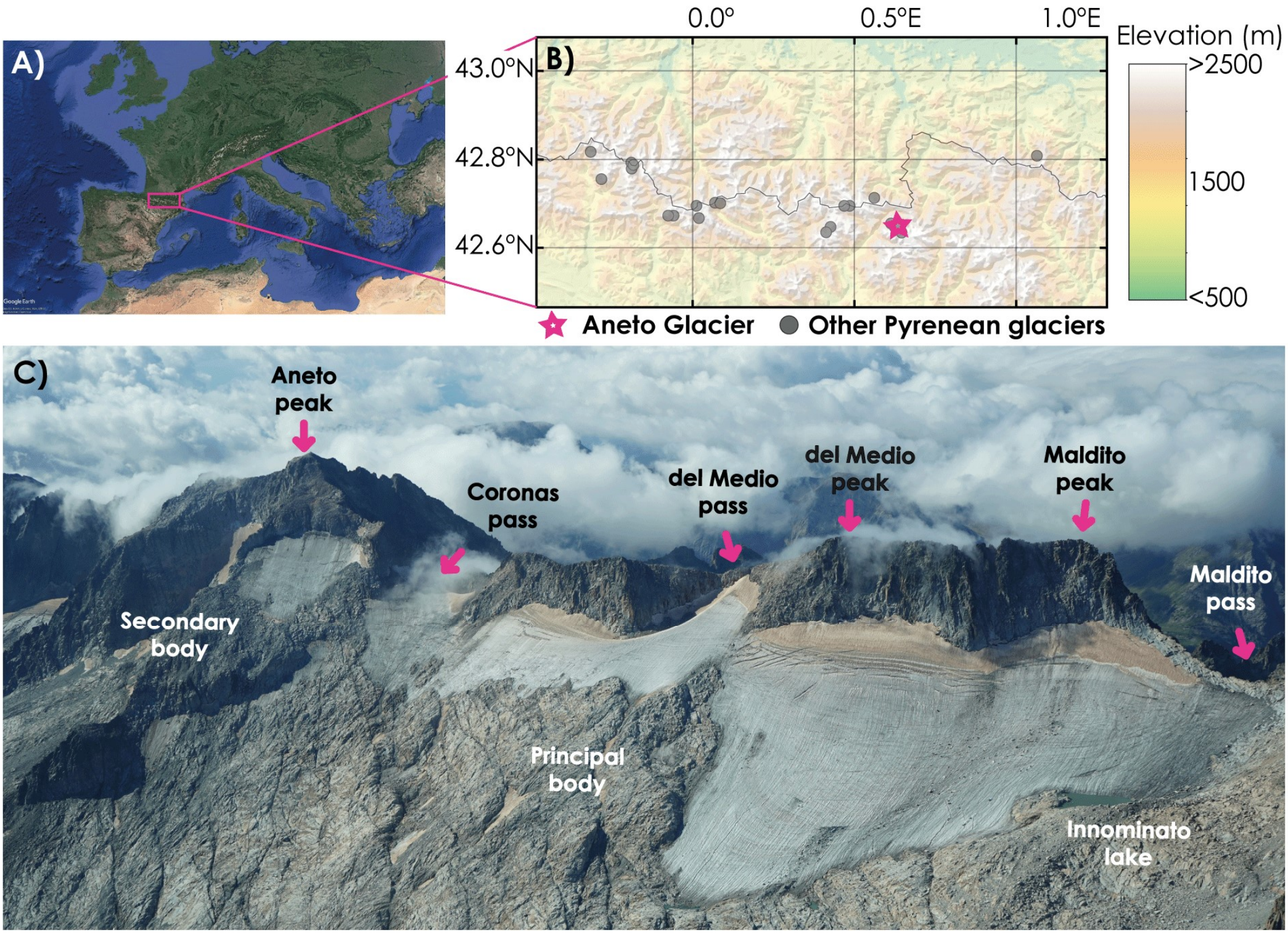
The vanishing of the southernmost glaciers of Europe

Benasque - La Maladeta

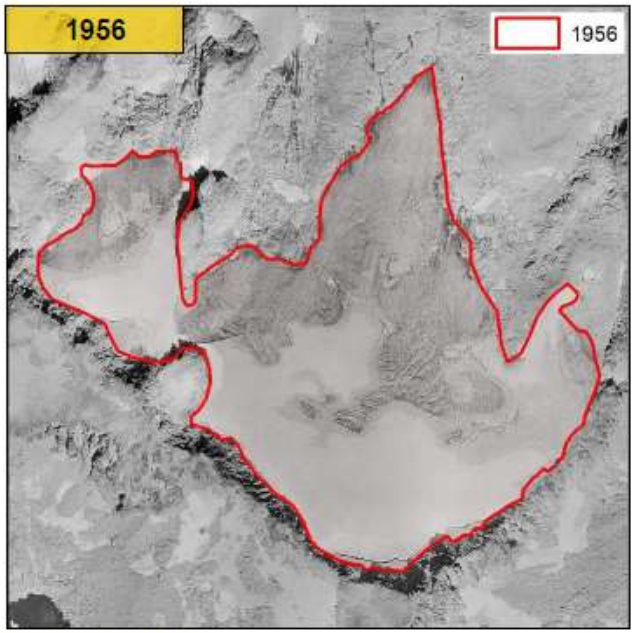
AMERICAN FLIGHT
1956

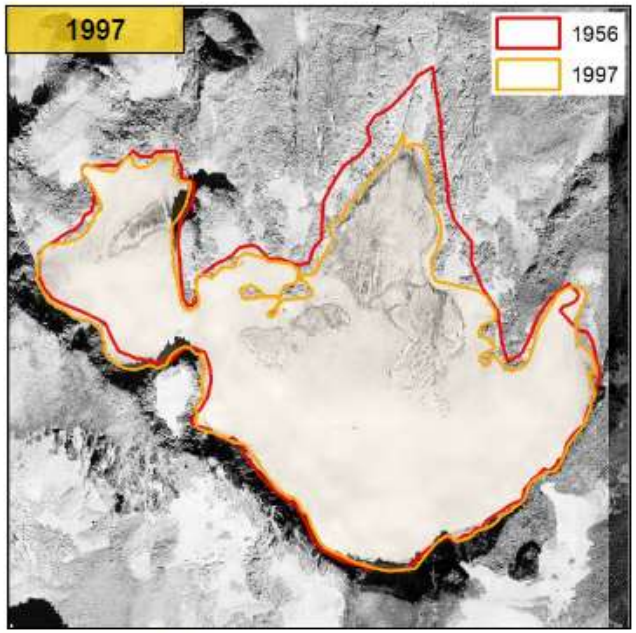
PNOA
2018

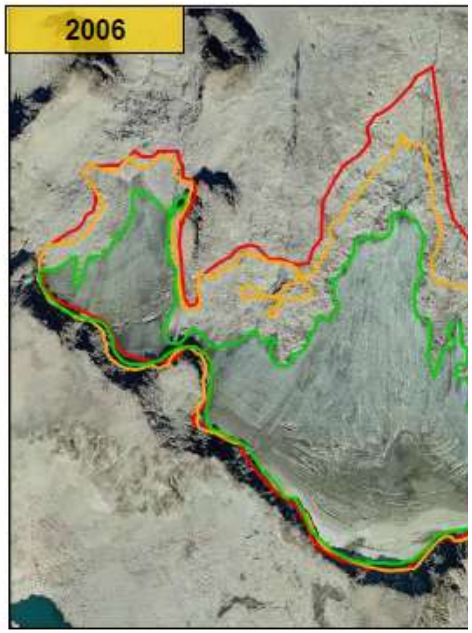


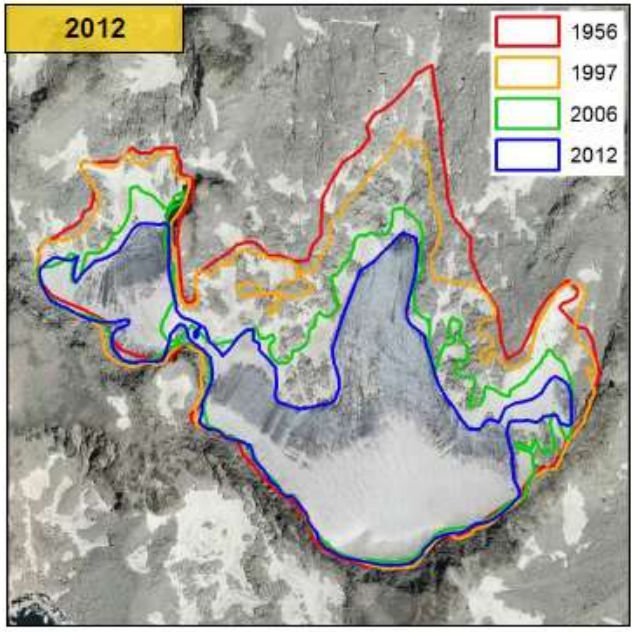

A)
B)
0.0°
0.5°E
1.0°E
43.0°N
42.8°N
42.6°N
Elevation (m)
>2500
1500
<500
Aneto Glacier
Other Pyrenean glaciers
C)
Aneto peak
Coronas pass
del Medio pass
del Medio peak
Maldito peak
Maldito pass
Secondary body
Principal body
Innominato lake

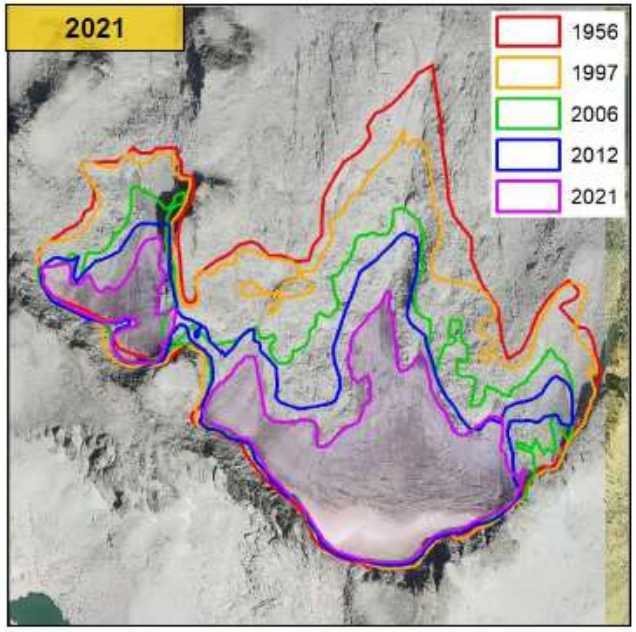
EVOLUCIÓN DE LA SUPERFICIE DEL GLACIAR DE LA MALADETA
ORTOFOTOGRAFÍAS HISTÓRICAS: 1956 – 2021









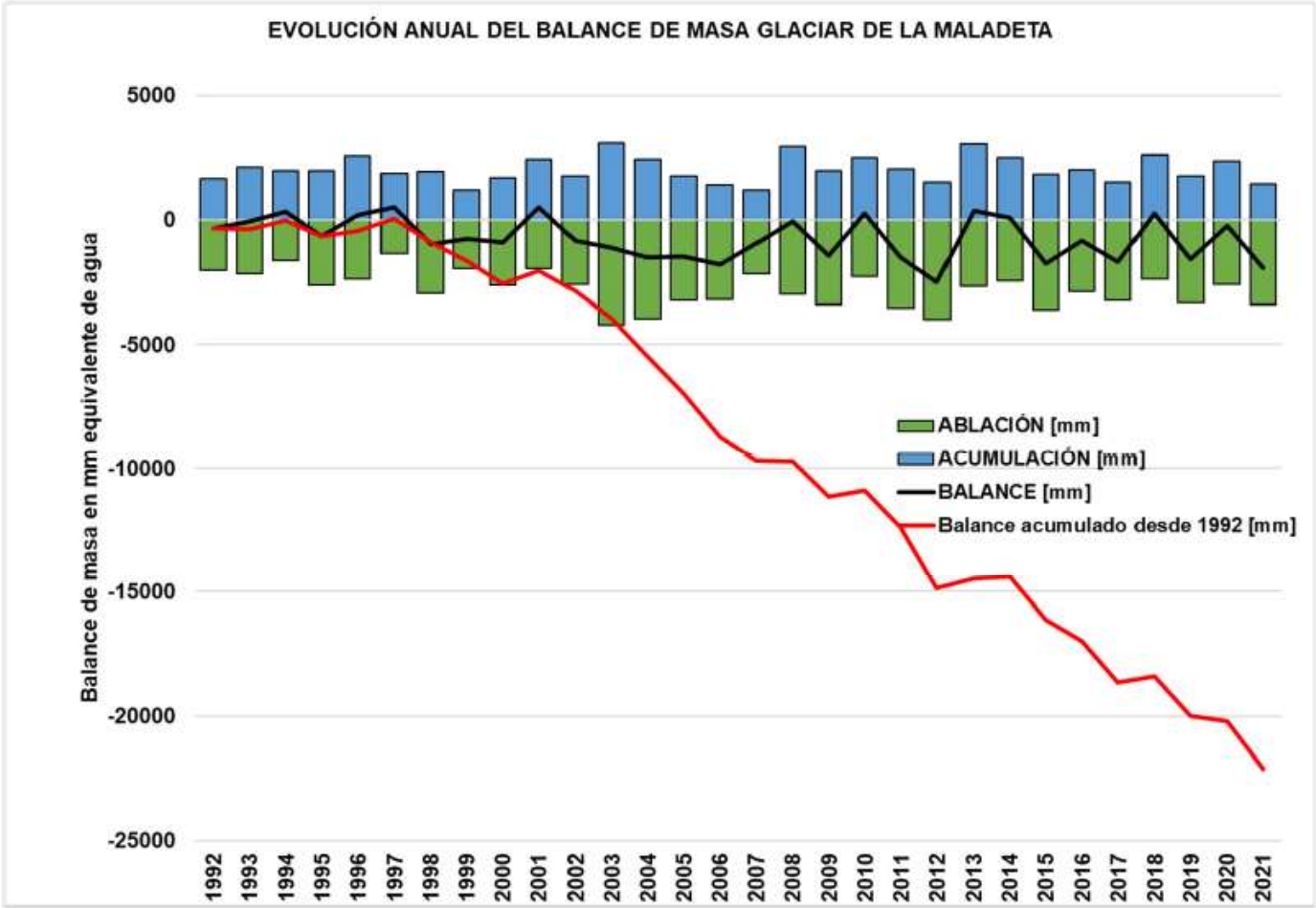


Año	Superficie (m²) (1)	Fu
1956	607.600	Amer
1997	546.500	Vuel
2006	363.300	Vu
2012	293.000	Vu
2021	202.200	Vu (e

(1) Superficie calculada a partir de la c perimetral mostrada en las figuras.
(2) https://centrodedescargas.cnig.es

