



# KOBAZULOAK: NATUR ETA KULTUR ONDAREA GILTZAPEAN ?

*Arantza Aranburu*  
***Geologian doktore***





1. Zer da karsta?

2. Karst guztiak berdinak dira ?

3. Kobak, zergatik dira garrantzitsu ?

4. Ondarea nola babestu? Nola arnasten  
dute kobek ?



# Euskal Herriko Karsta:

## 1. Zer da Karsta?

Azido karbonatikoan aberastutako  
urek arroketak gauzaturiko higadura  
(disoluzioa)

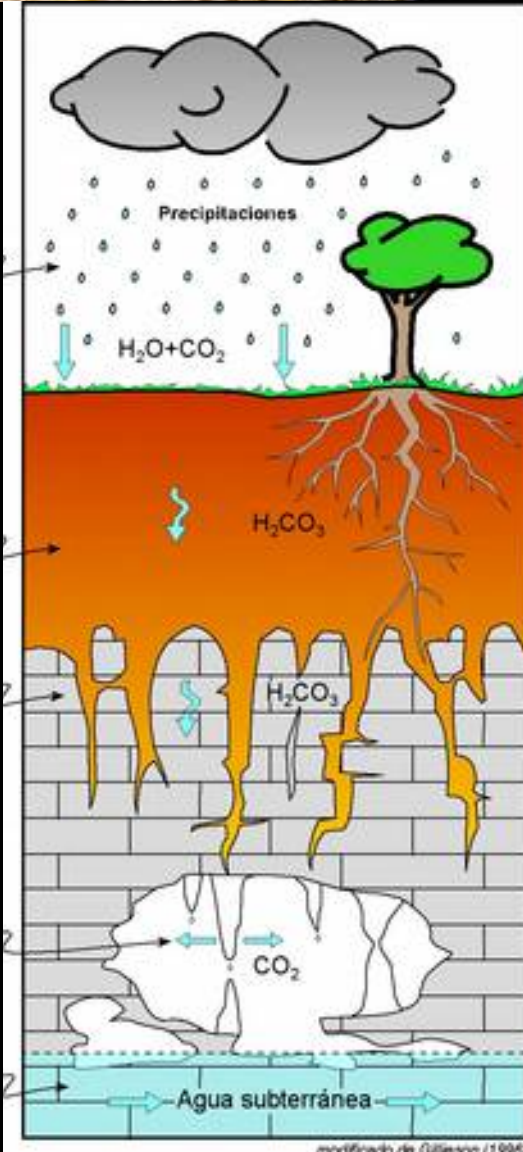
Kanpo geomorfologia propioa  
(dolinak, lenarra, ...)

Barne Porositatea □ akuiferoak,  
kobak.



# Euskal Herriko Karsta:

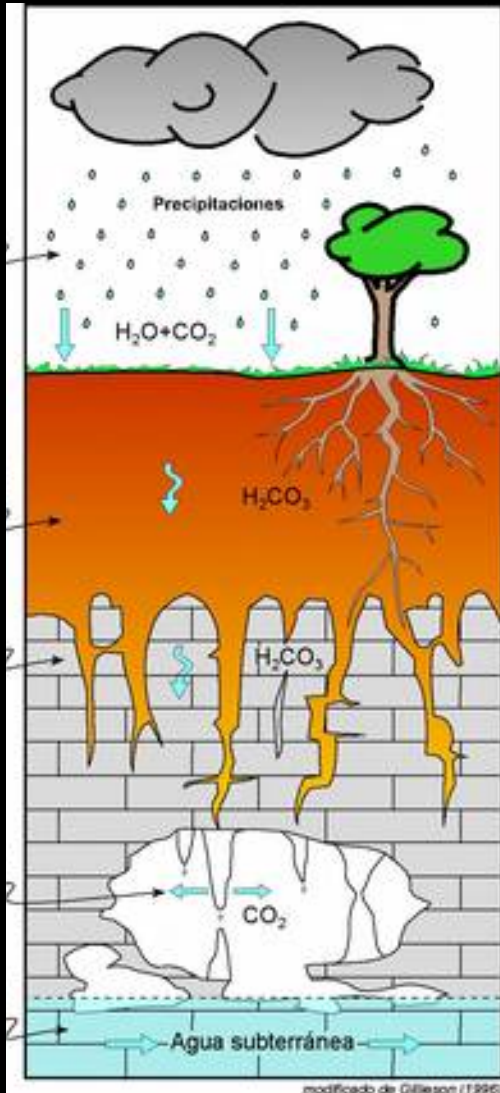
## 1. Zer da Karsta?



