



Karst landscapes

Paysages karstiques



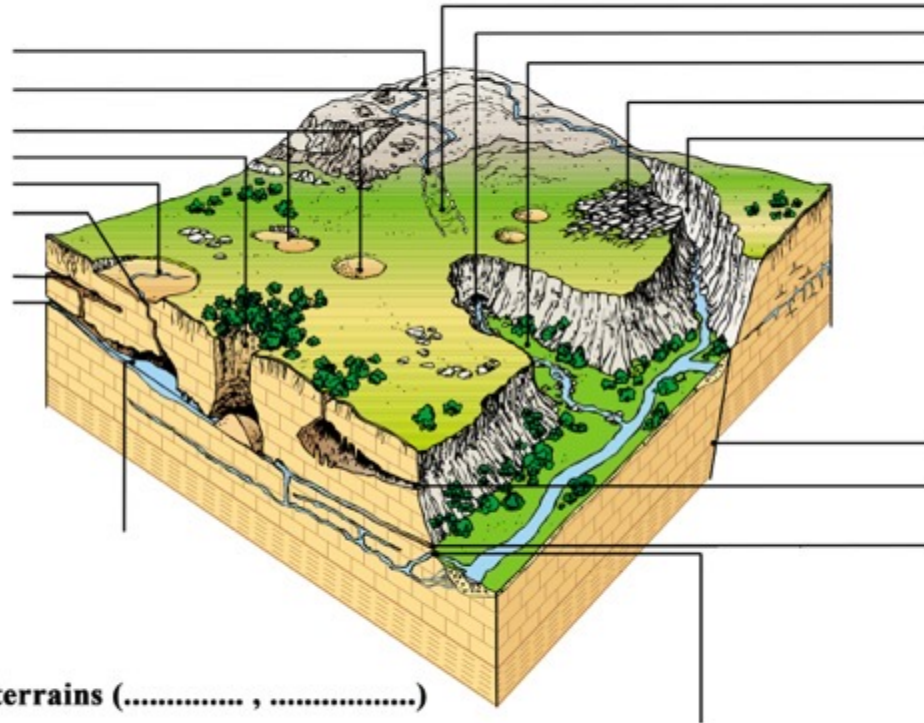
Fabrice Mourau^{1,2}


1: Science teacher, Collège Pierre de Coubertin, Le Luc (France)


2: EduMed observatory, UMR Géoazur (Valbonne)

KARST LANDSCAPES

(look, listen and complete)



 Non-karstic terrains (..... ,)

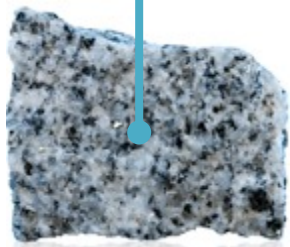
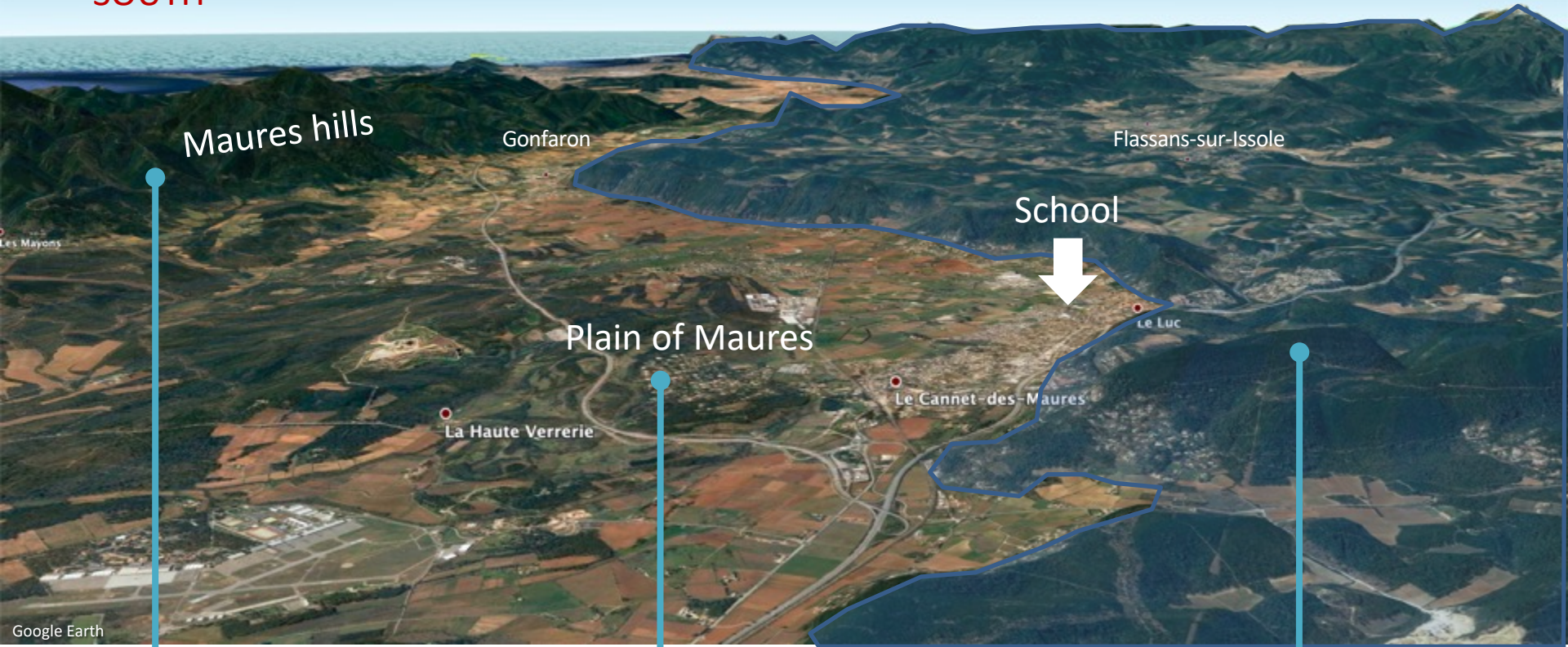
 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