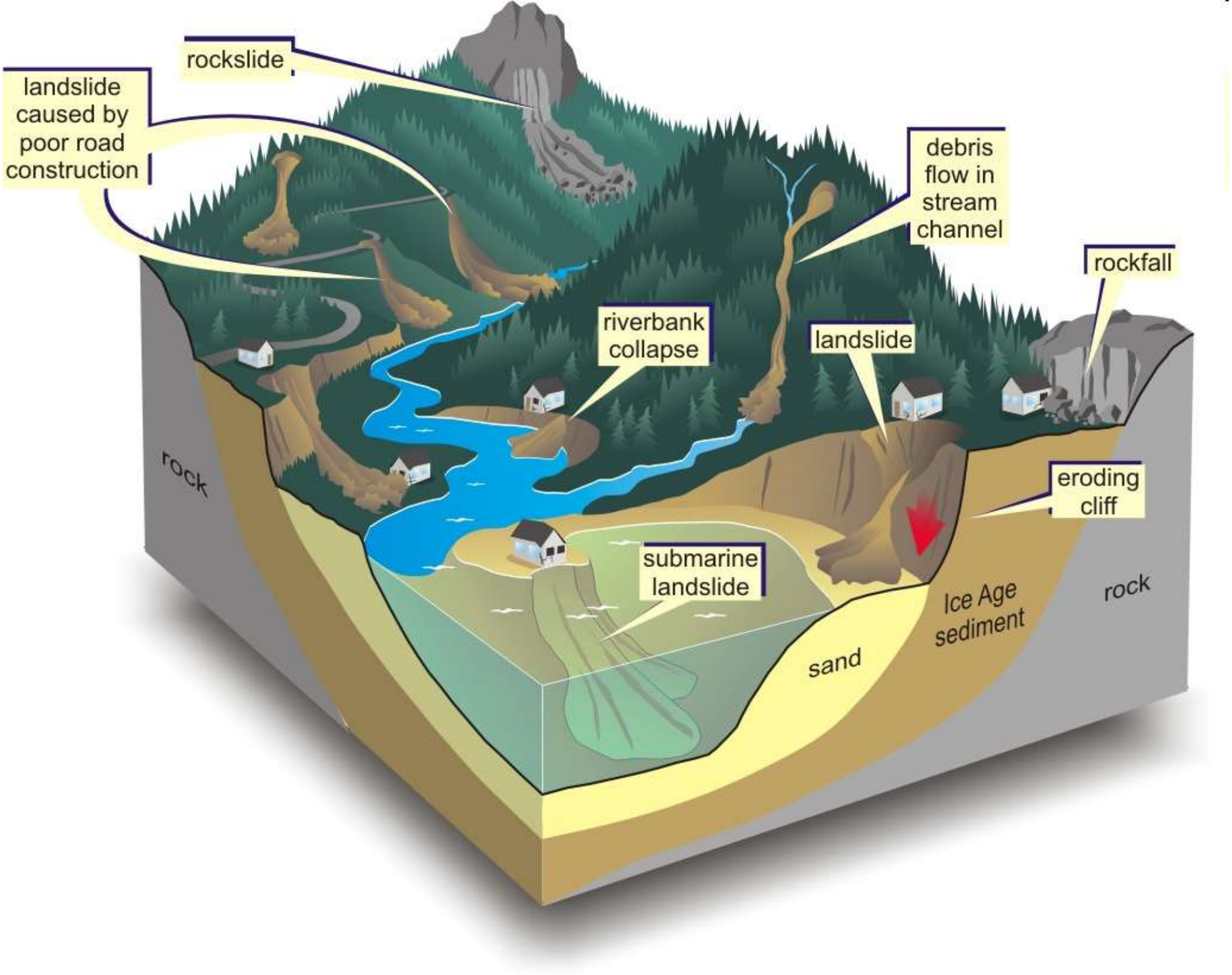
GOBIERNO DE ESPAÑA
VICEPRESIDENCIA TERCERA DEL GOBIERNO
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

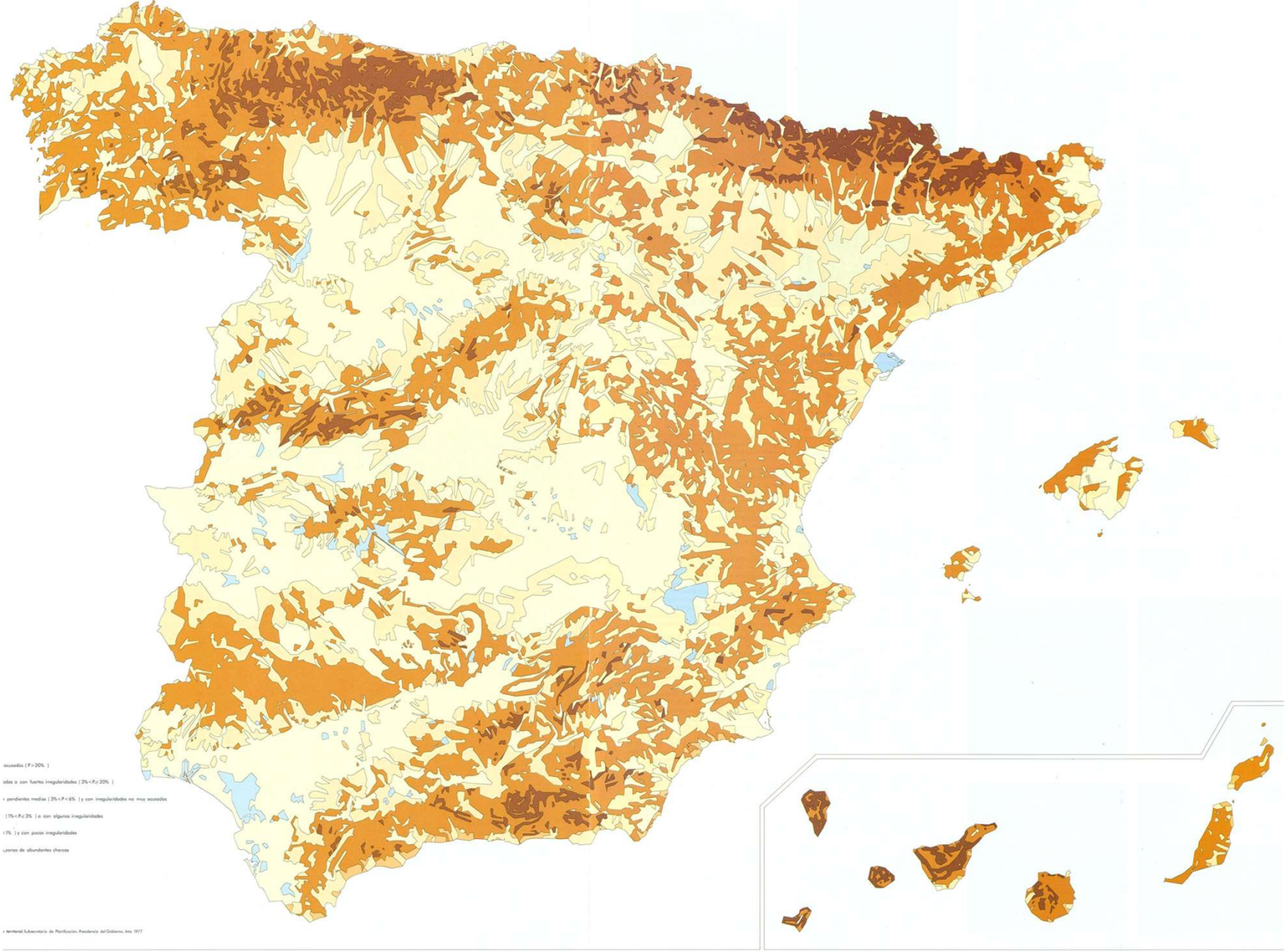
EVOLUCIÓN ANUAL DEL BALANCE DE MASA GLACIAR DE LA MALADETA



Ablación: pérdida de la masa del glaciar.
Acumulación: aumento de la masa del glaciar
Balance: Diferencia entre acumulación y ablación. Valores negativos indican que el glaciar está perdiendo masa

INSTABILITY OF THE MOUNTAIN SLOPES


rockslide
landslide caused by poor road construction
debris flow in stream channel
rockfall
riverbank collapse
landslide
rock
eroding cliff
submarine landslide
Ice Age sediment
rock
sand



Suelo con pendientes acusadas (P > 20 %)

Suelo con pendientes acusadas o con fuertes irregularidades (3% < P ≤ 20 %)

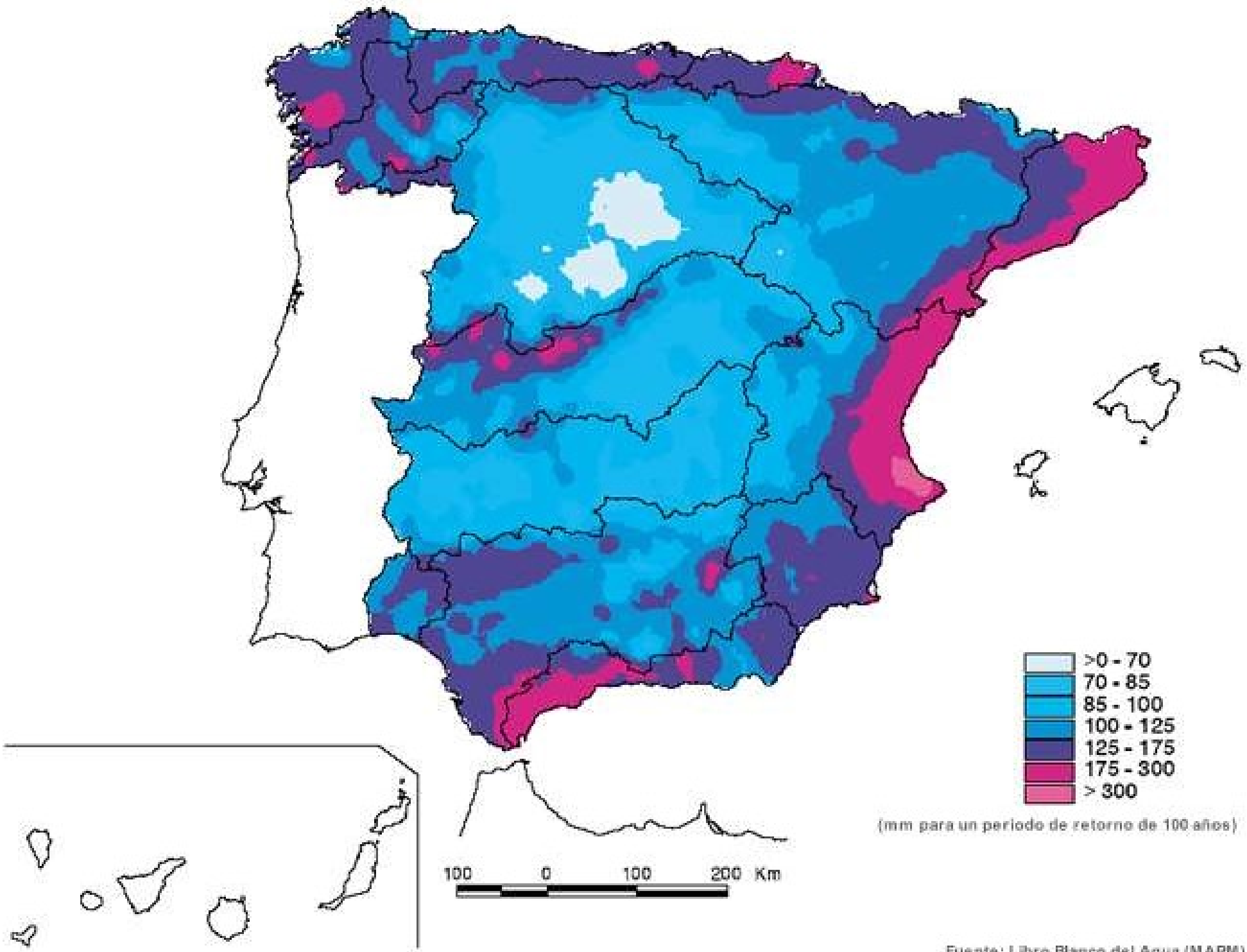
Zona costera de suelo con pendientes medias (3% < P ≤ 6 %) y con irregularidades no muy acusadas)

Suelo con pendiente suave (1% < P ≤ 3%) o con alguna irregularidad

Suelo llano (pendientes P < 1%) y con pocas irregularidades

Lagunas, embalses, zonas con abundantes charcas

LOS RIESGOS DE INUNDACIÓN
LLUVIAS MÁXIMAS DIARIAS EN LA ESPAÑA PENINSULAR



Fuente: Libro Blanco del Agua (MARM)


VEGETACIÓN ACTUAL
MAR CANTÁBRICO
FRANCIA
ANDORRA
OCÉANO ATLÁNTICO
PORTUGAL
Islas Baleares
MEDITERRÁNEO
Masas boscosas
(Incluye repoblaciones antiguas)
0 100 200 300 km
Fuente de información: MAPA (Ministerio de Agricultura, Pesca y Alimentación), 1991
Elaborado por Atlas Nacional de España (IGN)
MAR
Estrecho de Gibraltar
Ceuta
Melilla
ARGELIA
MARRUECOS
OCÉANO ATLÁNTICO
Islas Canarias