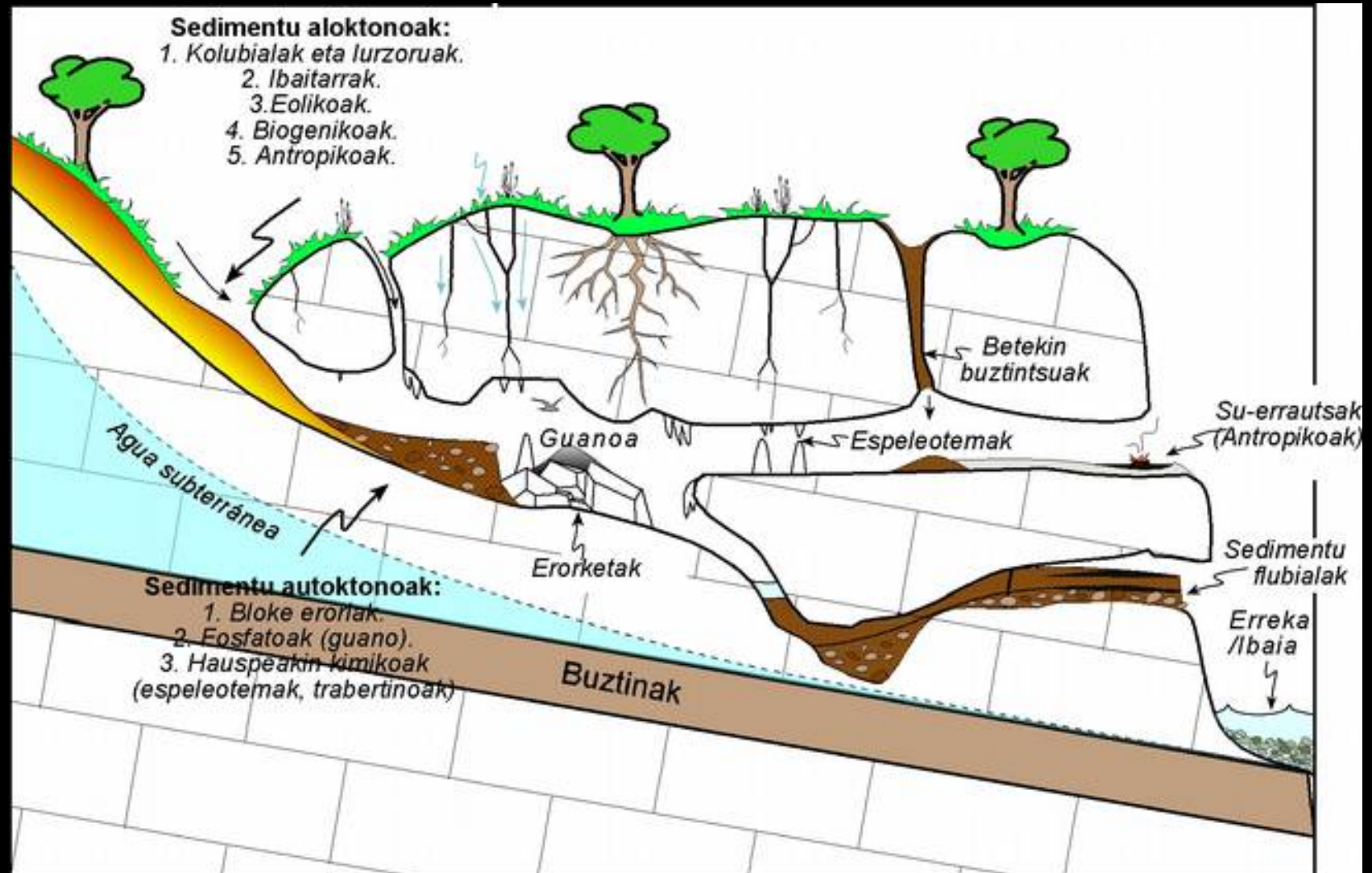


# Euskal Herriko Karsta:

## 1. Zer da Karsta?

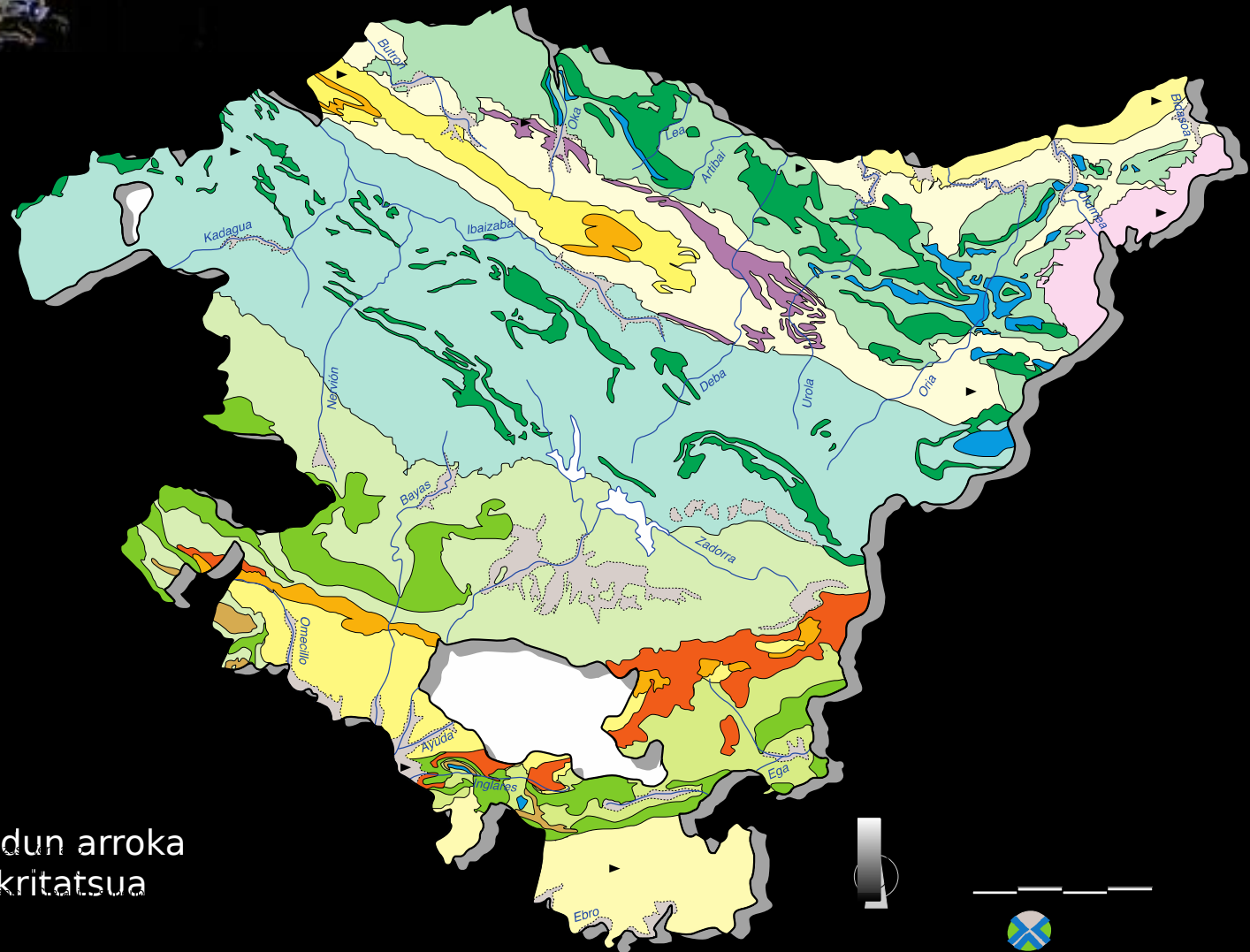


# Euskal Herriko Karsta:





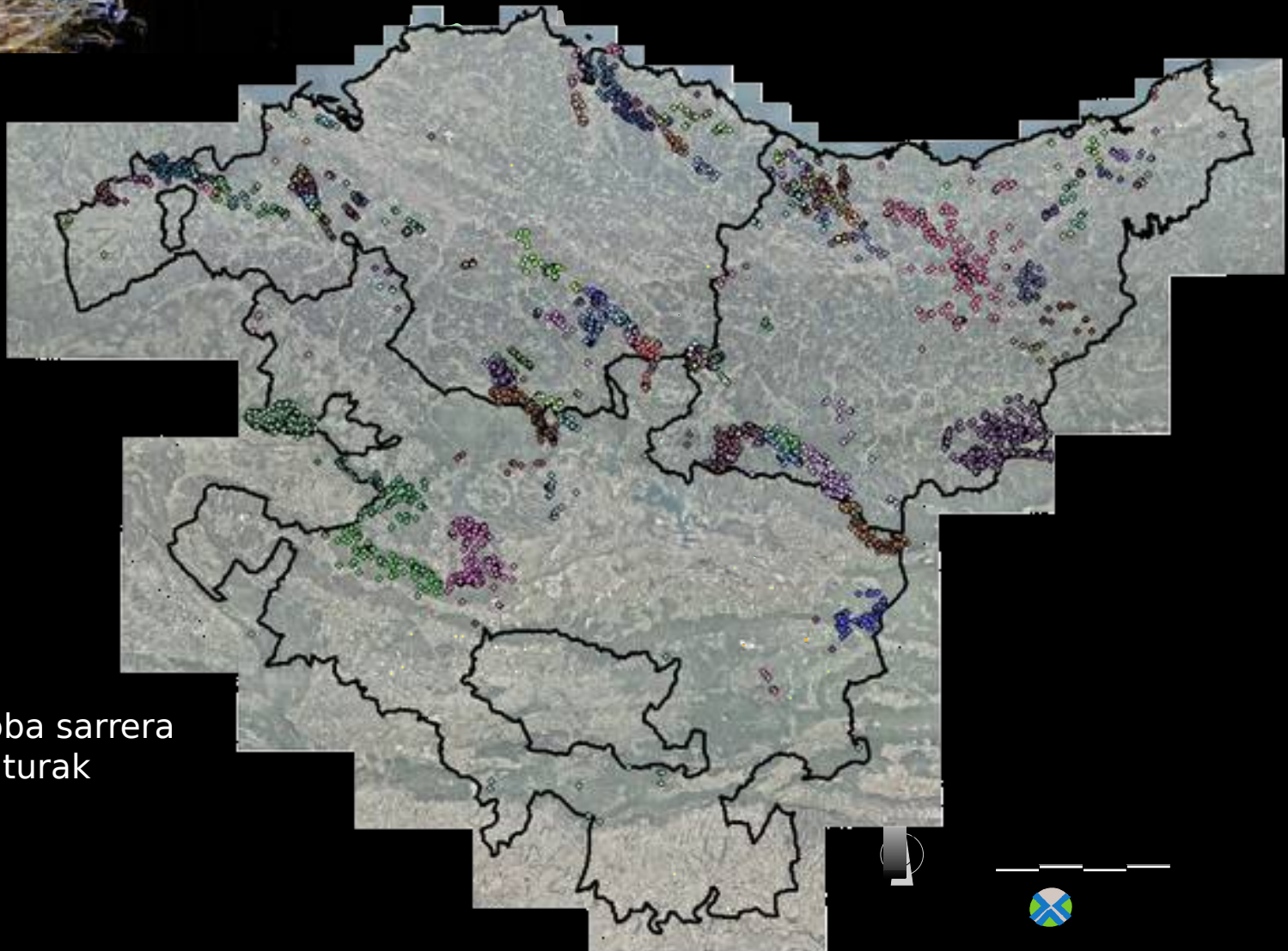
# Euskal Herriko Karsta:



75% karbonadun arroka  
(kareharri mikritatsua  
<30%)

# Euskal Herriko Karsta:

6.000 koba sarrera  
katalogaturak





# Euskal Herriko Karsta:

2. Karst guztiak berdinak dira ?  
Garai ezberdinetan sortuak, abiapuntu  
ezberdinetik  
(Urradura-azalak vs Orogenia)

(Paleo)Urradura-azalak <

*Cockpits*

< Aleptarra



# Euskal Herriko Karsta:

## 2. Karst guztiak berdinak dira ?



*Urradura-azal goratuetako*

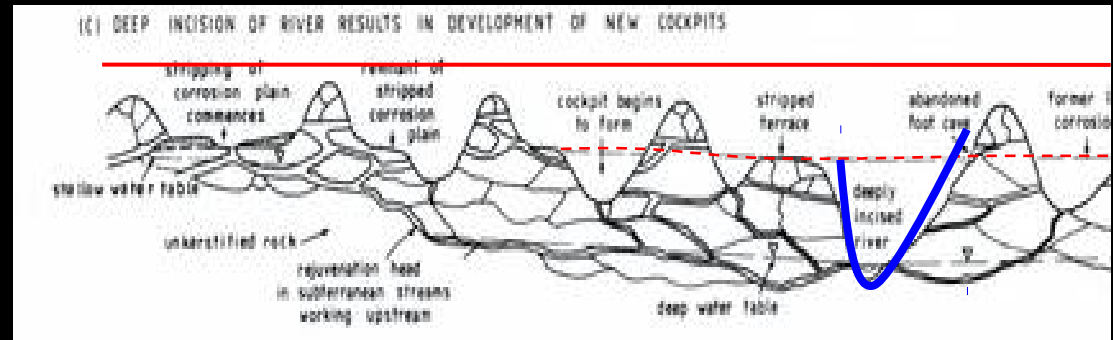
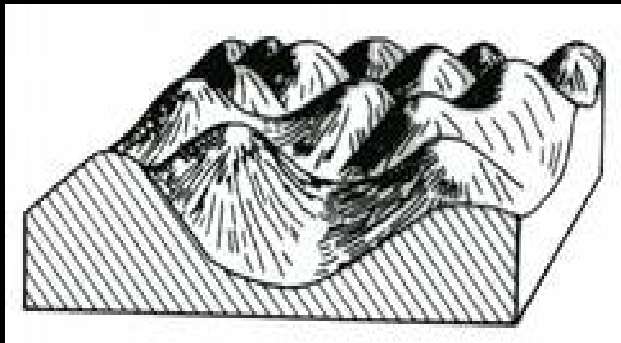