→ Places all words with a red asterisk* on the scheme

SOUTH

WEST



Granite* (Granite)



Sandstone* (Grès)

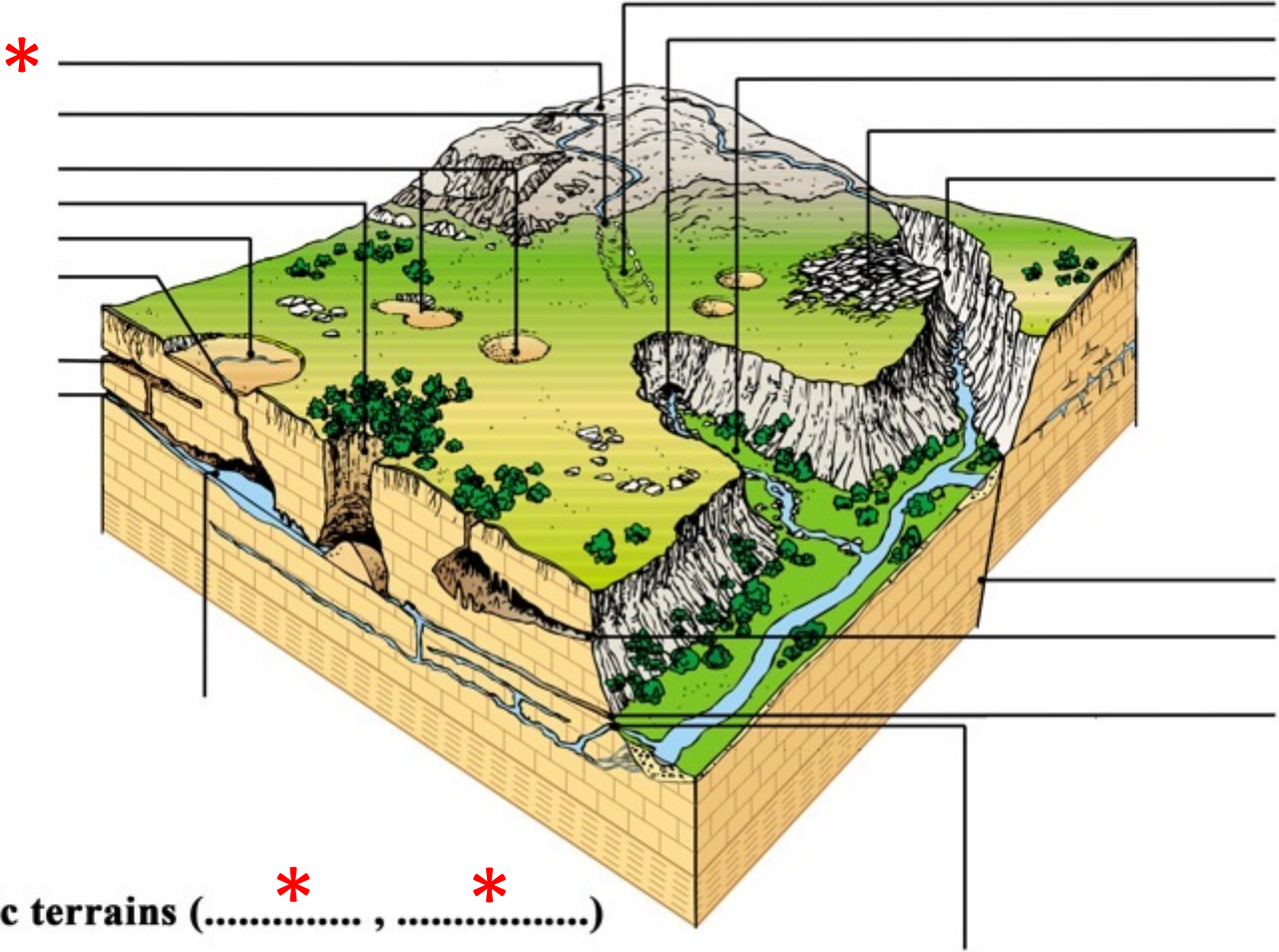
Non-karstic terrains*




Limestone* (Calcaire)