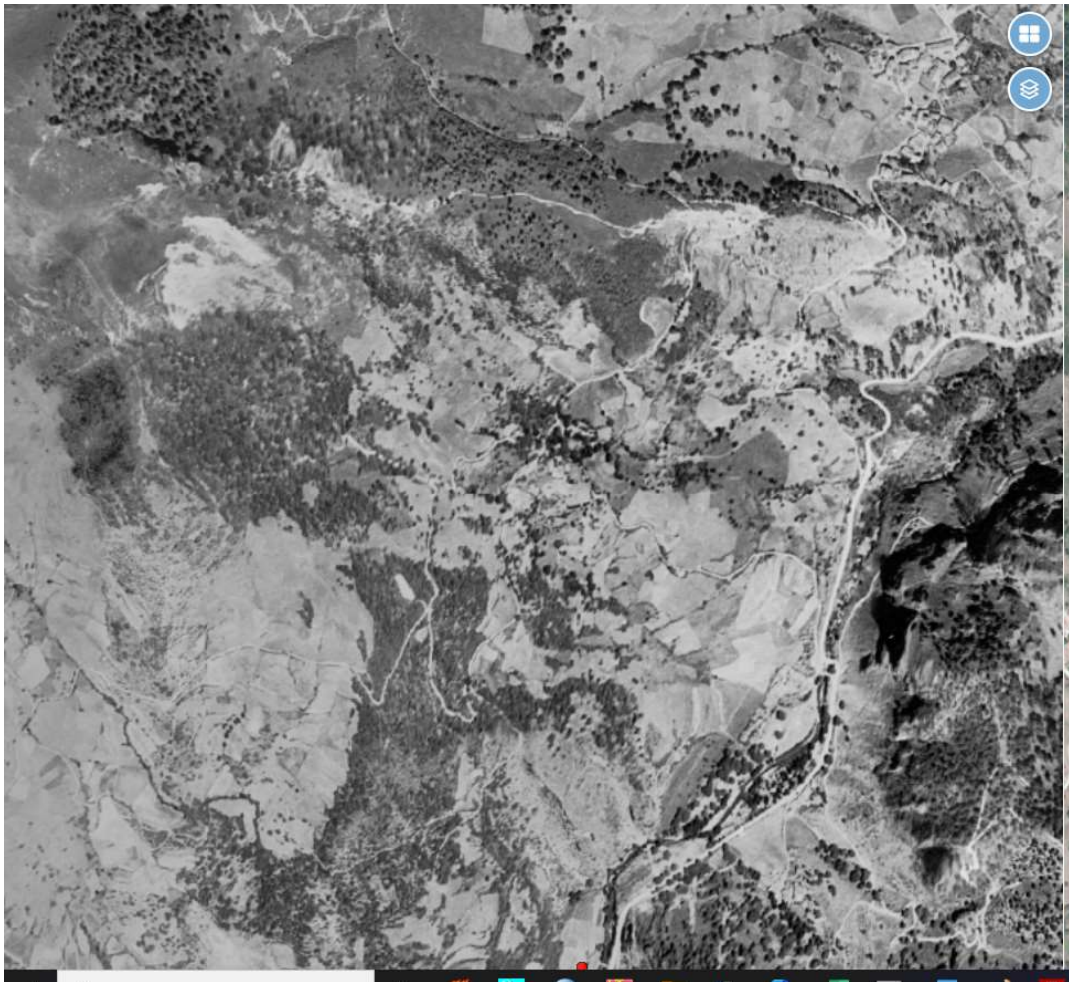
NATURAL LANDSCAPES

Landslides

Sebrango (Cantabria)

AMERICAN FLIGHT
1956

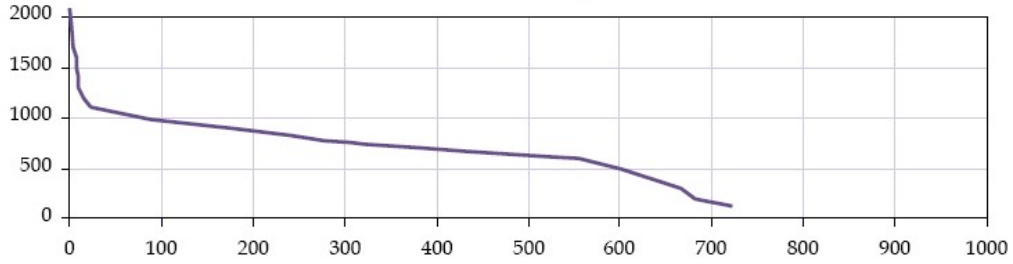
PNOA
2014



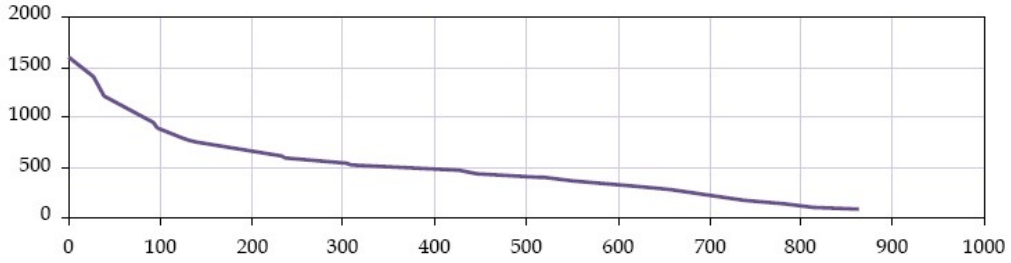
FLOODING


ÁMBITO TERRITORIAL DE LAS ADMINISTRACIONES HIDRAÚLICAS
MAR CANTÁBRICO
OCÉANO ATLÁNTICO
FRANCIA
ANDORRA
PORTUGAL
Islas Baleares
MEDITERRÁNEO
MAR
ARGELIA
MARRUECOS
Estrecho de Gibraltar
Ceuta
Melilla
OCEANO ATLÁNTICO
Islas Canarias
CUENCA HIDROGRÁFICA
ÁMBITOS DE PLANIFICACIÓN
(1) Galicia-Costa (*)
(2) Norte I, II y III
(3) Cuencas internas del País Vasco (*)
(4) Duero
(5) Tajo
(6) Guadiana I y II
(7) Cuenca Atlántica Andaluza (*)
(8) Guadalquivir
(9) Cuenca Mediterránea Andaluza (*)
(10) Segura
(11) Júcar
(12) Ebro
(13) Cuencas internas de Cataluña (*)
(14) Baleares (*)
(15) Canarias (*)
(*) Cuencas intracomunitarias (administradas por su comunidad autónoma)
Ámbitos Territoriales
Límite de las comunidades autónomas
0 100 200 300 km
Fuente de información: Ministerio de Medio Ambiente. Dirección General del Agua. Boletín Hidrológico Semanal, nº 3, 2007