# Euskal Herriko Karsta:

## 2. Karst guztiak berdinak dira ?



### *Cockpits* Karsta

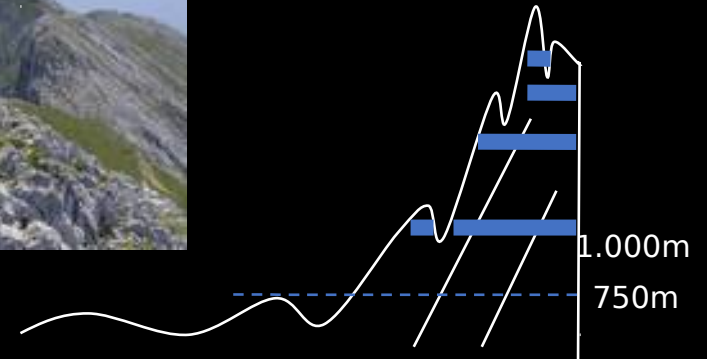




# Euskal Herriko Karsta:

## 2. Karst guztiak berdinak dira ?

*Alpetar Karsta*  
(± 700-1000m)



Karaitza 16

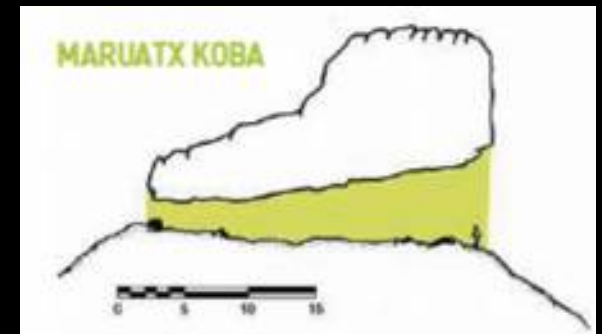
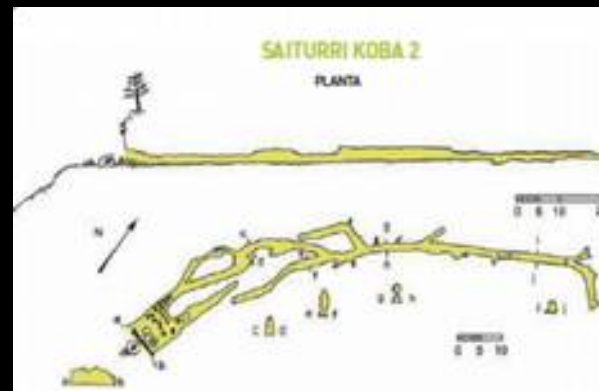
3

### EL PALEOKARST DE AIZKORRI

El Paleokarst de Aizkorri es un sistema de cuevas y cavernas que se encuentra en el macizo de Aizkorri, en el norte de los Pirineos. Este sistema de paleokarst se formó durante el Pleistoceno y el Holoceno, y está formado por cuevas y cavernas que se comunican entre sí a través de un sistema de galerías y pasadizos. El sistema de paleokarst de Aizkorri es uno de los más importantes de la Península Ibérica, y es considerado un patrimonio natural de gran valor científico y turístico.



*Aloña Mendi Espeleologo Taldea (2010)*

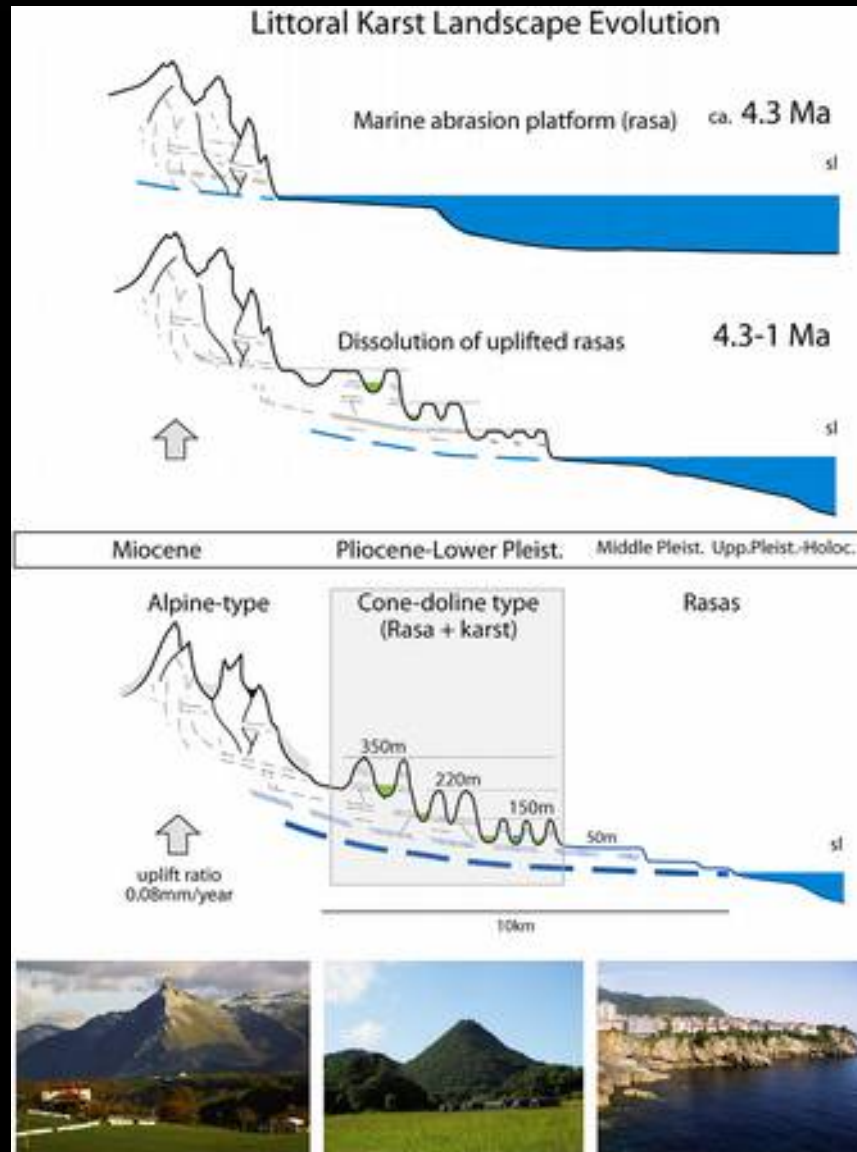




# Euskal Herriko Karsta:

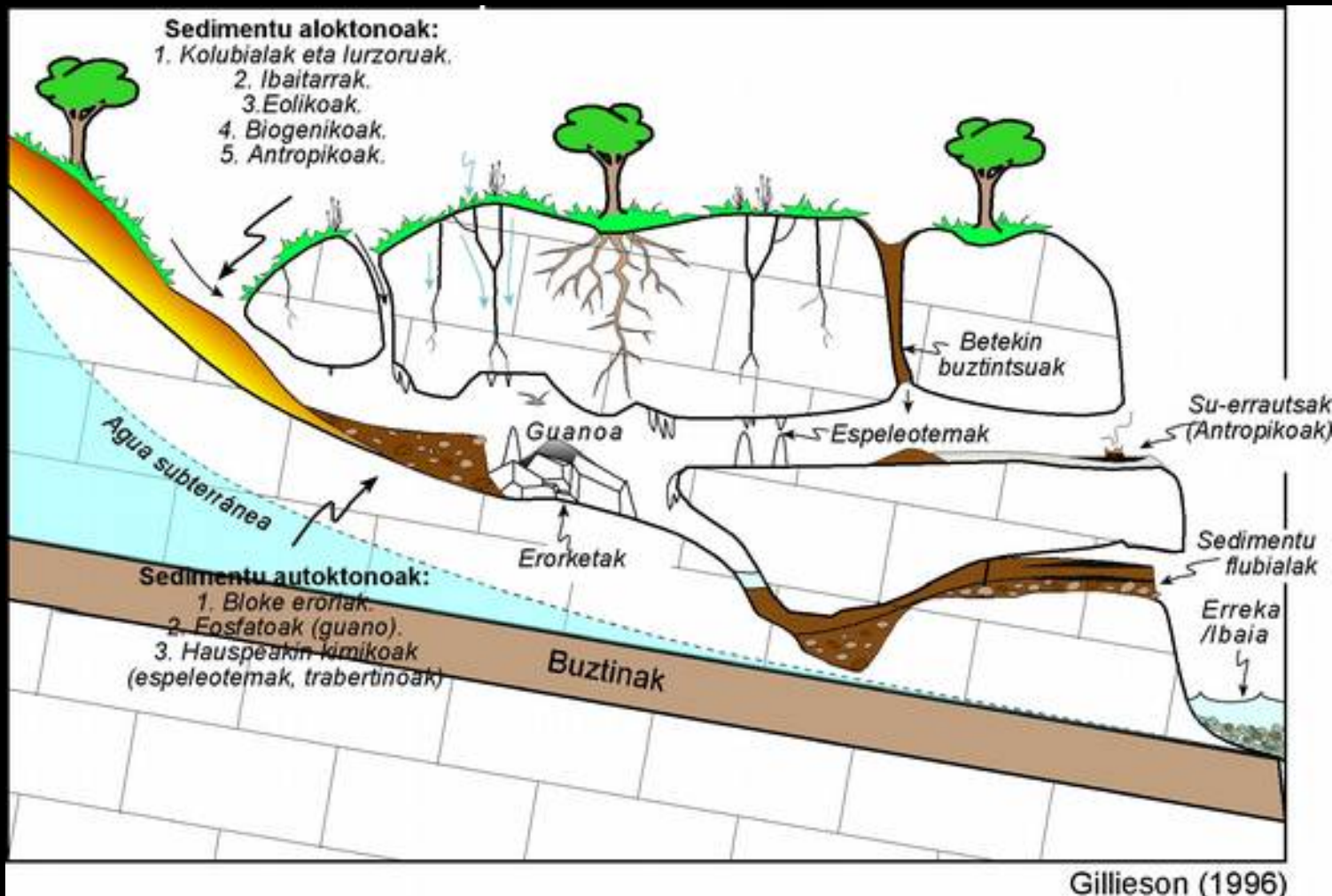
## 2. Karst guztiak garaikide dira ?