Karstic terrains

Sandstone-Limestone-Granite-Non-karstic terrains



 Non-karstic terrains (..... ,)

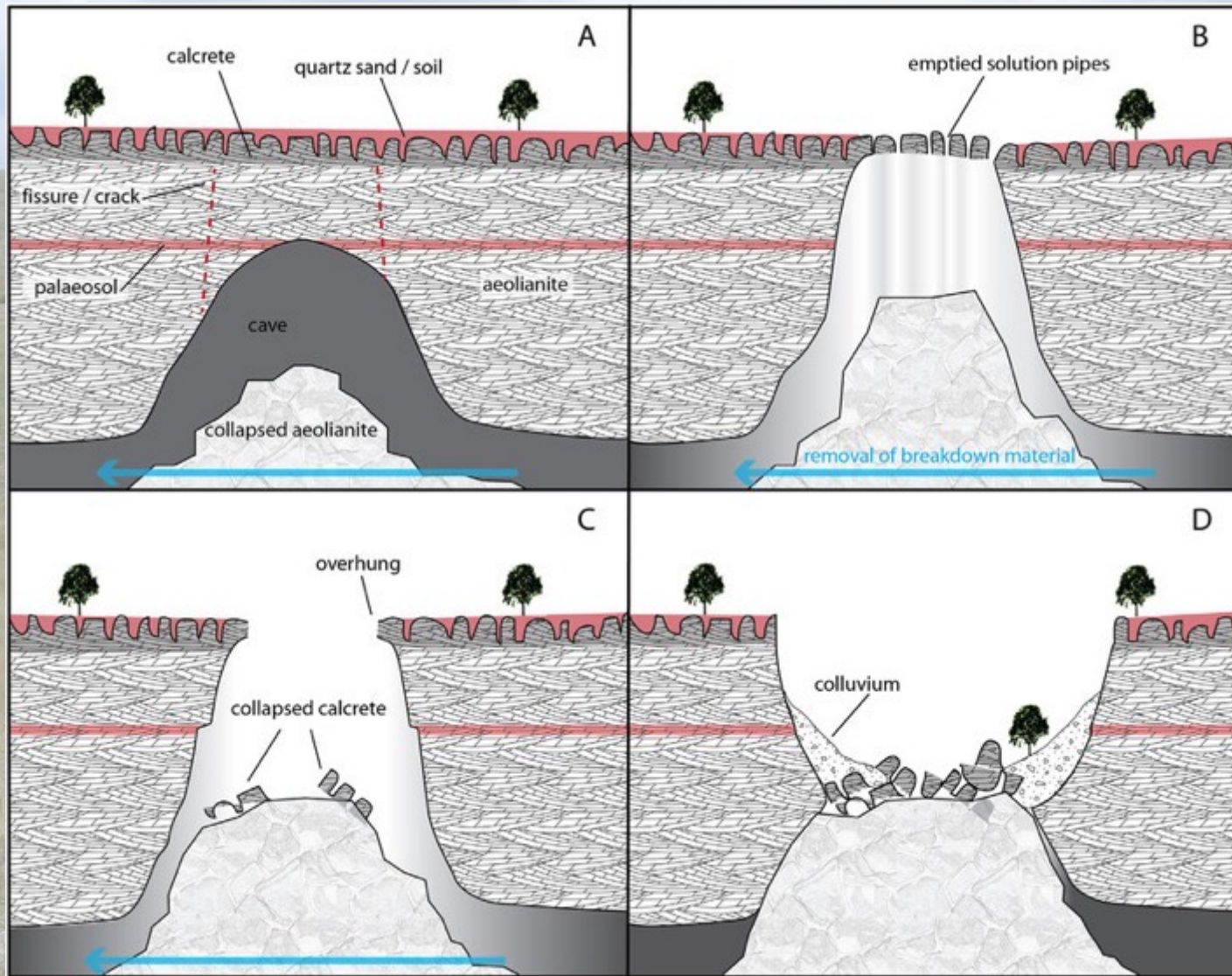
 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