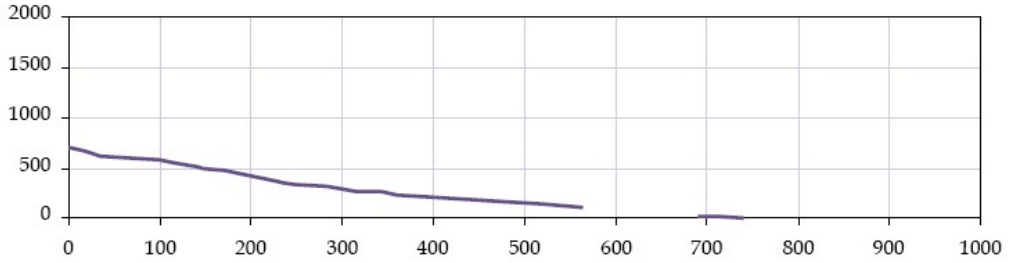
Duero hasta Portugal



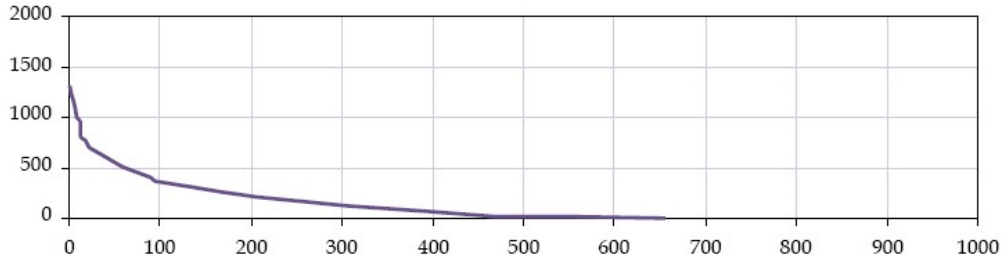
Tajo hasta Portugal



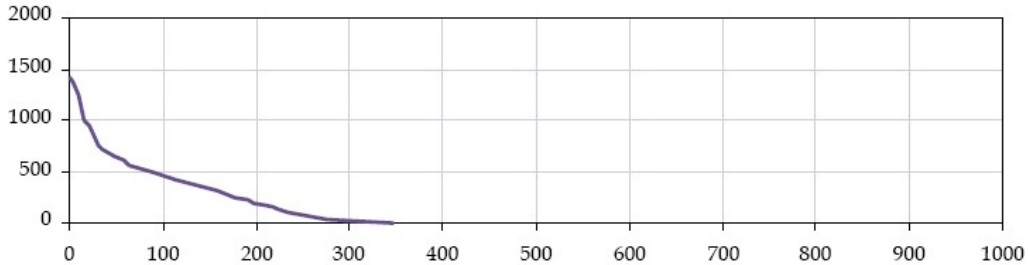
Guadiana



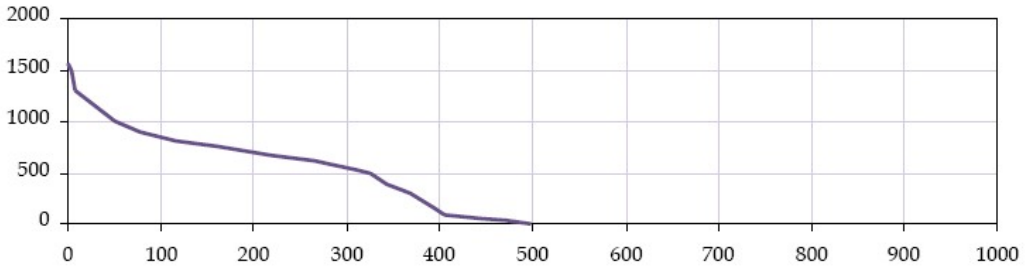
Guadalquivir



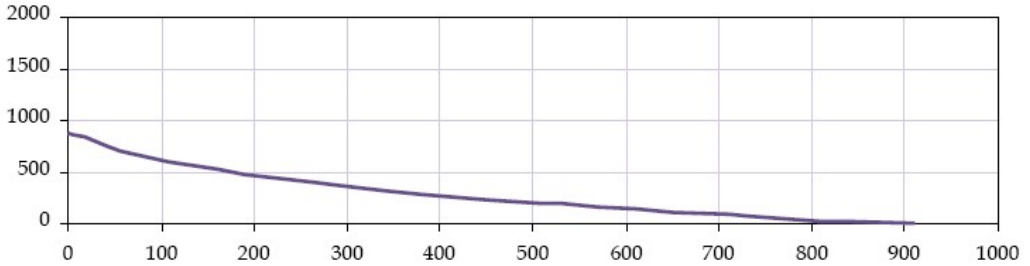
Segura



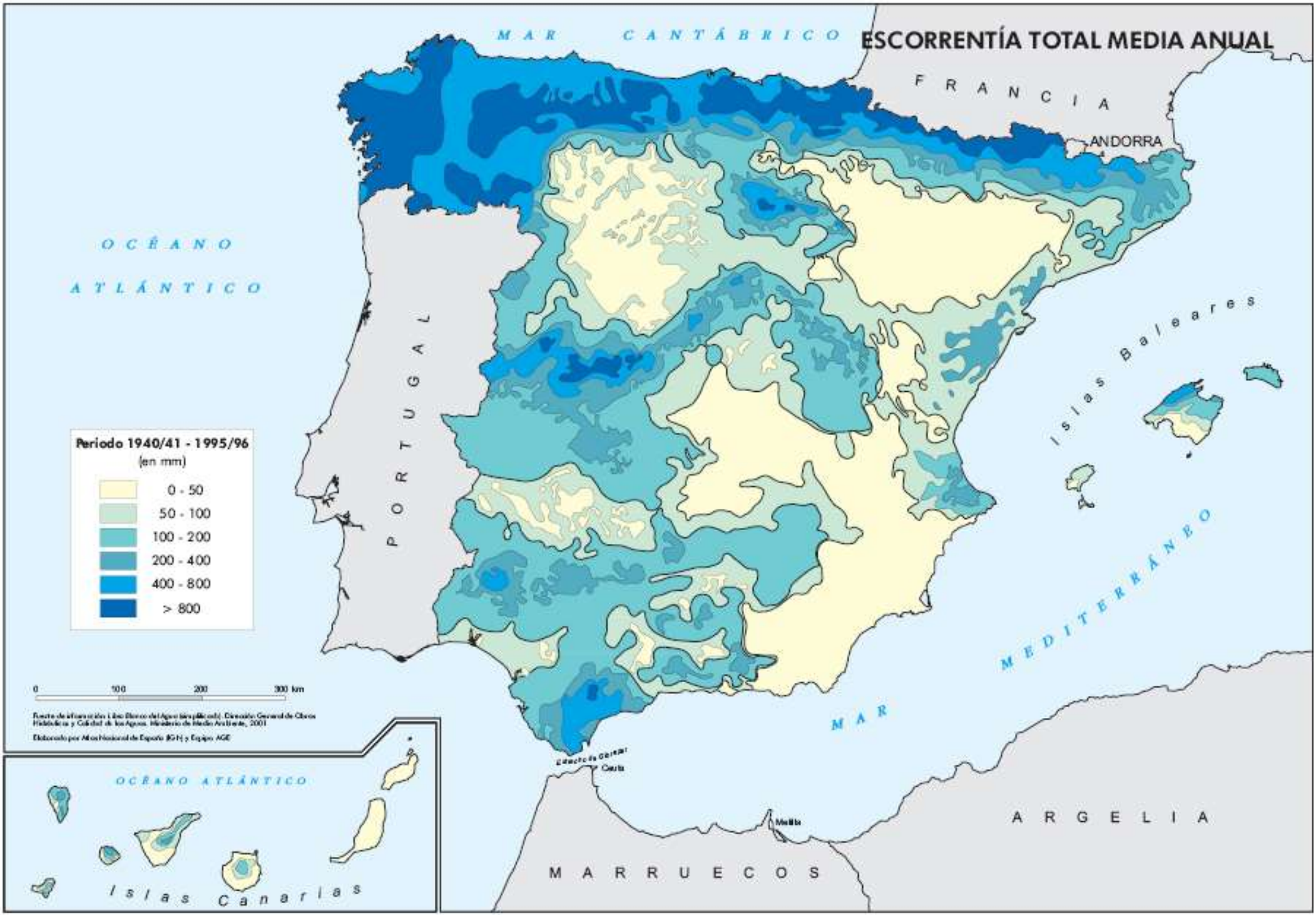
Júcar

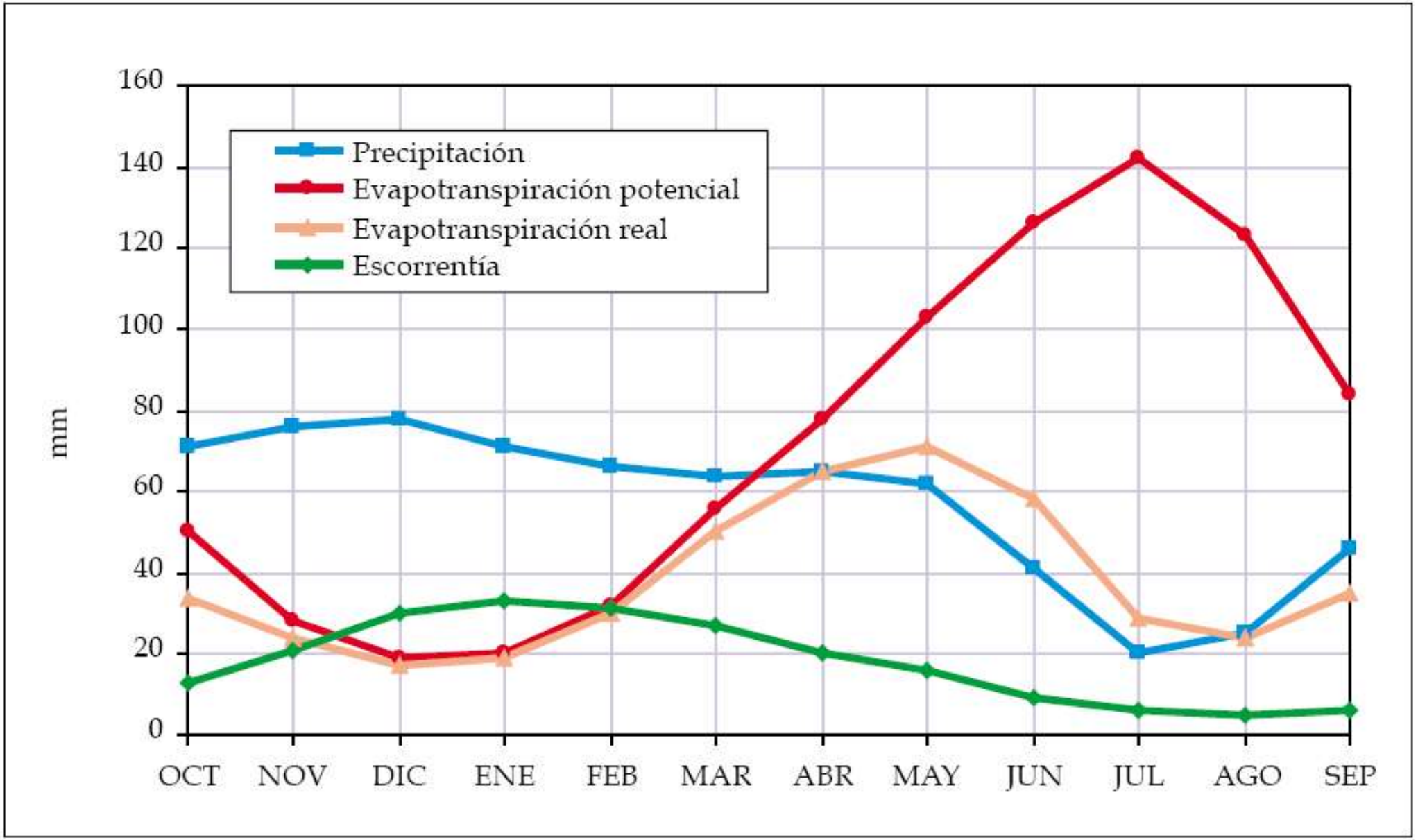


Ebro

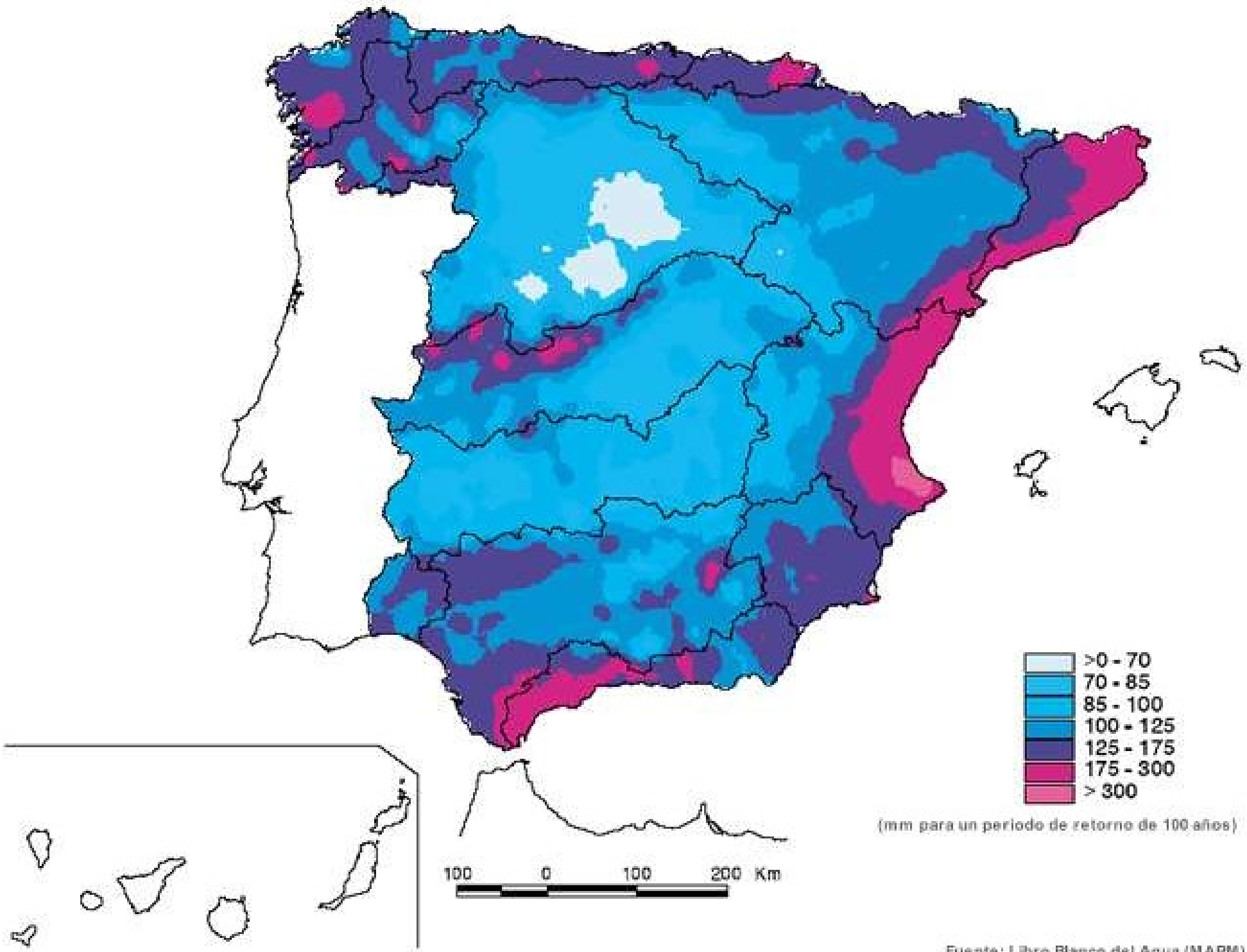


ESCORRENTÍA TOTAL MEDIA ANUAL

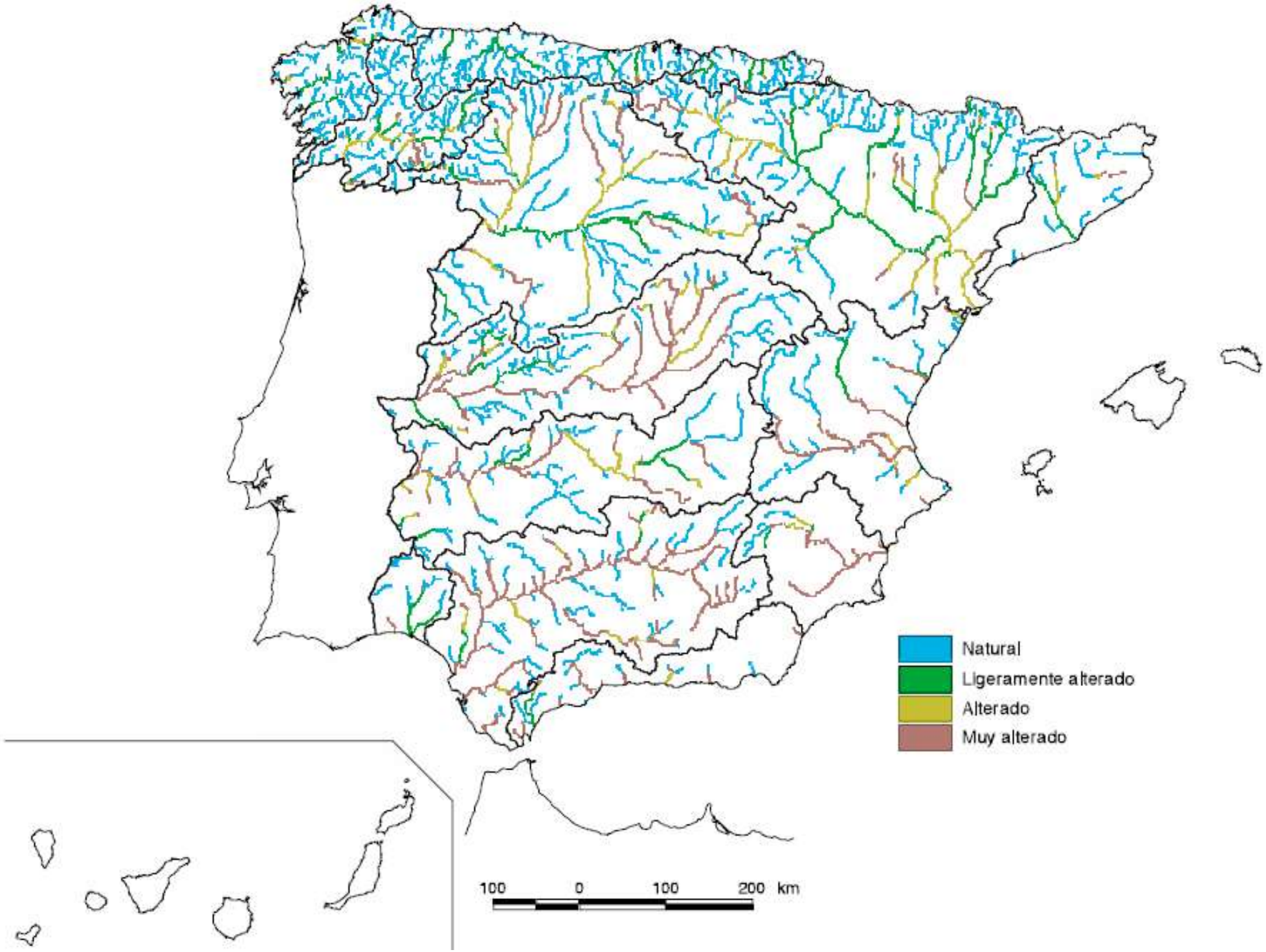


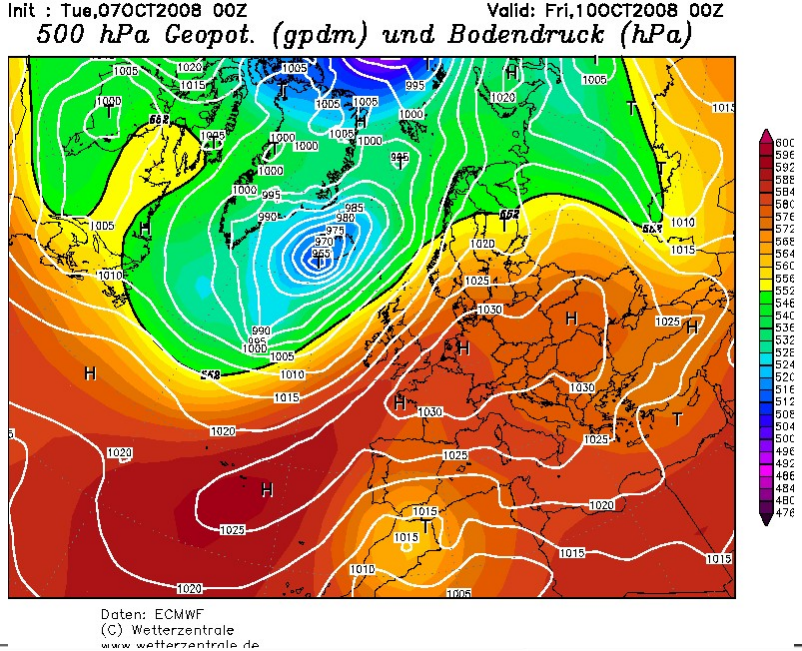

160
140
120
100
80
60
40
20
0
mm
Precipitación
Evapotranspiración potencial
Evapotranspiración real
Escorrentía
OCT
NOV
DIC
ENE
FEB
MAR
ABR
MAY
JUN
JUL
AGO
SEP

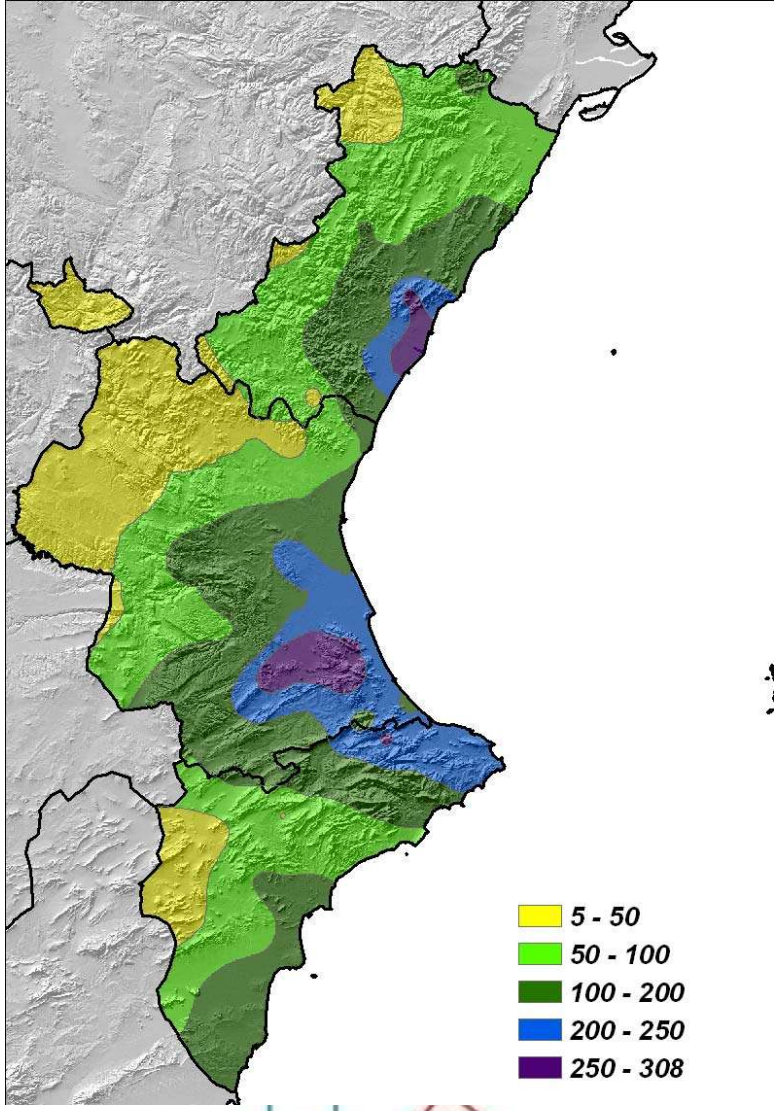
LOS RIESGOS DE INUNDACIÓN
LLUVIAS MÁXIMAS DIARIAS EN LA ESPAÑA PENINSULAR



Fuente: Libro Blanco del Agua (MARM)