| Eonema / Eona  |           | Erakema / Era  |             | Sistema / Periodoa |          | GSSP | Adina (Ma) oraina |       |       |      |
|----------------|-----------|----------------|-------------|--------------------|----------|------|-------------------|-------|-------|------|
| Seriea / Epoka |           | Estaia / Adina |             |                    |          |      |                   |       |       |      |
| Fanerozoiko    | Zenozoiko | Kuaternario    | Holozeno    |                    |          |      | 0.0117            |       |       |      |
|                |           |                |             | Goi                |          |      | 0.126             |       |       |      |
|                |           |                | Pleistozeno | Erdi               |          |      |                   | 0.781 |       |      |
|                |           |                |             | Calabriar          |          |      |                   | 1.80  |       |      |
|                |           |                |             | Gelasiar           |          |      |                   | 2.58  |       |      |
|                |           |                |             | Piacenziar         |          |      |                   | 3.600 |       |      |
|                |           | Neogeno        | Pliozeno    | Zanclear           |          |      |                   | 5.333 |       |      |
|                |           |                | Miozeno     | Messiniar          |          |      |                   | 7.246 |       |      |
|                |           |                |             | Tortoniar          |          |      |                   |       | 11.63 |      |
|                |           |                |             | Serravalliar       |          |      |                   |       | 13.82 |      |
|                |           |                |             | Langhiar           |          |      |                   |       | 15.97 |      |
|                |           |                |             | Burdigaliar        |          |      |                   |       | 20.44 |      |
|                |           |                |             | Aquitaniar         |          |      |                   |       | 23.03 |      |
|                |           |                |             | Paleogeno          | Chattiar |      |                   |       |       | 28.1 |
|                |           |                |             |                    | Rupeliar |      |                   |       |       | 33.9 |
|                |           |                | Priaboniar  |                    |          |      |                   |       | 37.8  |      |
|                |           | Bartoniari     |             |                    |          |      |                   | 41.2  |       |      |
|                |           | Paleozeno      | Eozeno      | Lutetiar           |          |      |                   | 47.8  |       |      |
|                |           |                | Ypresiar    |                    |          |      |                   |       | 56.0  |      |
|                |           |                |             | Thanetiar          |          |      |                   |       | 59.2  |      |
|                |           |                |             | Selandiar          |          |      |                   |       | 61.6  |      |
|                |           |                |             | Daniar             |          |      |                   |       | 66.0  |      |



# Euskal Herriko Karsta:

## 3. Zergatik dira garrantzitsu ? Sedimentu/ Klimaren “kutxa beltza”

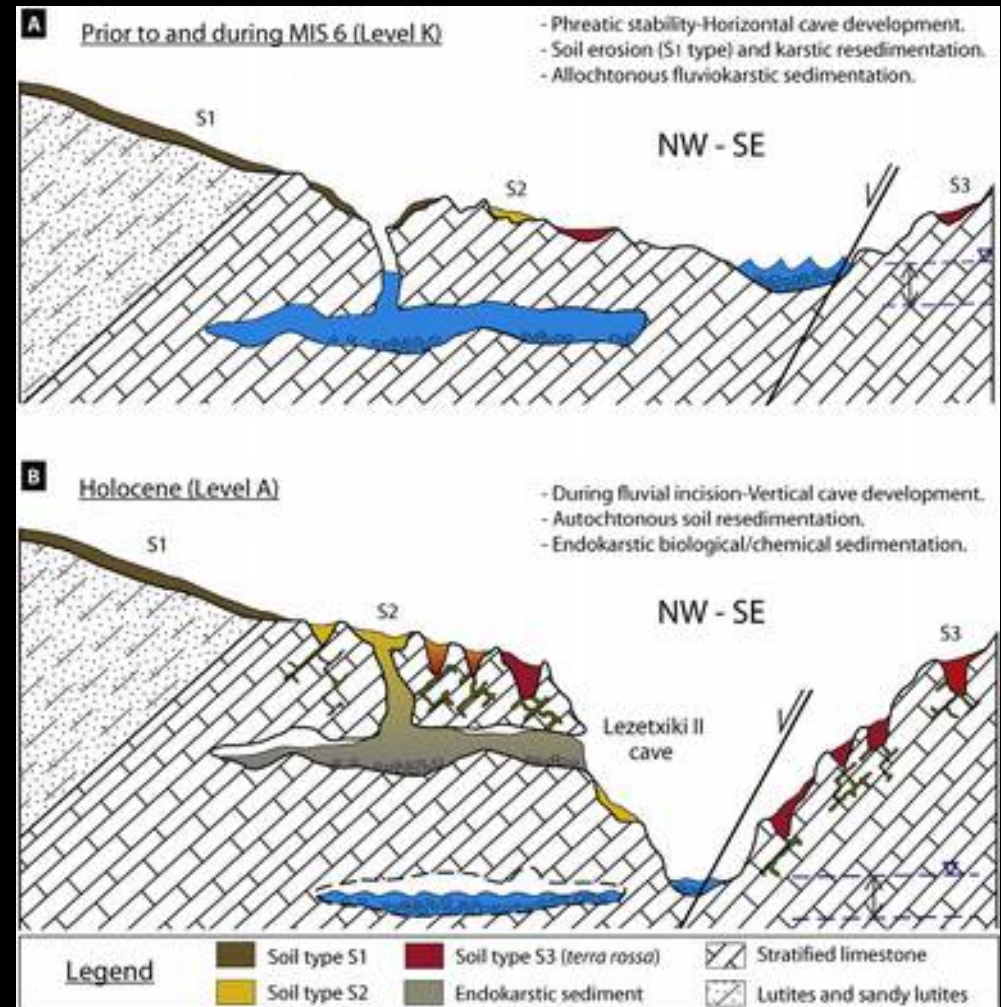
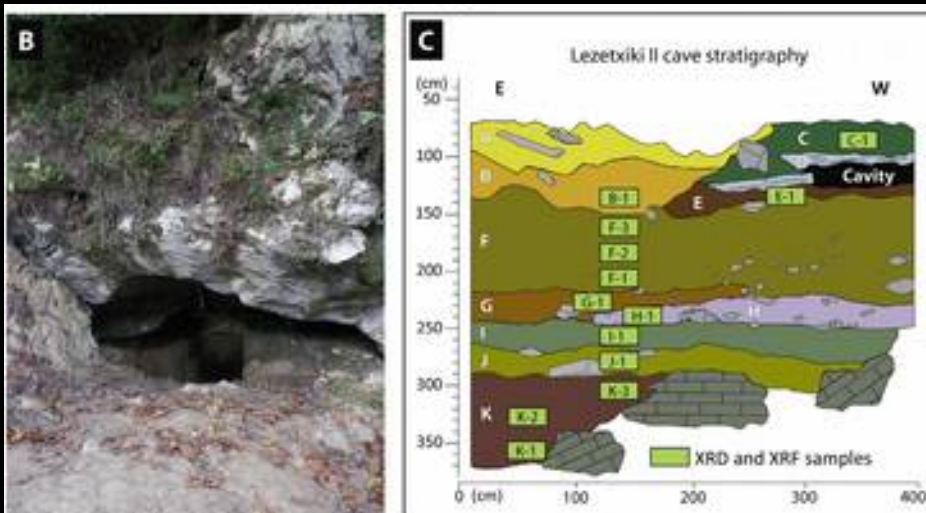