Sinkhole/Doline*



Sinkhole/Doline*

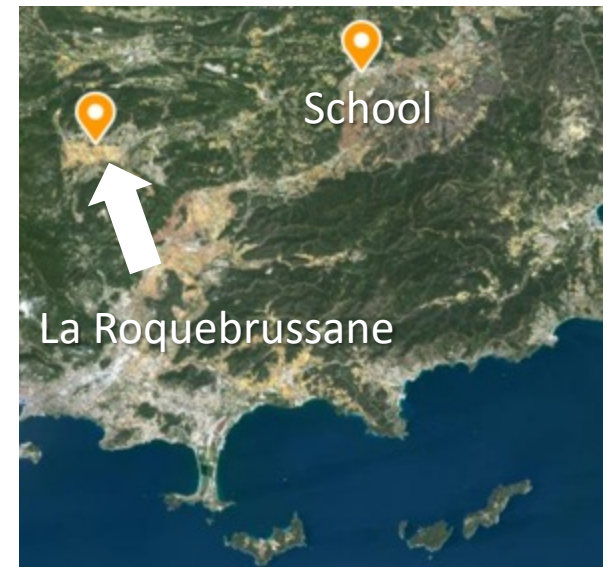
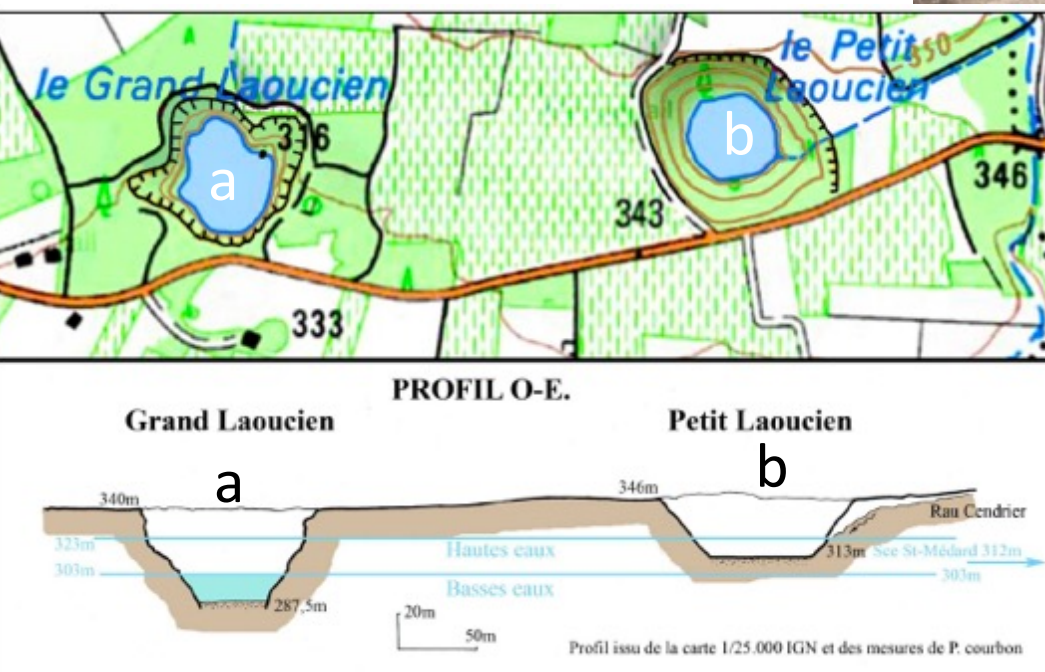