Natural
Ligeramente alterado
Alterado
Muy alterado
100 0 100 200 km

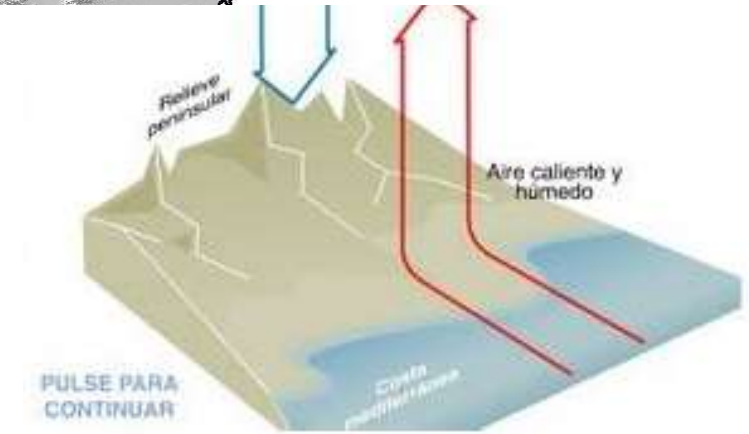




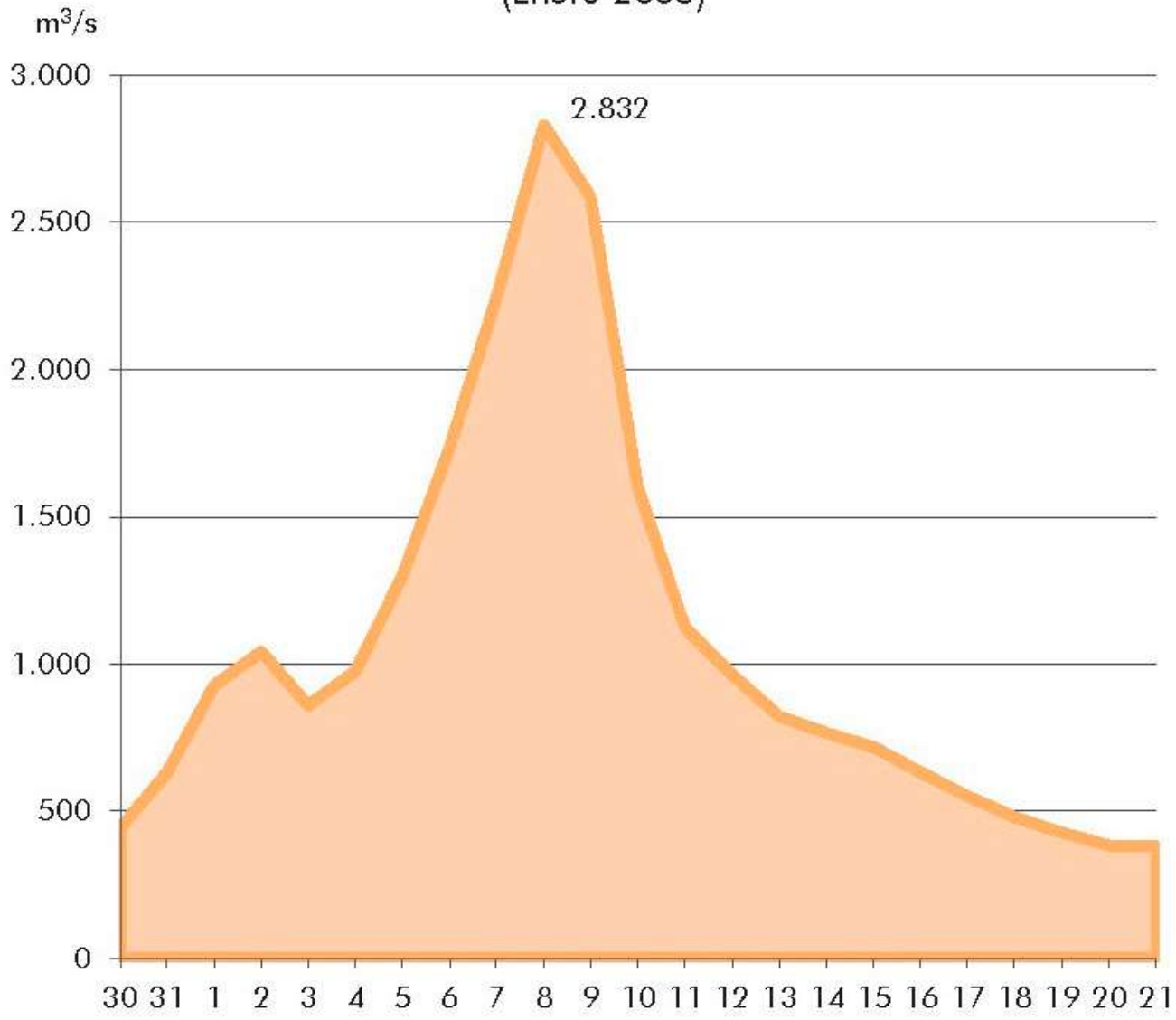
La gota fría

Estas nubes, del tipo cumulonimbos, descargan una fuerte lluvia, normalmente acompañada de un gran aparato eléctrico y de granizo. Las lluvias torrenciales pueden dejar hasta 232 litros por metro cuadrado de agua provocando graves inundaciones.

La presencia de una red de colectores fluviales de corto recorrido (ríos-rambla, ramblas y barrancos) de comportamiento torrencial favorece los desbordamientos de los ríos y las inundaciones.

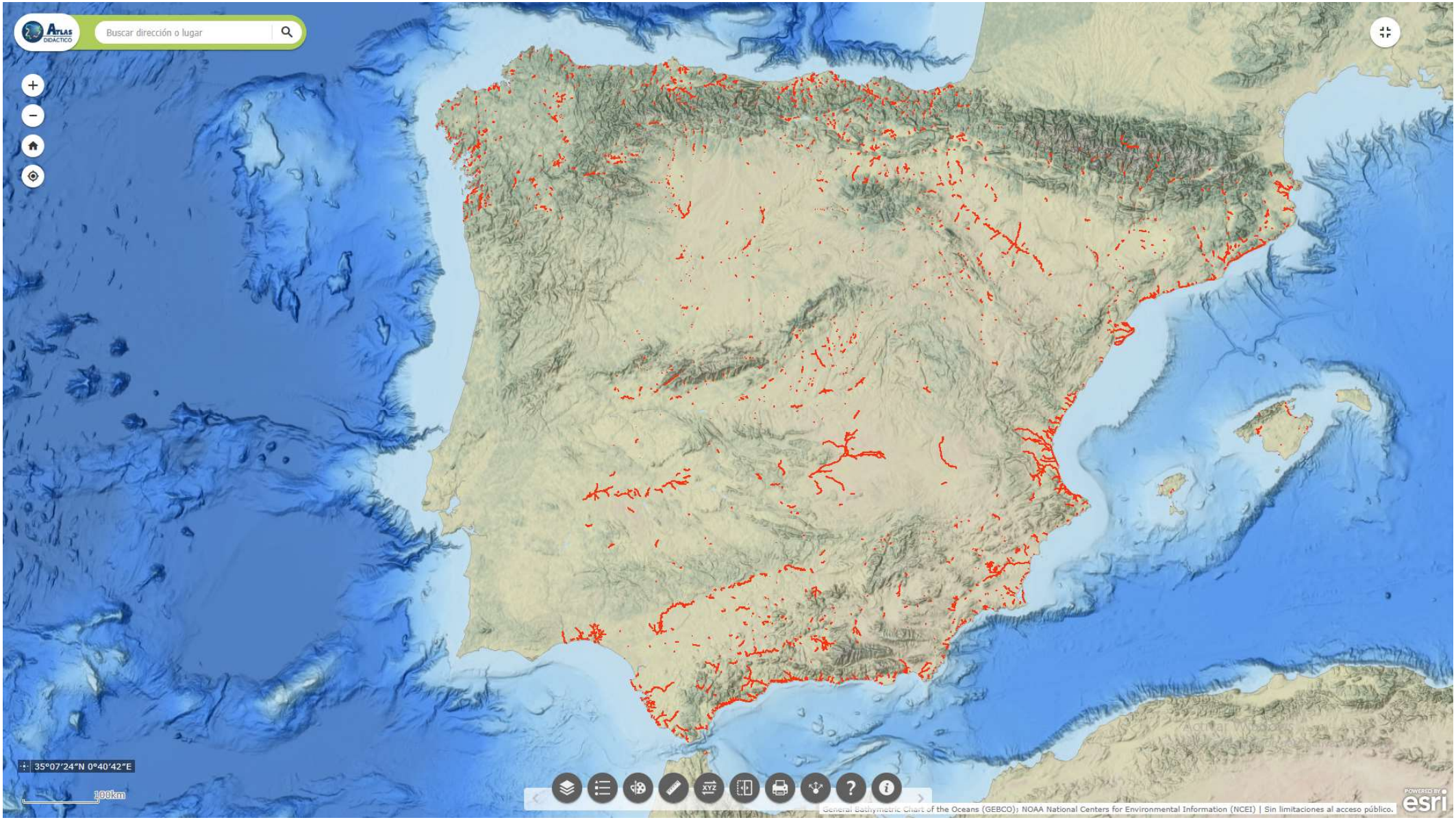


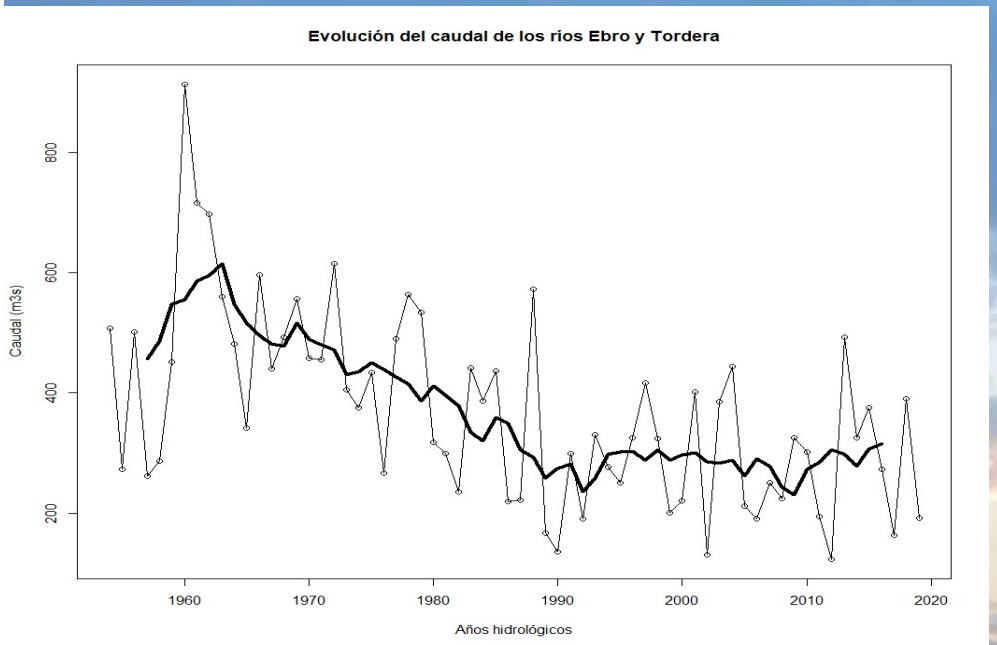
RÍO EBRO EN ZARAGOZA
(Enero 2003)



Fuente: Anuarios de Aforos. Ministerio de Agricultura, Alimentación y Medio Ambiente

Elaborado por: Instituto Geográfico Nacional. Atlas Nacional de España


Atlas Didactico
Buscar dirección o lugar
35°07'24"N 0°40'42"E
100km
XYZ
General Bathymetric Chart of the Oceans (GEBCO); NOAA National Centers for Environmental Information (NCEI) | Sin limitaciones al acceso público.
esri


Evolución del caudal de los ríos Ebro y Tordera
Caudal (m3s)
200
400
600
800
1960
1970
1980
1990
2000
2010
2020
Años hidrológicos

NATURAL LANDSCAPES

Riverflow dinamics: Galachos (River Ebro)

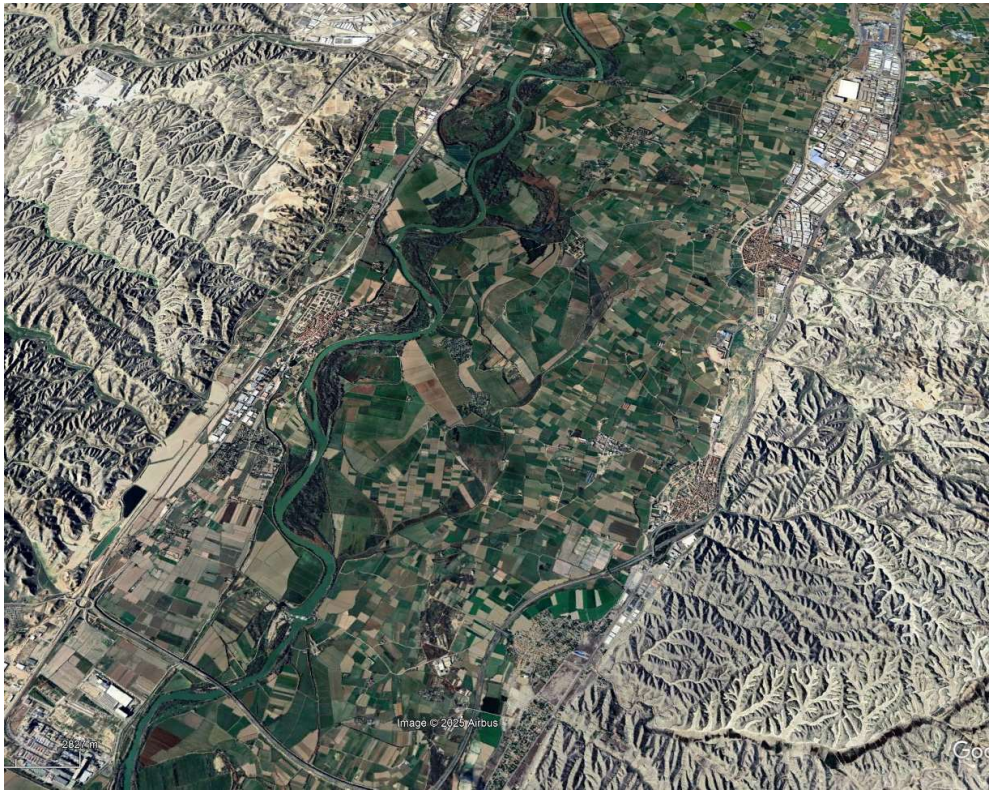
Juslibol (Zaragoza)

AMERICAN FLIGHT
1956

PNOA
2018

DESCRIPTION

- **GALACHO**:
  - Popular name in Aragon
  - An **oxbow lake** within a meander cutoff (also known as abandoned meander).