# Euskal Herriko Karsta:

## 3. Zergatik dira garrantzitsu ? Sedimentu/ Klimaren “kutxa beltza”

Paleo-lurzorua  
kobetan





# Euskal Herriko Karsta:

## 3. Zergatik dira garrantzitsu ?

### Sedimentu/ Klimaren “kutxa beltza”

Praileaitz  
 Urtiaga  
 Polvorín  
 Atapuerca

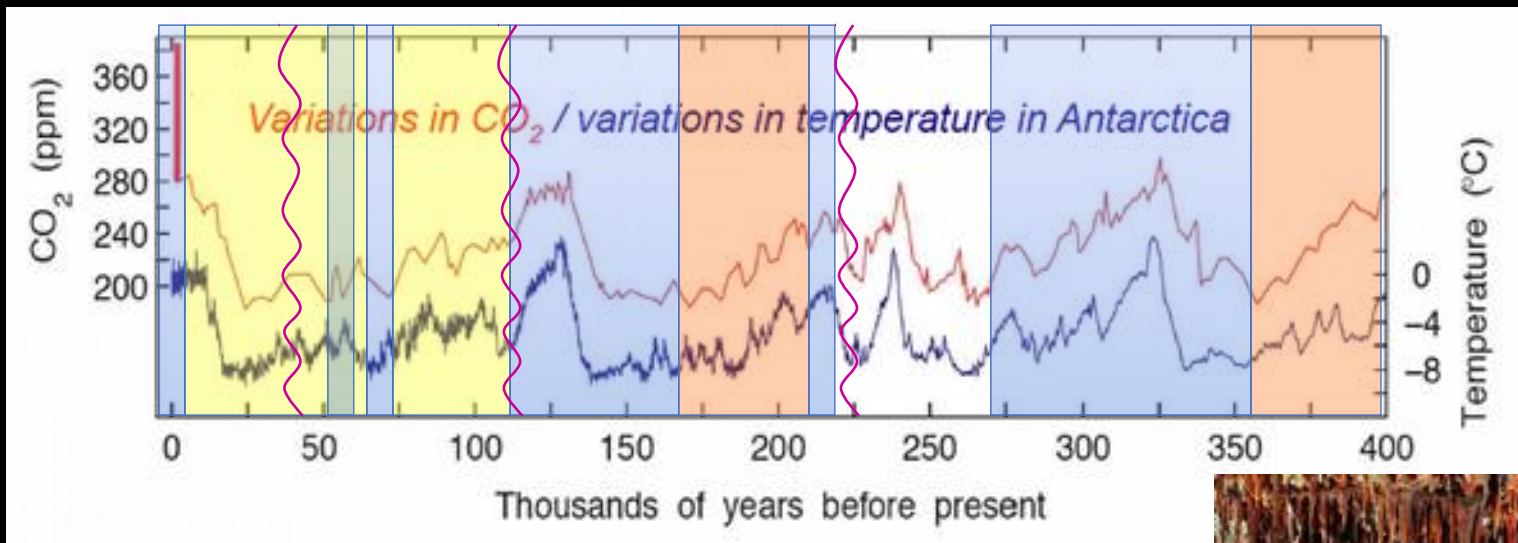
Urtiaga  
 Lz-II

Polvorín  
 Moreno (Goi.)  
 Praileaitz  
 Aizkoltxo  
 Atapuerca

Askondo  
 Aizkoltxo  
 Polvorín  
 Askondo

Asnarre  
 Goikoetxe  
 Urtiaga  
 Atapuerca

Asnarre  
 Goikoetxe



Urtiaga  
 Polvorín?  
 Axlor

Praileaitz  
 Polvorín  
 Goikoetxe

Goikoetxe  
 Urtiaga



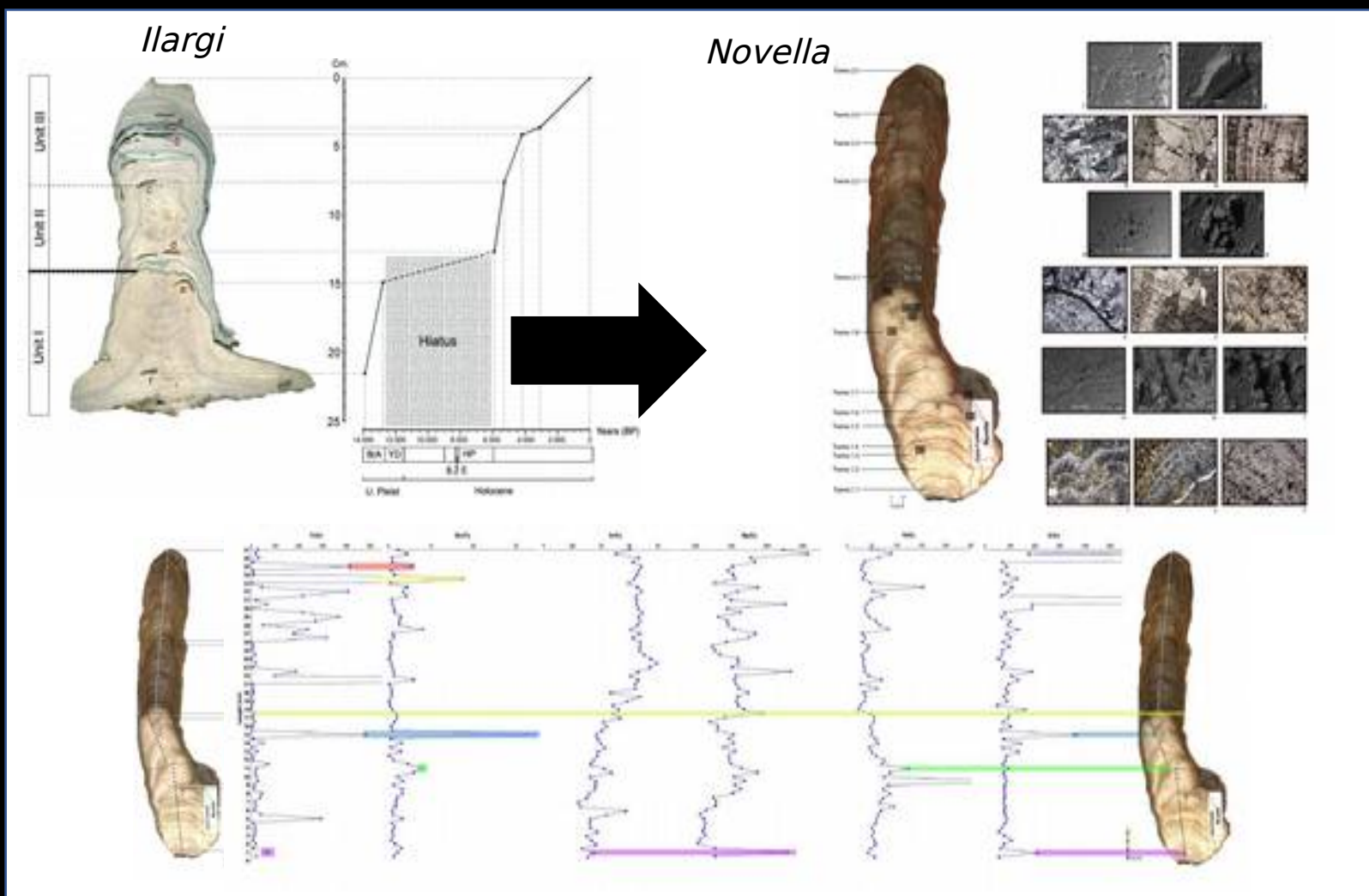




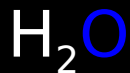
# Euskal Herriko Karsta:

## 3. Zergatik dira garrantzitsu ?

### Klimaren “kutxa beltza”



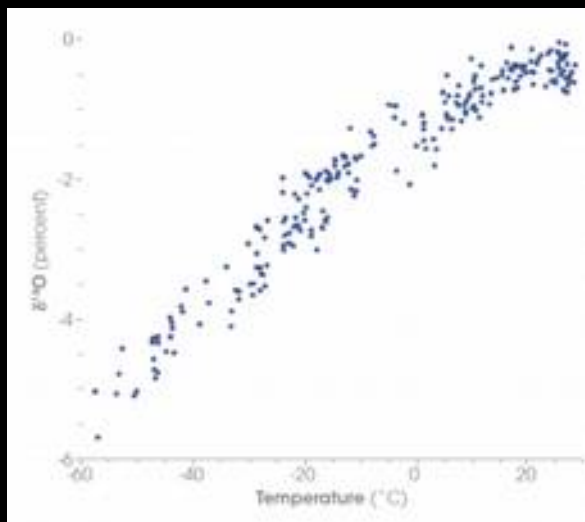
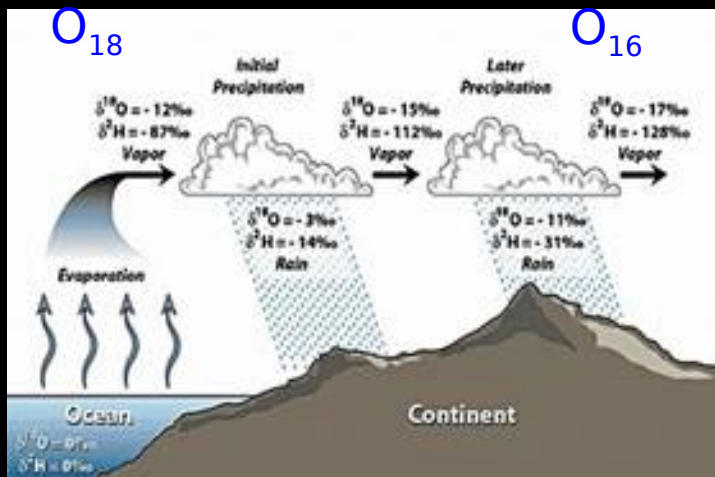




Novella  
(Praileaitz)