Sinkhole Doline*

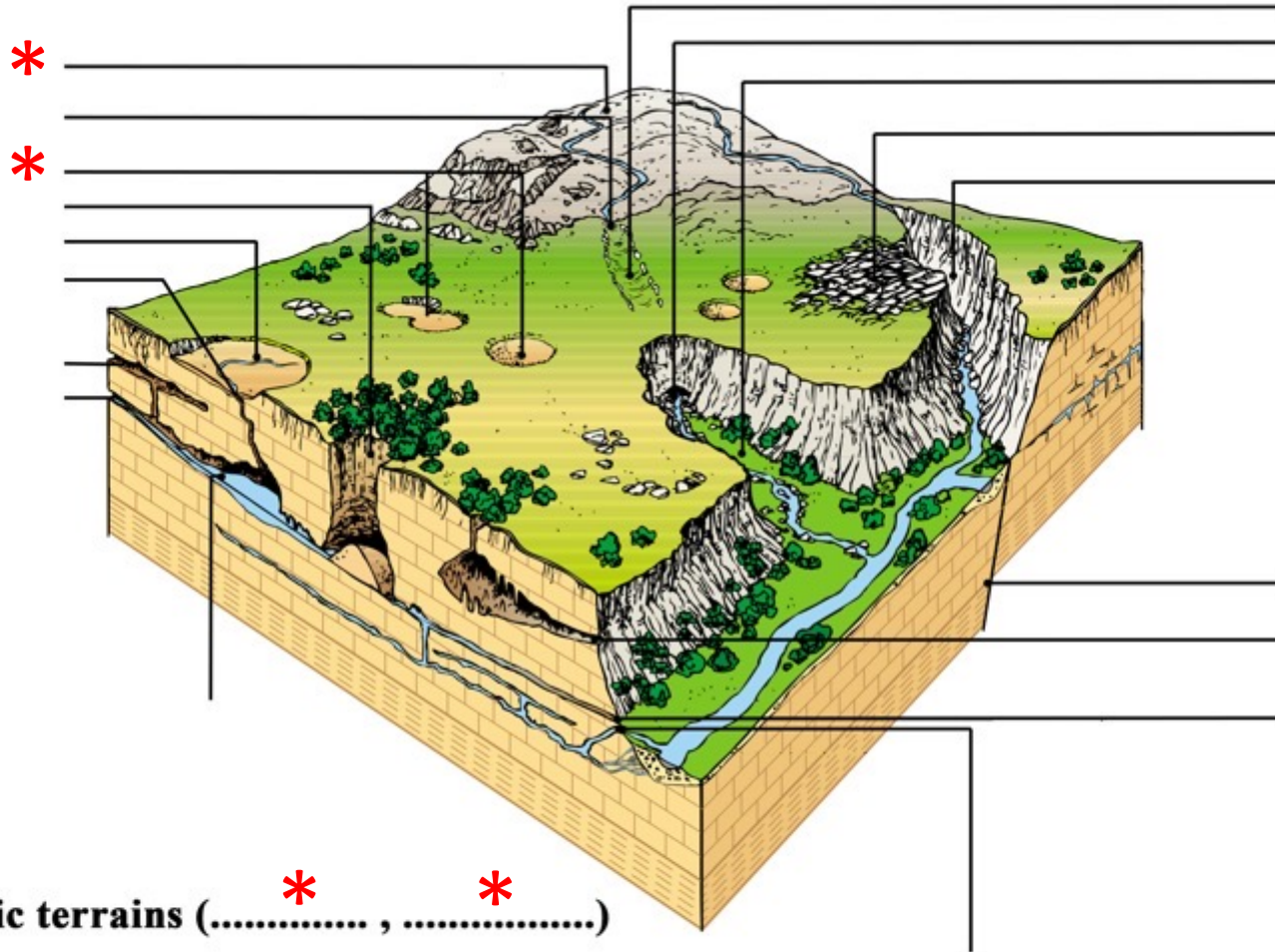



The dolines of the big (a) and the small « Laoucien » (b) at « la Roquebrussane » (Var)