- **MEANDER CUTOFF**:
  - A meander that has been abandoned by its stream after the formation of a neck cutoff.

ORIGIN OF A MEANDER

- One of a series of regular sinuous curves in the channel of a river or other watercourse.

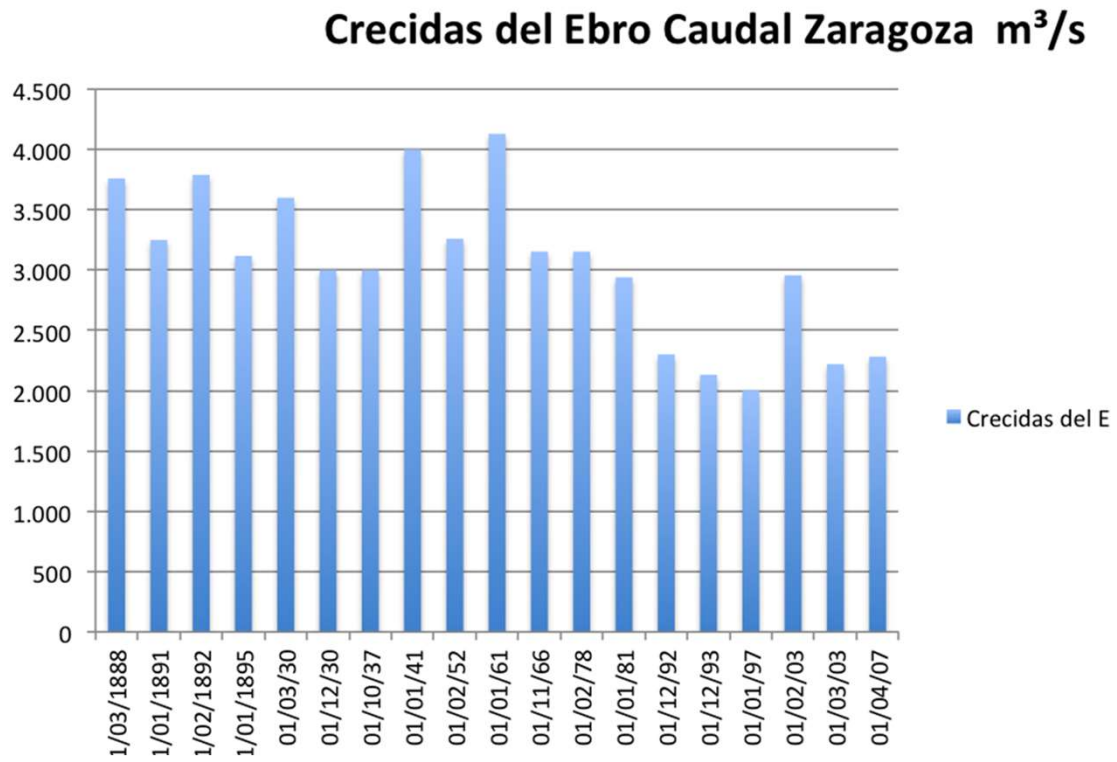
- A coupled cycle of erosion and sedimentation
  A watercourse
  - Erodes the sediments of an outer, concave bank (cut bank or river cliff)
  - Deposits sediments on an inner, convex bank which is typically a point bar.

- The result is the formation of a sinuous course as the channel migrates back and forth across the axis of a floodplain

ORIGIN

- Formed on January 2nd 1961

- Resulted from one the largest flood of the Ebro in the 20th century (4130 m³/s of flow, about 16 times the average value).

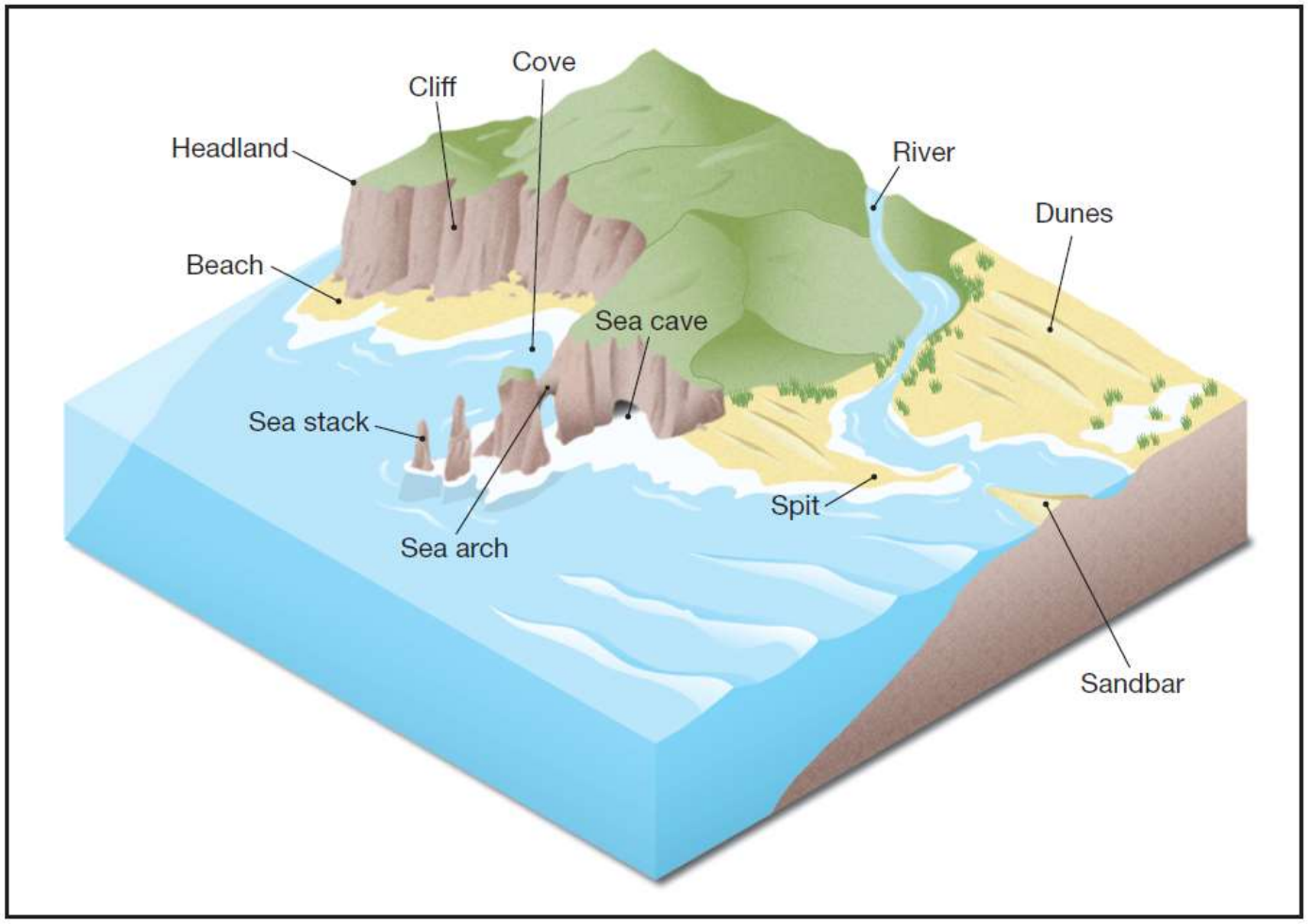


COASTAL LANDSCAPES

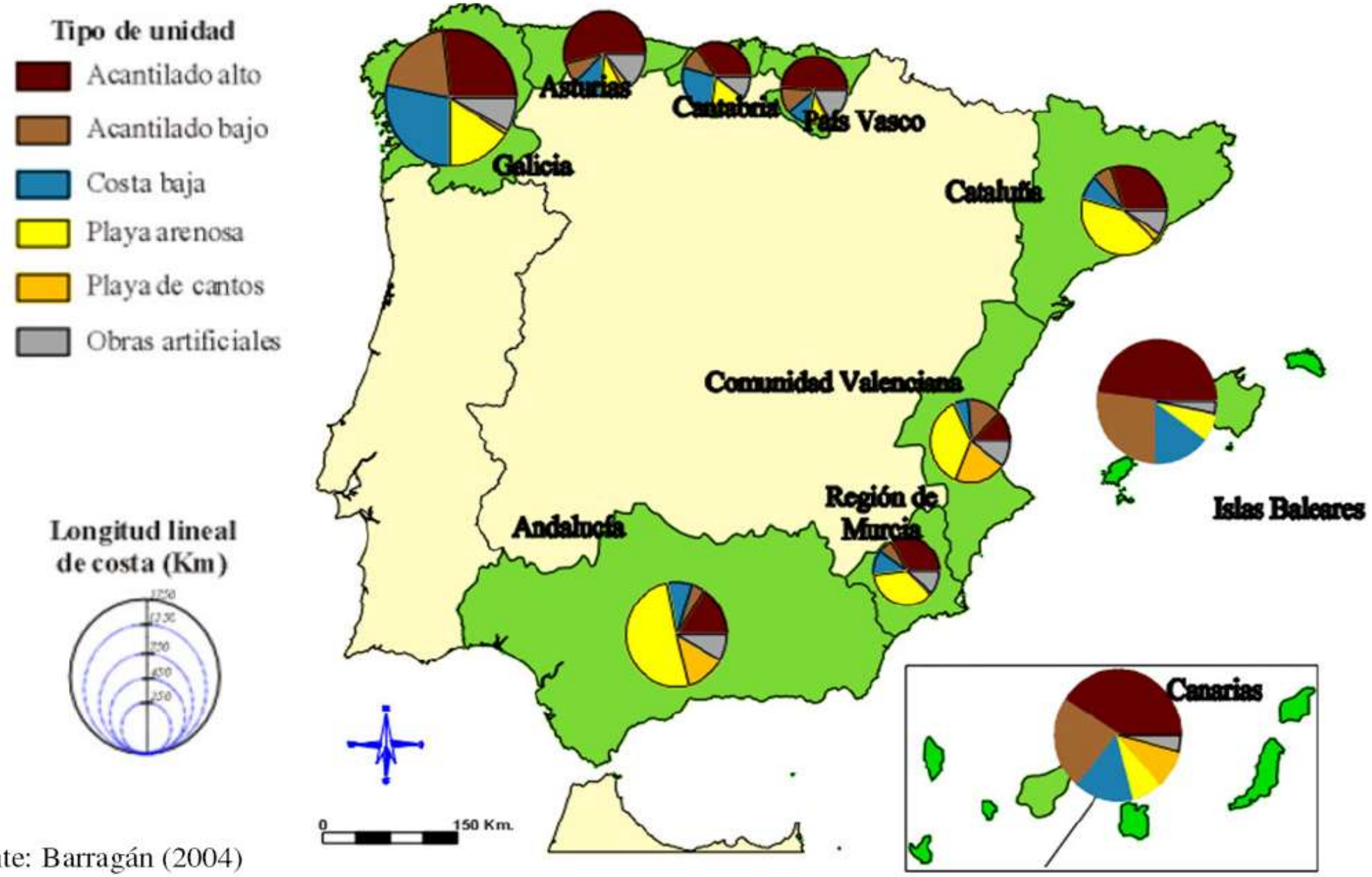
COASTAL LANDFORMS

1. **<u>Erosion</u>**
   - Cliffs.
   - Wave-cut platforms.
   - Natural arches.
   - Bays..

2. **<u>Accumulation</u>**.
   - Beaches
   - Estuaries
   - Sand-spits…



Caracterización Geomorfológica de las Costas Españolas



Fuente: Barragán (2004)


THE EBRO DELTA

- One of the largest wetland areas (320 km2) in the western Mediterranean.
- Placed on the Ramsar Convention list of wetlands of international importance
- Resulting from an inbalance between:
    - Sediment deposition (Ebro river large input)
    - Removal of this material by wave erosion.

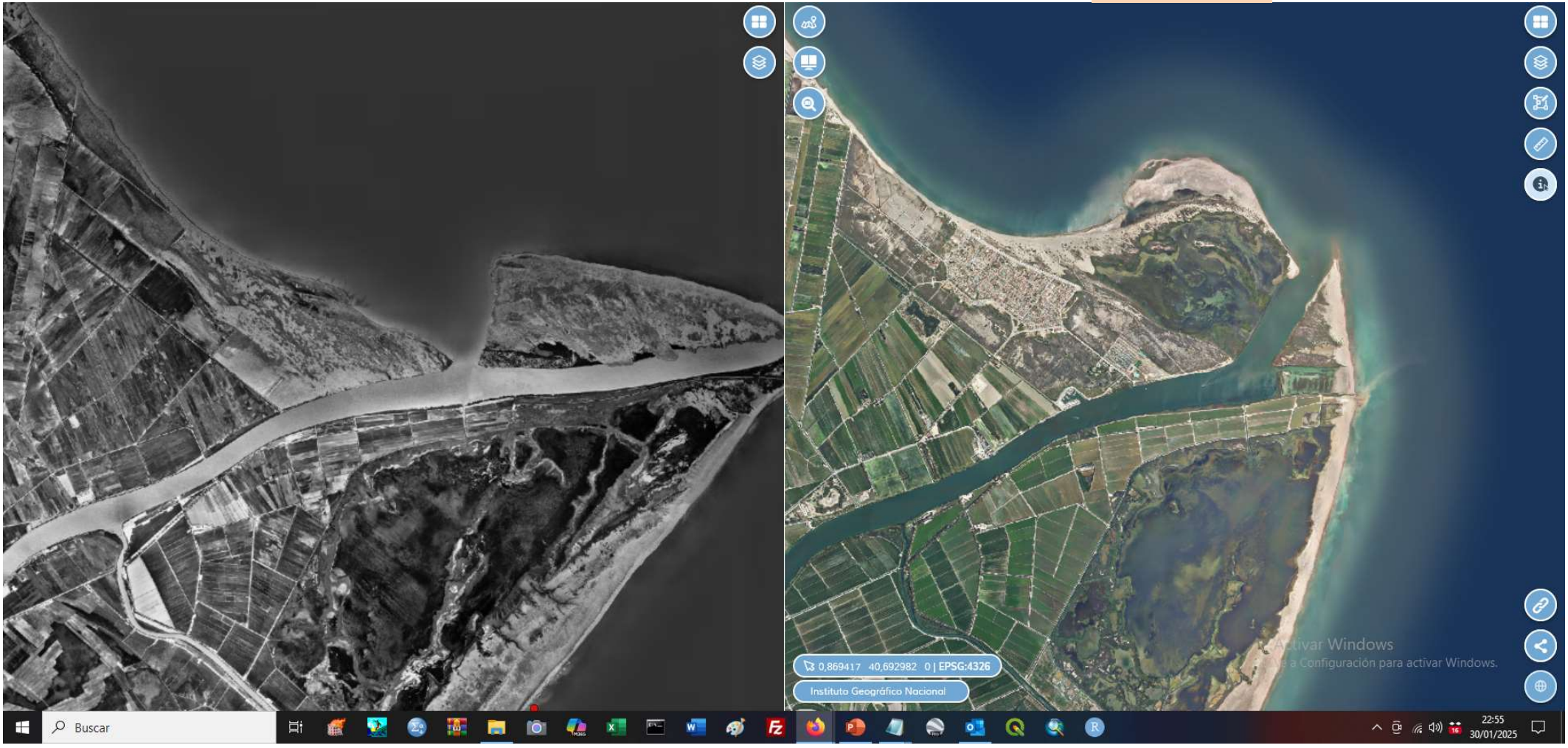
NATURAL LANDSCAPES

Coastal Retreat: Ebro Delta

Tortosa (Tarragona)