Tenperatura Tantanketa/lurzorua



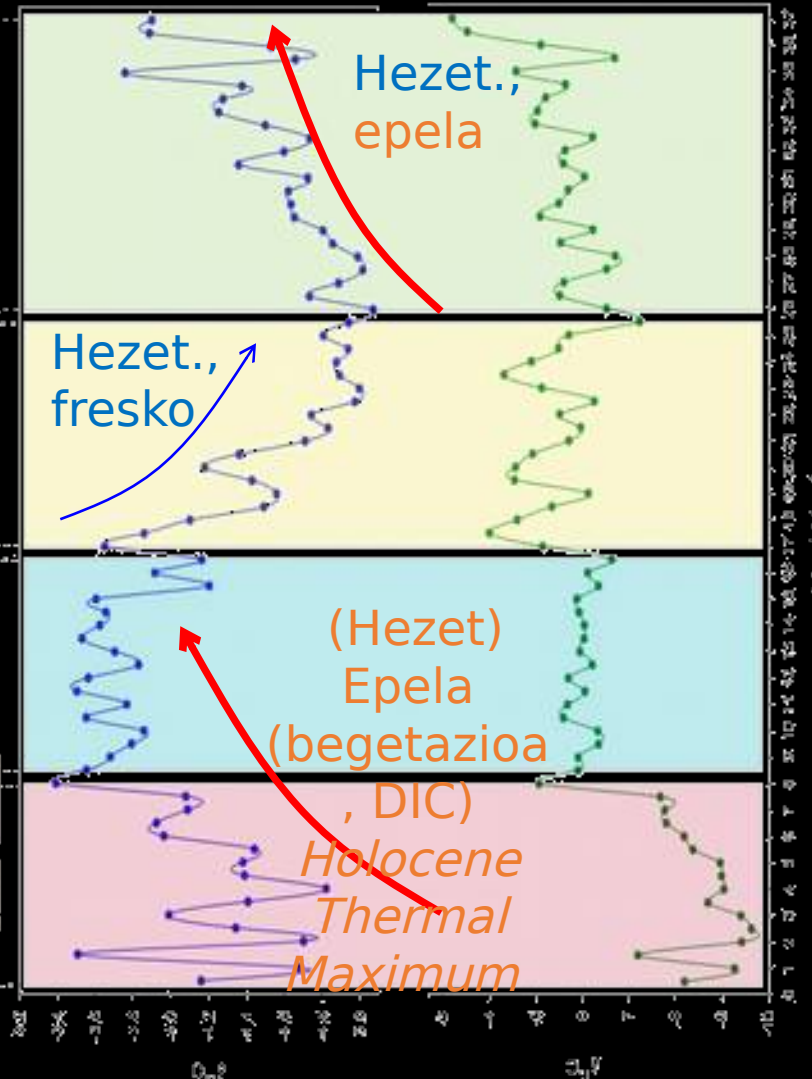
0.79 ka  
BP

92mm/  
ka

3.1 ka

129mm/  
ka

4.9 ka



# Euskal Herriko Karsta:

## 4. Ondarearen Zaintza

Ze ondare?

Naturala

Paisai

Kulturala





# Euskal Herriko Karsta:

## 4. Ondarearen Zaintza

Mehatsu/Arriskua eta

Ze ondare?





# Euskal Herriko Karsta:

## 4. Ondarearen Zaintza

Zer, Zertatik, Nola



*Praileaitz, Deba (Gipuzkoa)*

# Euskal Herriko Karsta:

## 4. Ondarearen Zaintza

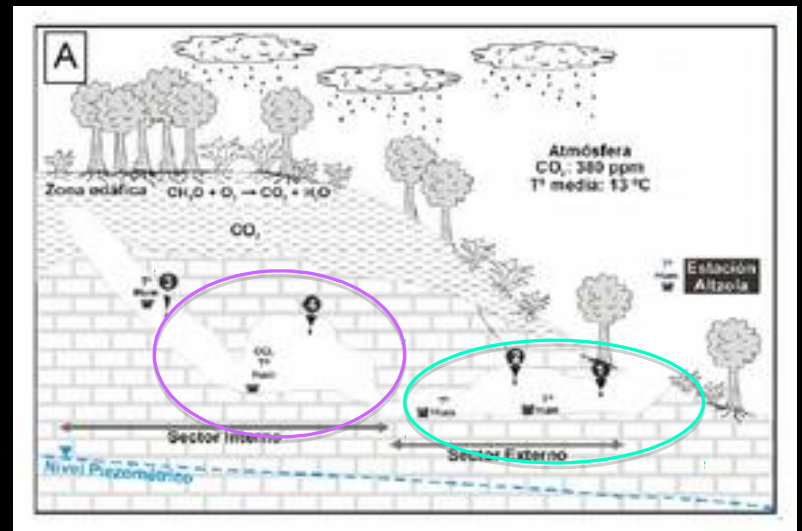
### Zer, Zertatik, Nola



*Praileaitz, Deba (Gipuzkoa)*

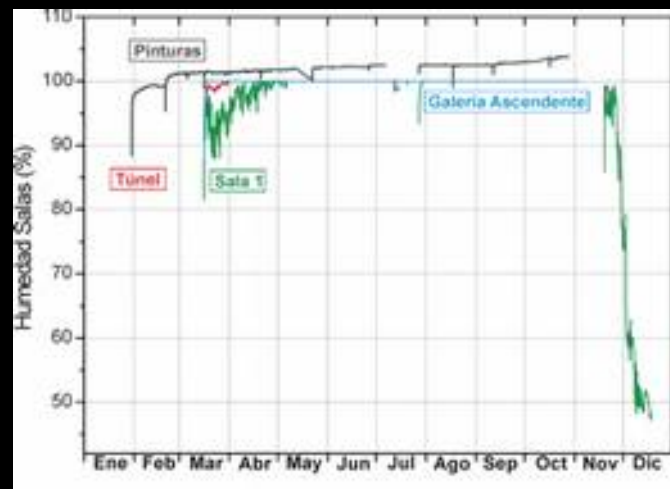
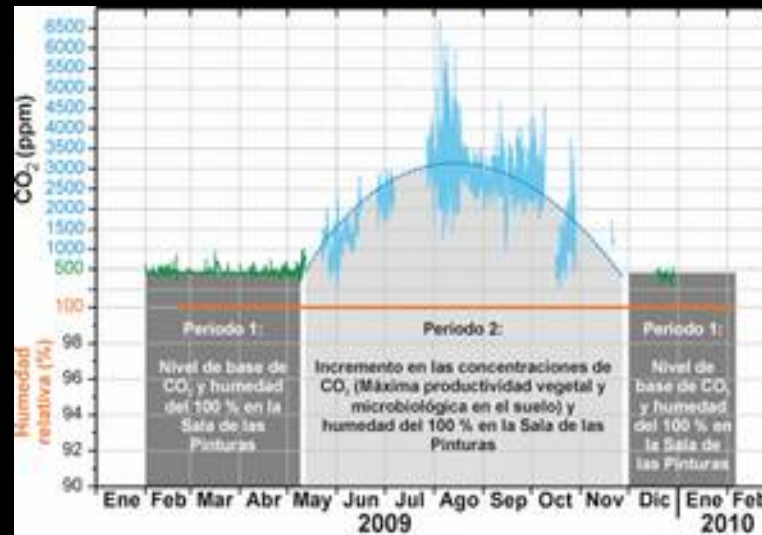
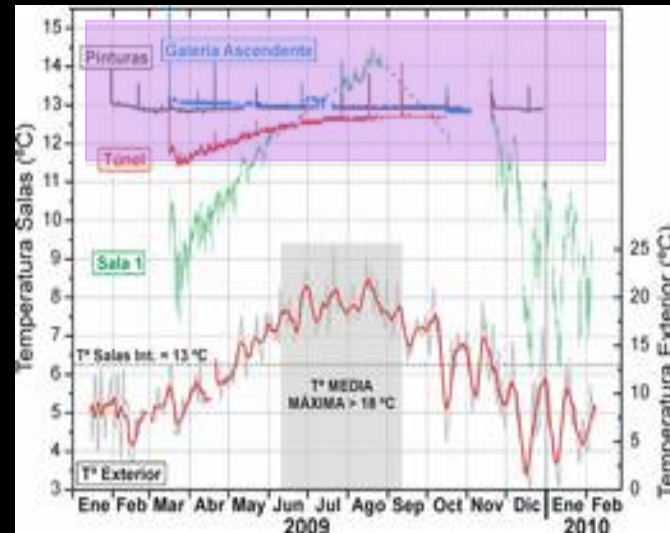
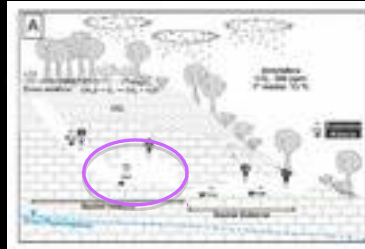


*Patologiak*



# Euskal Herriko Karsta:

Nola arnasten du  
Praileaitzek?