Pictures: F. Mourau (2018)



Sinkhole/Doline



 Non-karstic terrains (.....*,*)

 Karstic terrains (.....*)

(D'après Bakalowicz et al. , 1999)

Canyon*

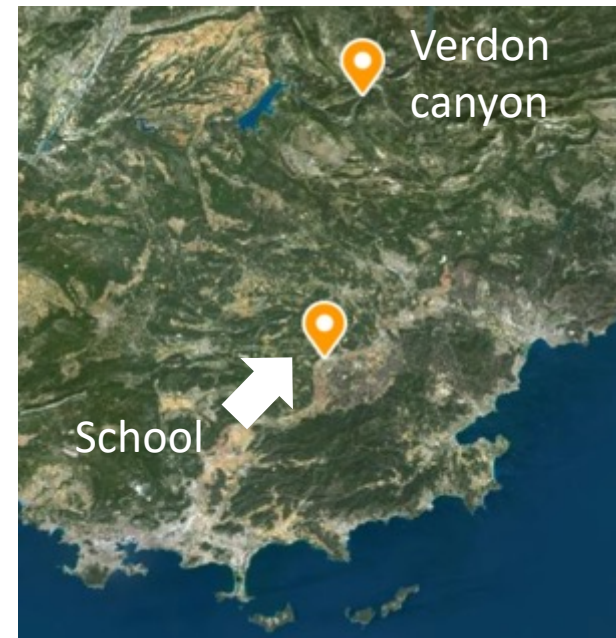


Gola di Goropu, Sardinia (Picture : E. Sanson, 2002)