AMERICAN FLIGHT 1956

PNOA 2022

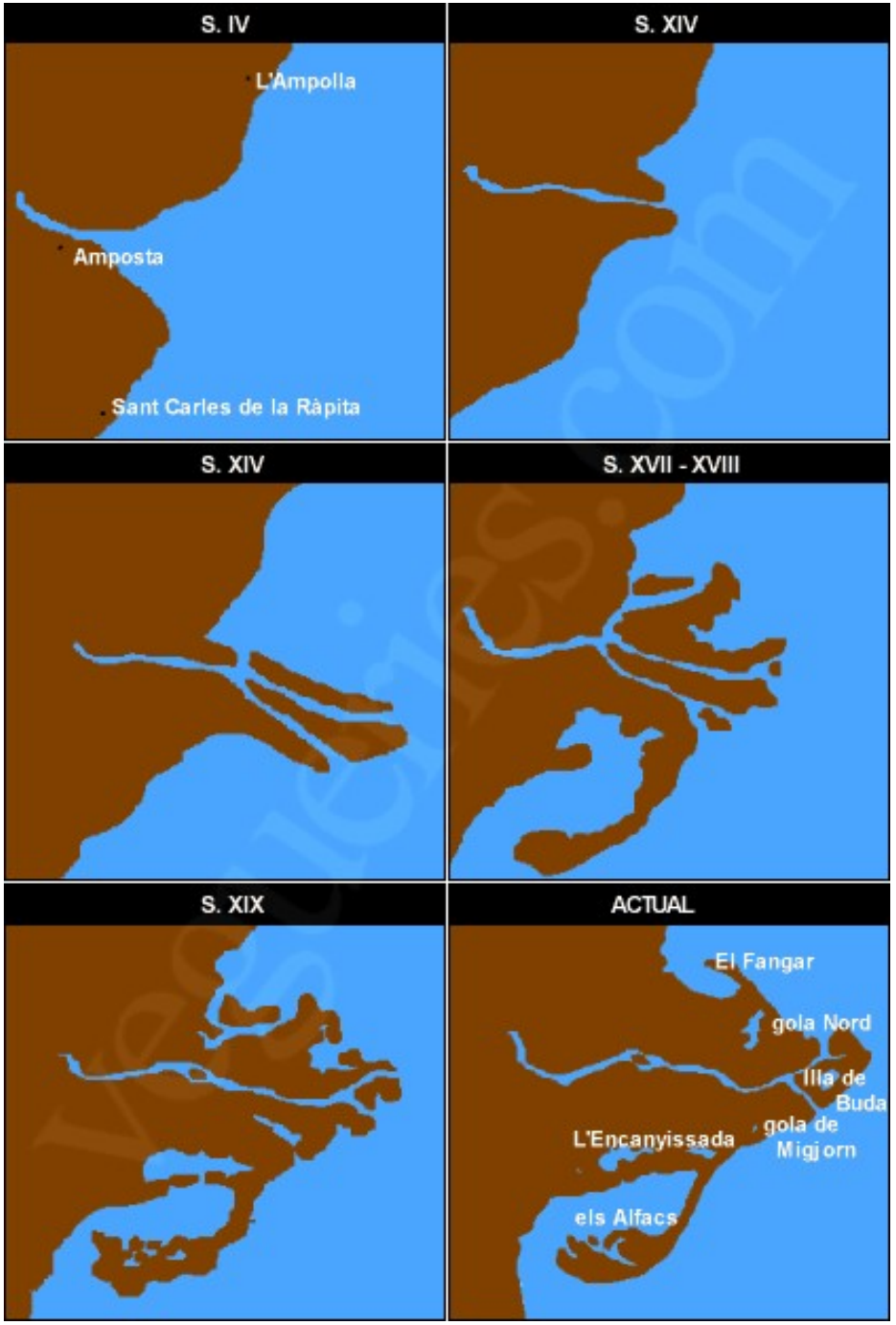


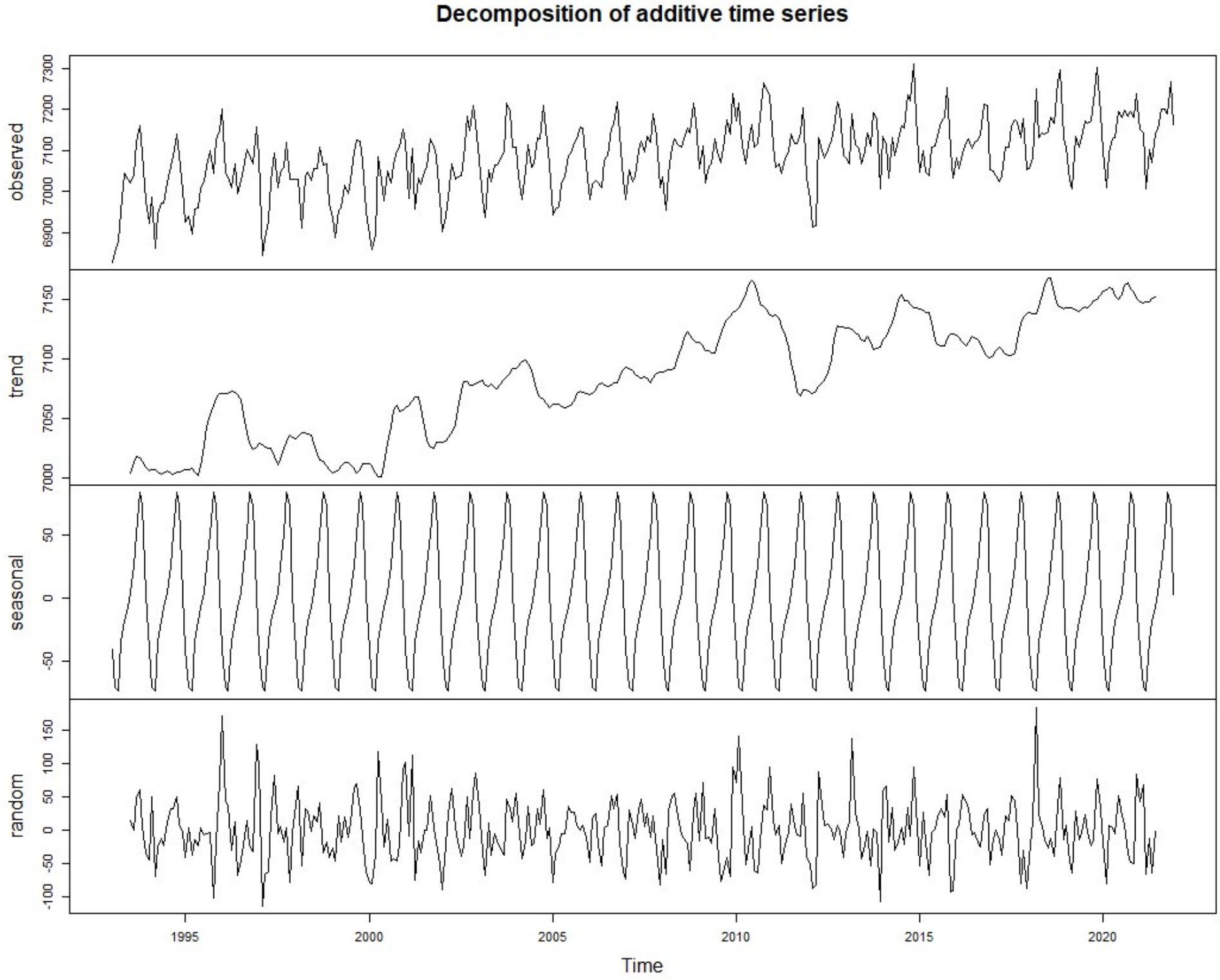
EVOLUTION

- Historical growth downriver

  - Seaport of Amposta (4th century),
  - Now located well inland from the current river mouth.

- Current retreat →
  - Aforestation.
  - Large dams intercept sediments.
  - Subsidence.
  - Salt intrusión.
  - **¿Sea level rise?**




Decomposition of additive time series
observed
6900
7000
7100
7200
7300
trend
7000
7050
7100
7150
seasonal
-50
0
50
random
-100
-50
0
50
100
150
1995
2000
2005
2010
2015
2020
Time