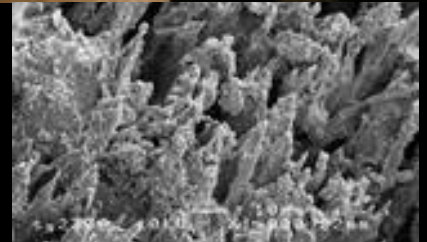
*T<sup>a</sup> kte  
hezetasuna  
± 100%  
lhintz-puntua*

*Kondentsazioa*

Ur ez mineralizatua  
CE=174 microSiem./cm , pH= 7,39



*CO<sub>2</sub> (lurzorua)*

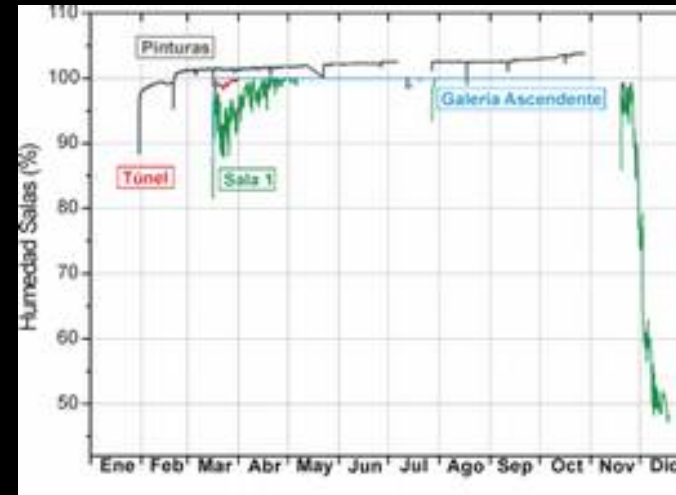
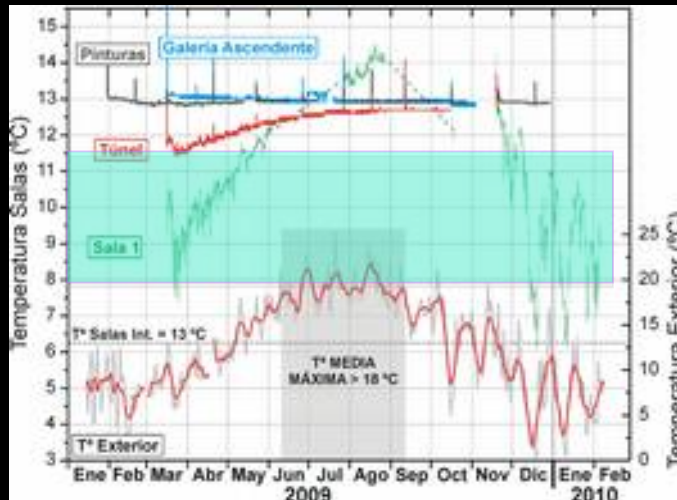
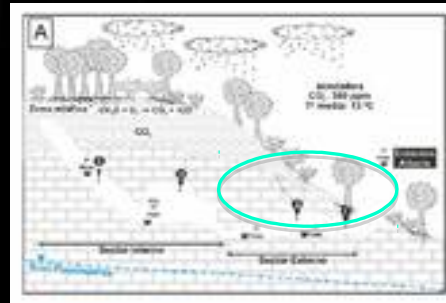


*Disoluzioa*



# Euskal Herriko Karsta:

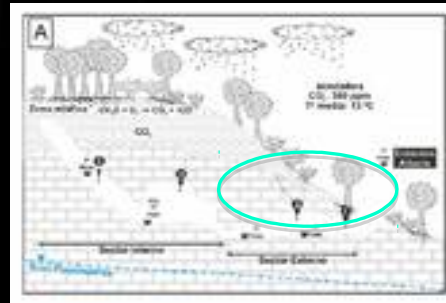
Nola arnasten du  
Praileaitzek?



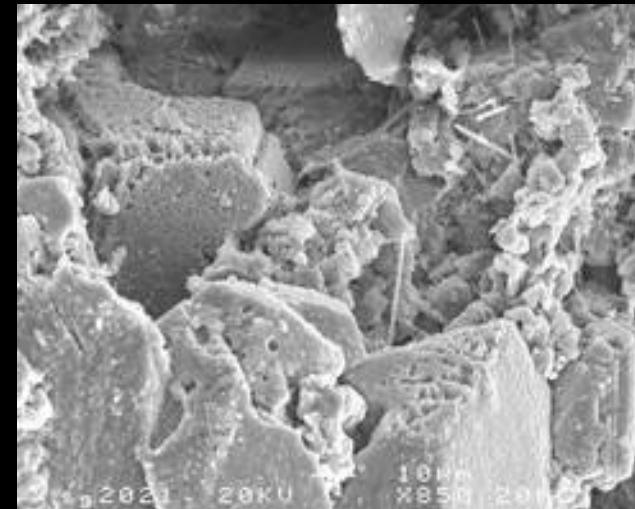
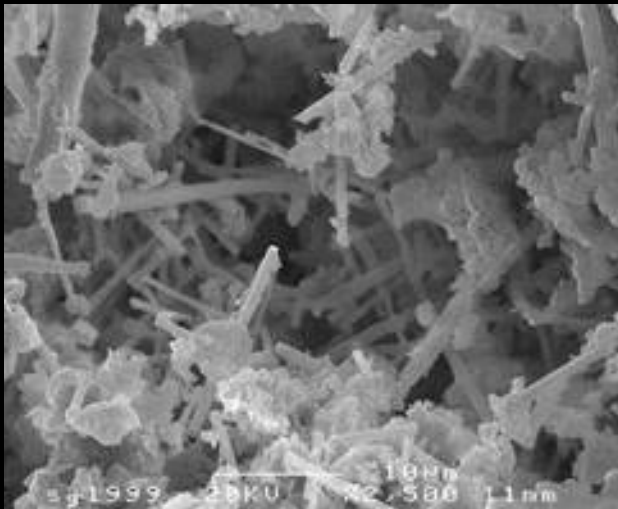
$T^a$  - Hezetasuna  
EZ konstantea  
Lurrunketa

Kondentsazioa  
Hezetasuna  
Kapilaritatea

# Euskal Herriko Karsta:



Nola arnasten du  
Praile...



*T<sup>a</sup> - Hezetasuna*  
*EZ konstantea*  
*Lurrunketa*

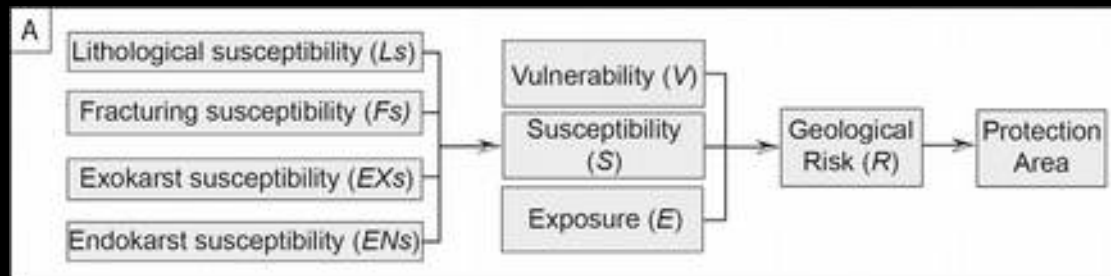
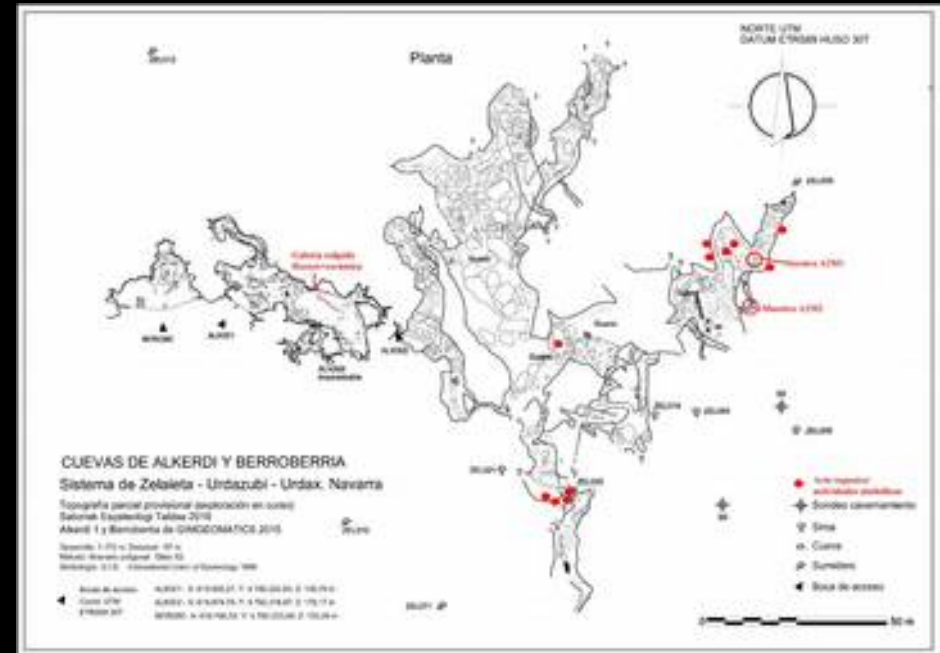
Kondentsazioa  
Hezetasuna  
Kapilaritatea