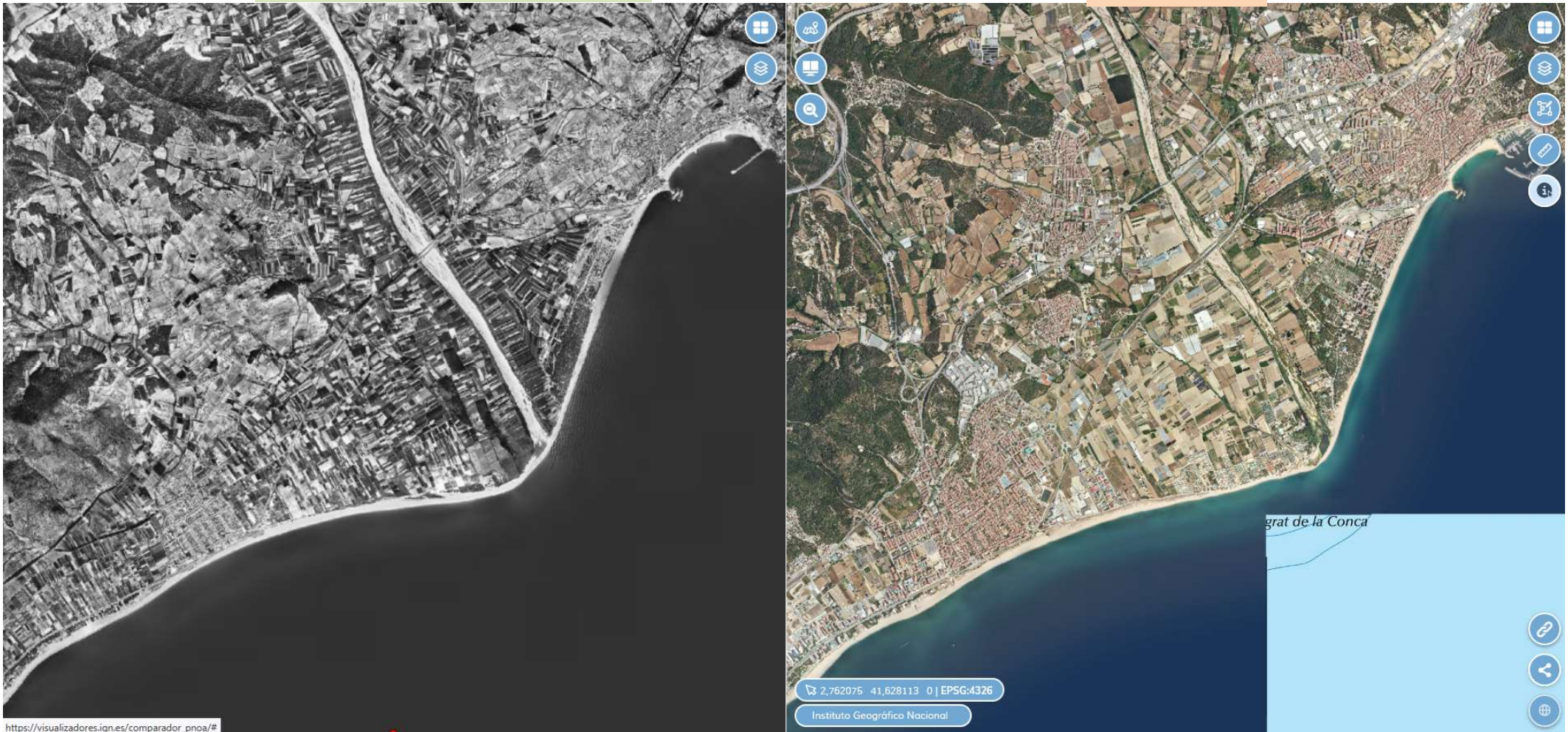
NATURAL LANDSCAPES

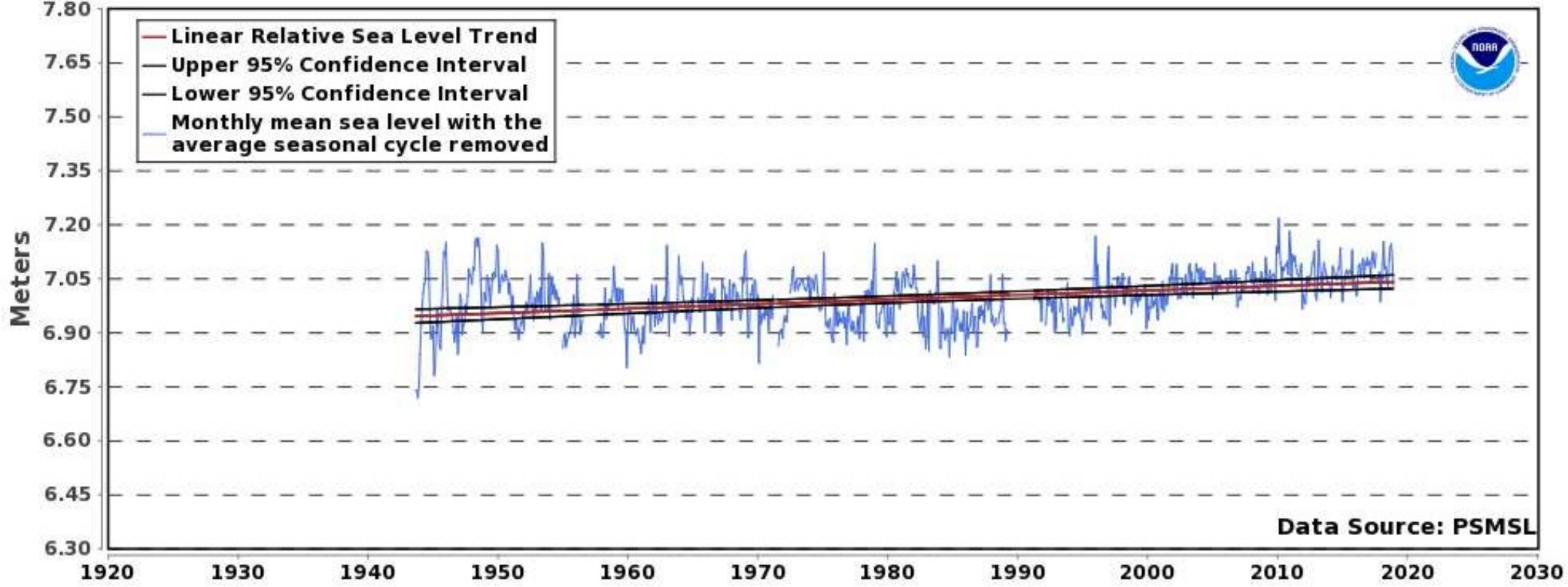
Coastal Retreat: Torderá Delta

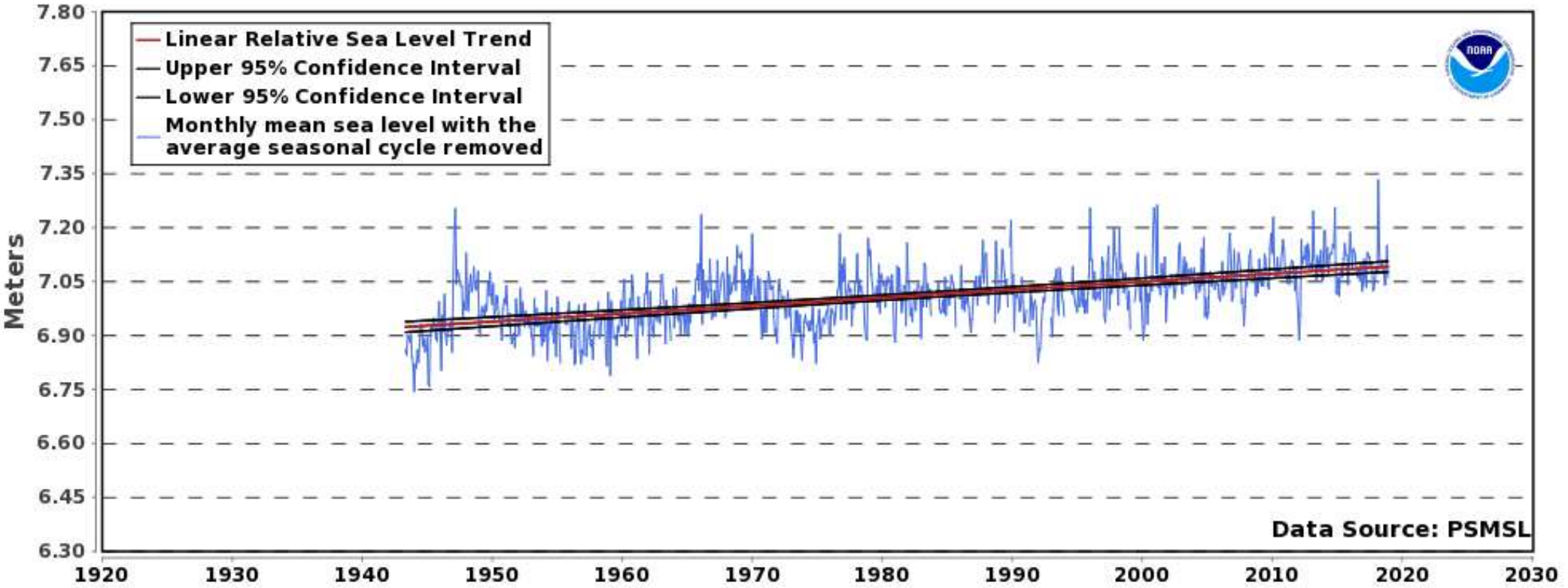
Malgrat de Mar (Barcelona)

AMERICAN FLIGHT
1956

PNOA
2017




Linear Relative Sea Level Trend
Upper 95% Confidence Interval
Lower 95% Confidence Interval
Monthly mean sea level with the average seasonal cycle removed
Meters
7.80
7.65
7.50
7.35
7.20
7.05
6.90
6.75
6.60
6.45
6.30
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
Data Source: PSMSL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6.45
6.30
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
Data Source: PSMSL

NATURAL LANDSCAPES

Coastal Retreat: Oyambre beach

Oyambre (Cantabria)

AMERICAN FLIGHT
1956

PNOA
2017

NATURAL LANDSCAPES

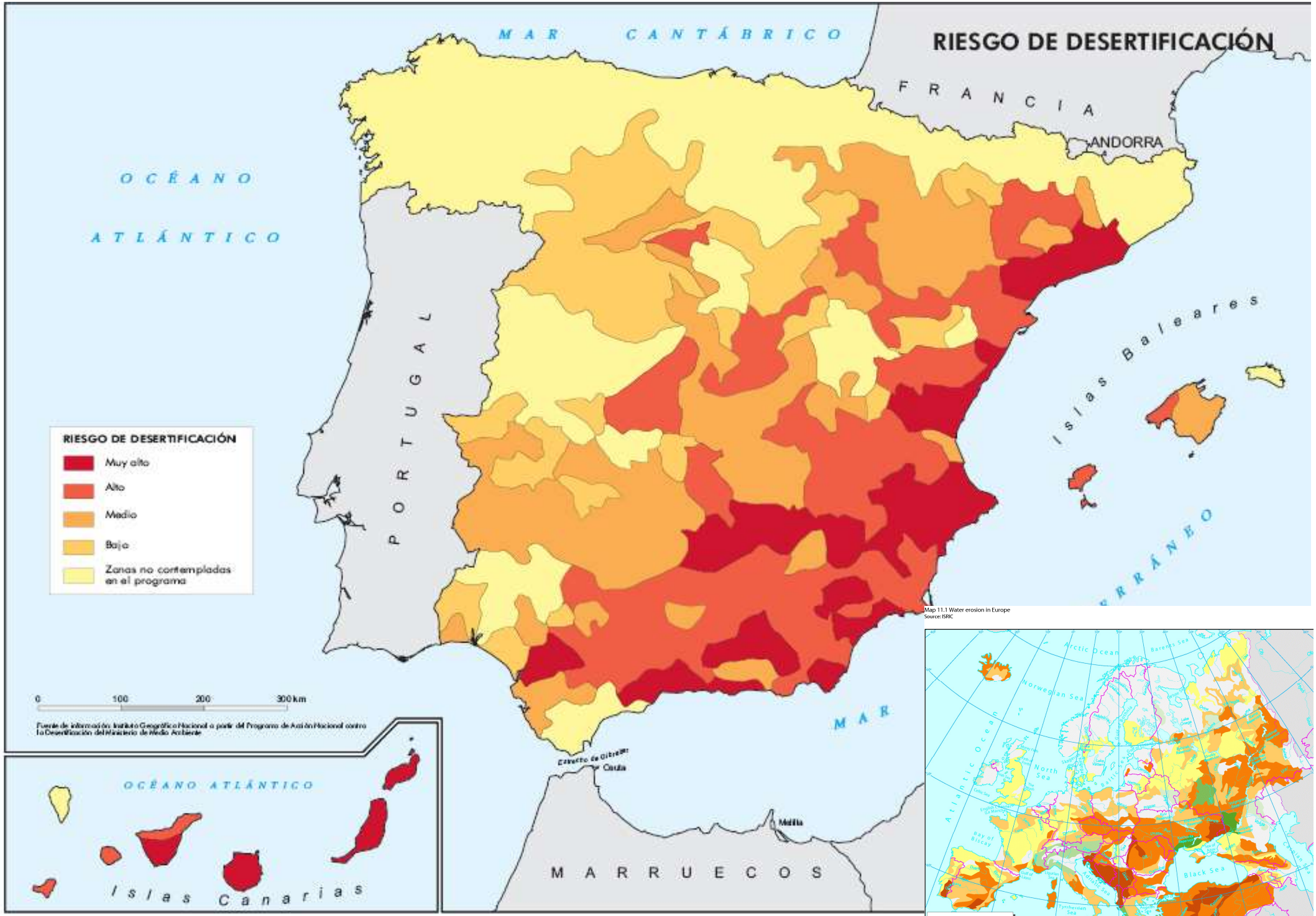
Coastal Retreat: Comillas Point

Comillas (Cantabria)

AMERICAN FLIGHT
1956

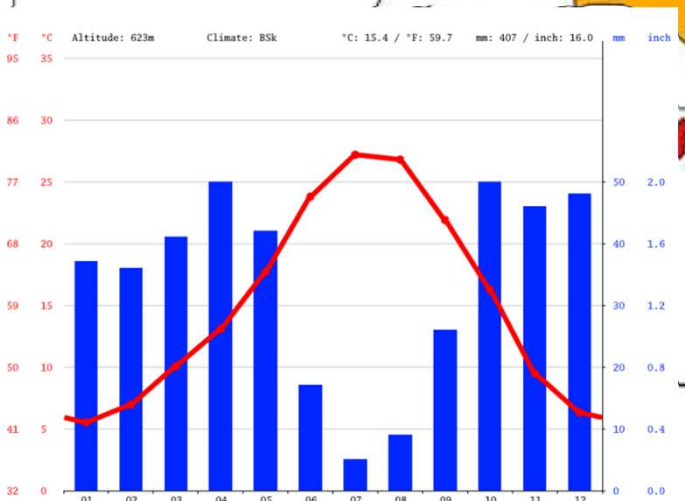
PNOA
2017

DESERTIFICATION



Map 11.1 Water erosion in Europe
Source: ISRIC

GOBIERNO DE ESPAÑA MINISTERIO DE MEDIO AMBIENTE



PROGRAMA DE ACCIÓN NACIONAL CONTRA LA DESERTIFICACIÓN

MAPA DE ARIDEZ

NATURAL LANDSCAPES

Drying lakes: Tablas de Daimiel

Daimiel (Ciudad Real)

AMERICAN FLIGHT
1956

PNOA
2022

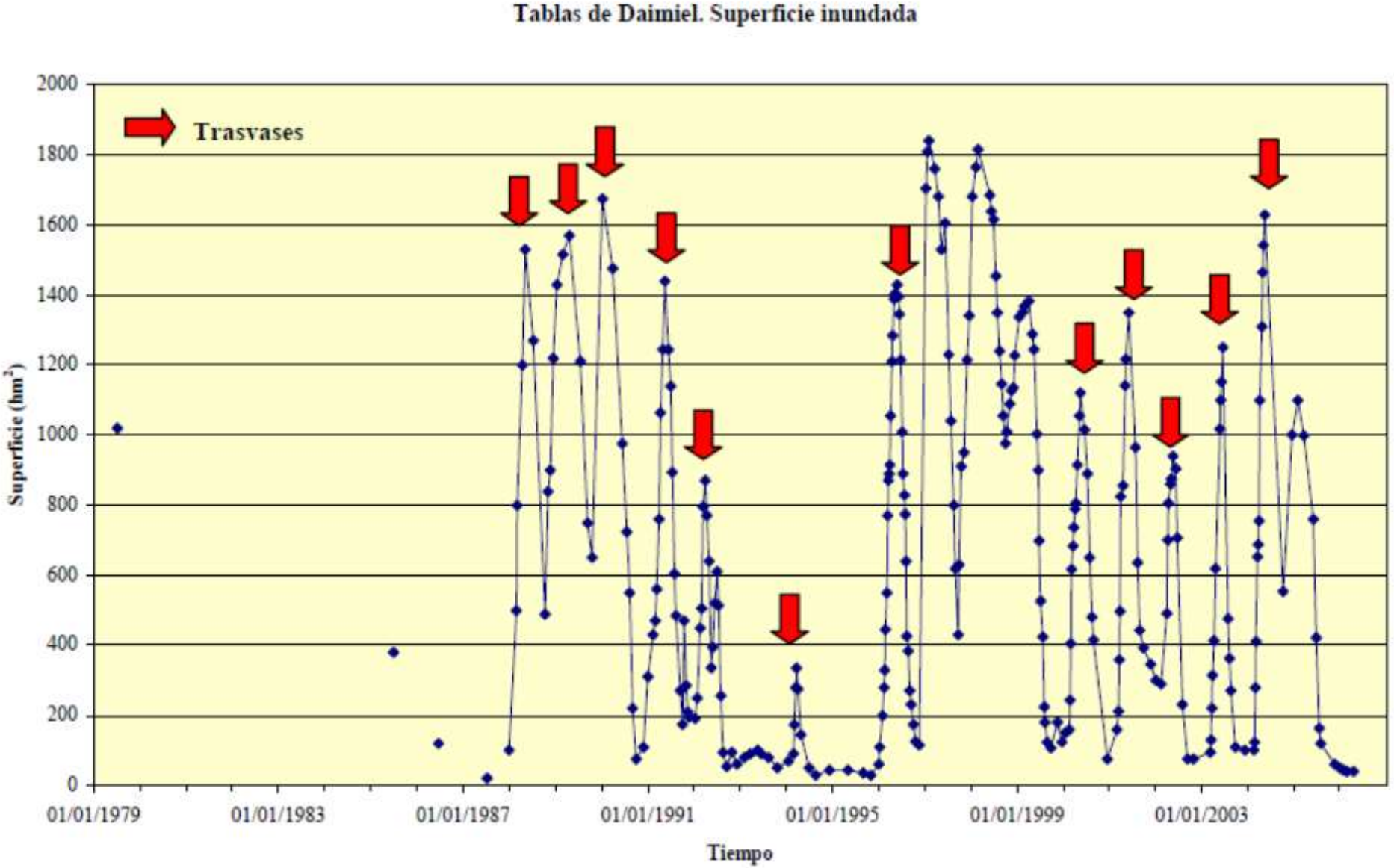


Figura 19. Superficie inundada en el Parque Nacional de Las Tablas de Daimiel y su entorno entre 1979 y 2006. Marcados los periodos en los que se ha realizado trasvase desde el acueducto Tajo-Segura. Castaño Castaño, S. (2008)