*Moonmilk*

Disoluzioa edo/eta  
prezipitazioa *in situ*

# Euskal Herriko Karsta:

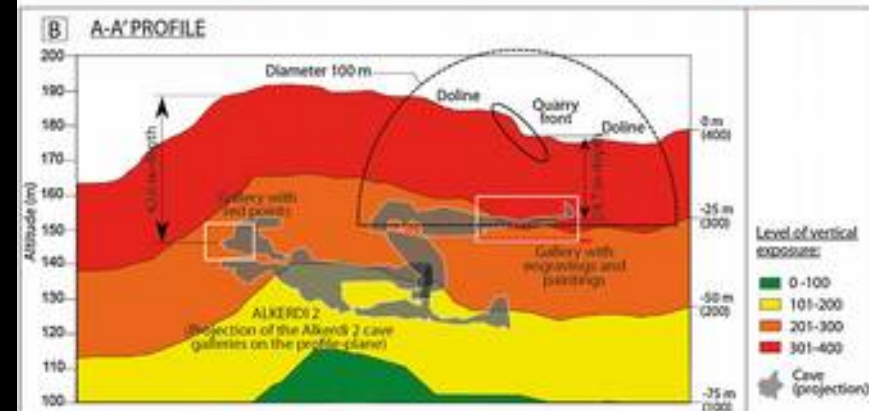
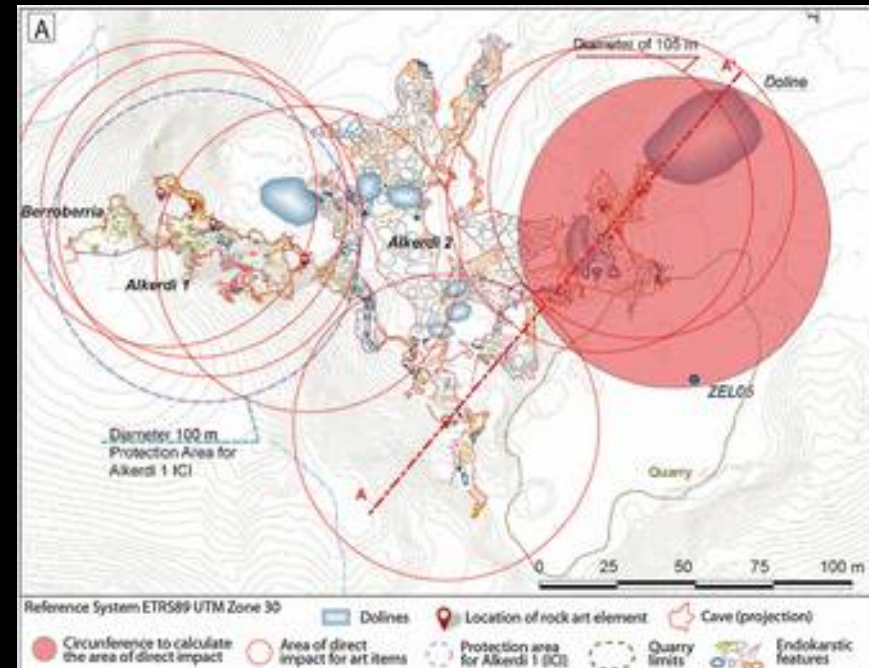
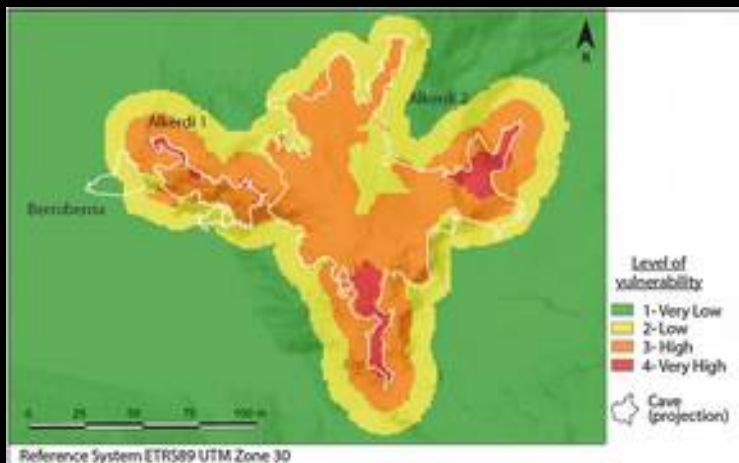
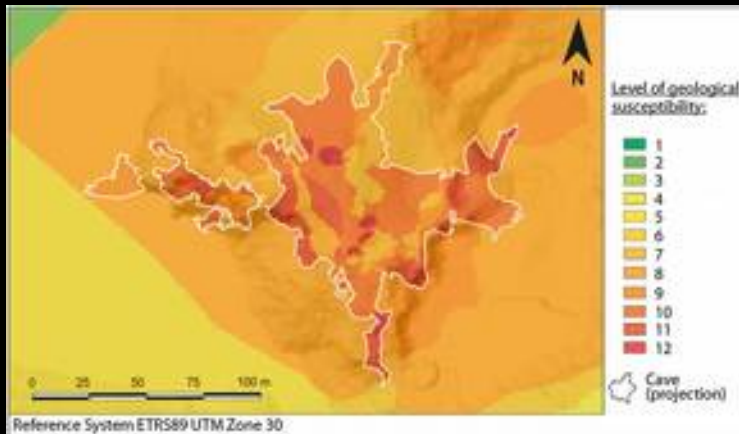
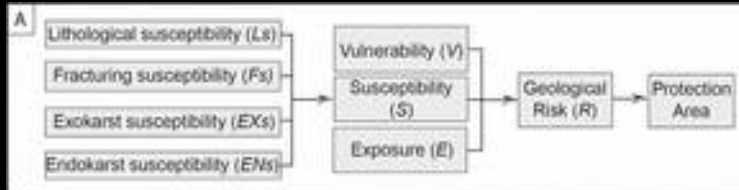
## *Alkerdi, Urdazubi (Nafarroa)*





# Euskal Herriko Karsta:

## *Alkerdi, Urdazubi (Nafarroa)*

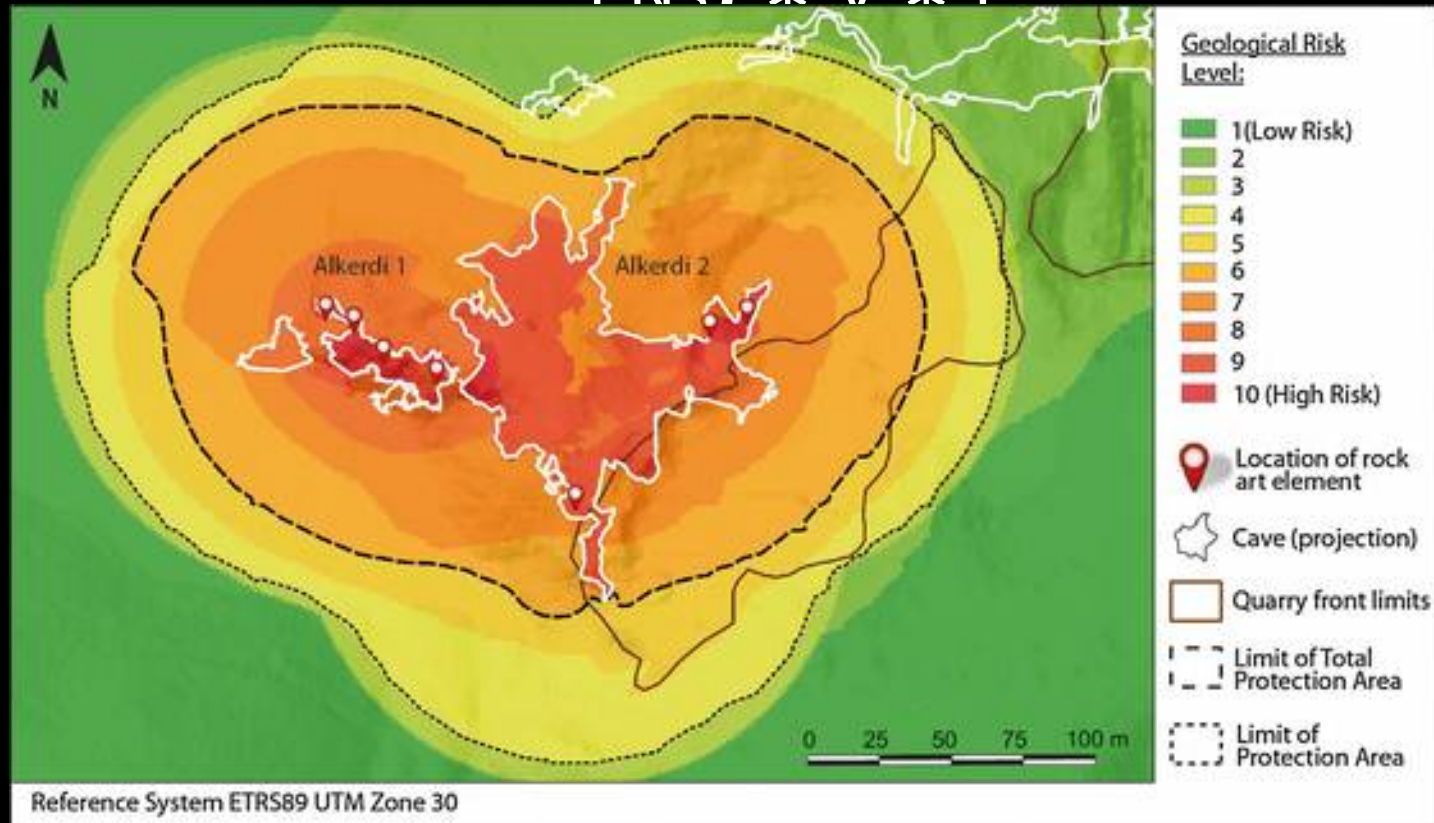


# Euskal Herriko Karsta:

## *Alkerdi, Urdazubi (Nafarroa)*

*Parametro ambientalak neurtzen ari gara!!!*

$$R = (LS + Fs + EXs + FNs) * V * F$$



# Euskal Herriko Karsta:



*Altamirako Koba*

NATUR ETA KULTUR ONDAREA GILTZAPEAN ?



# Euskal Herriko Karsta:



NATUR ETA KULTUR ONDAREA GILTZAPEAN ?

# Euskal Herriko Karsta:



NAT





***Eskerrik Asko***