Canyon*



The « Verdon » river has hollowed out Europe's biggest canyon

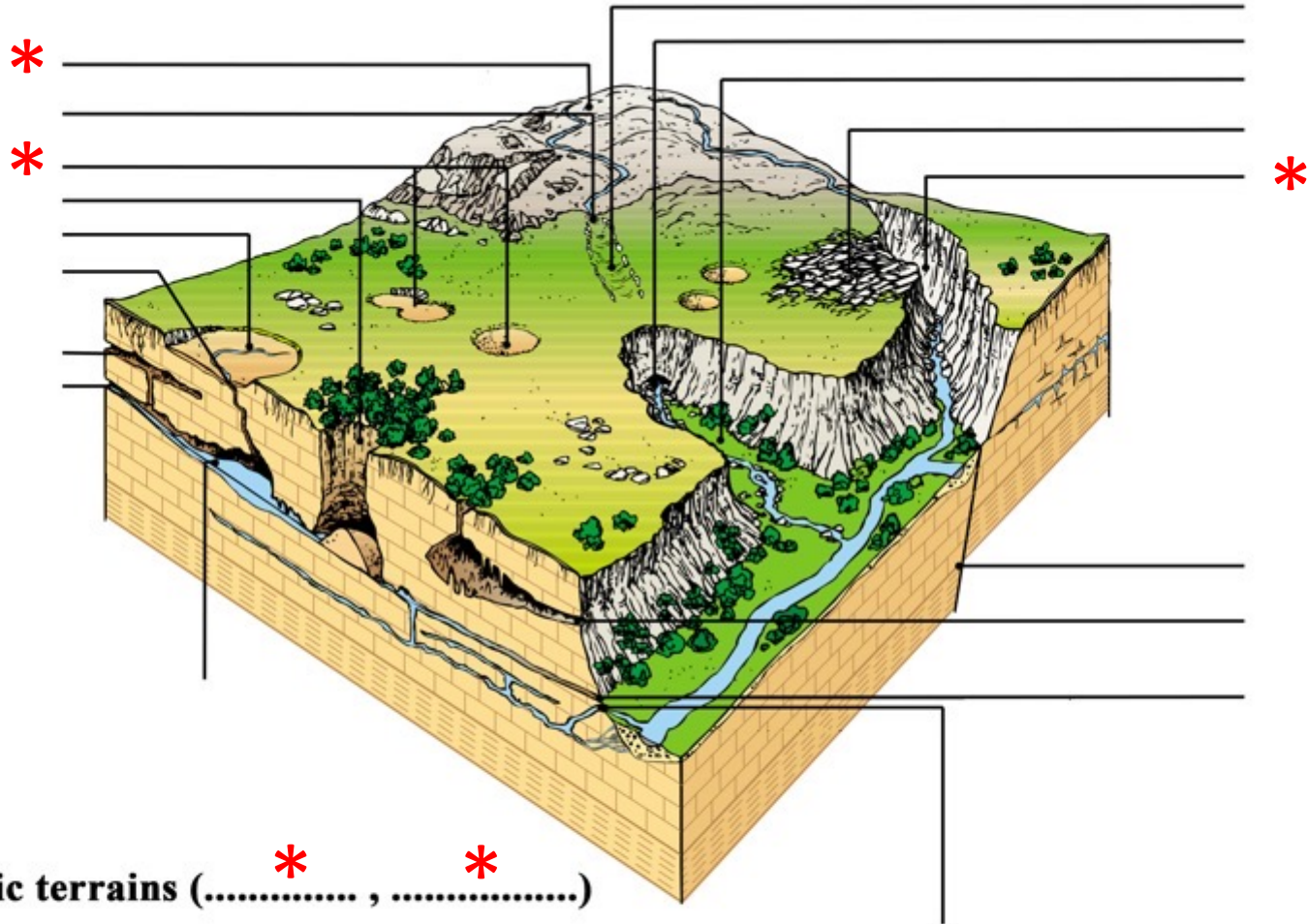



Canyoning

(Haut-Jabron, Alpes de Haute Provence)



Canyon



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

Dry valley*



Artuby river (November)



Artuby river (July)

Dry valley* (vallée sèche)



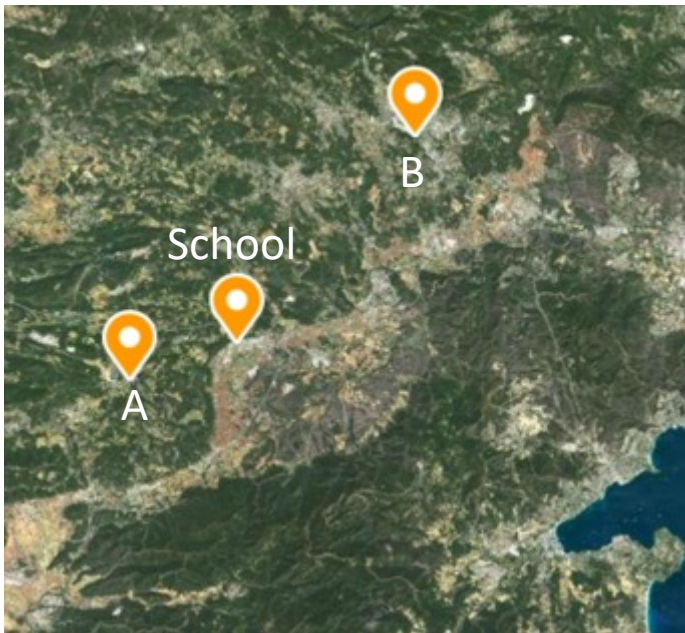
A : Issole (Flassans-sur-Issole)



B : Nartuby (Draguignan)



Photo F. Tetaz, Var Matin, 30 Octobre 2018

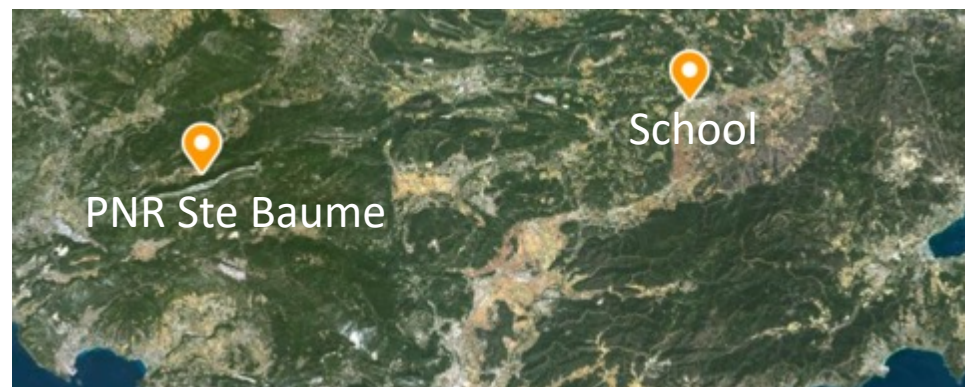




Cliché : Denis Caviglia – PNR Sainte Baume

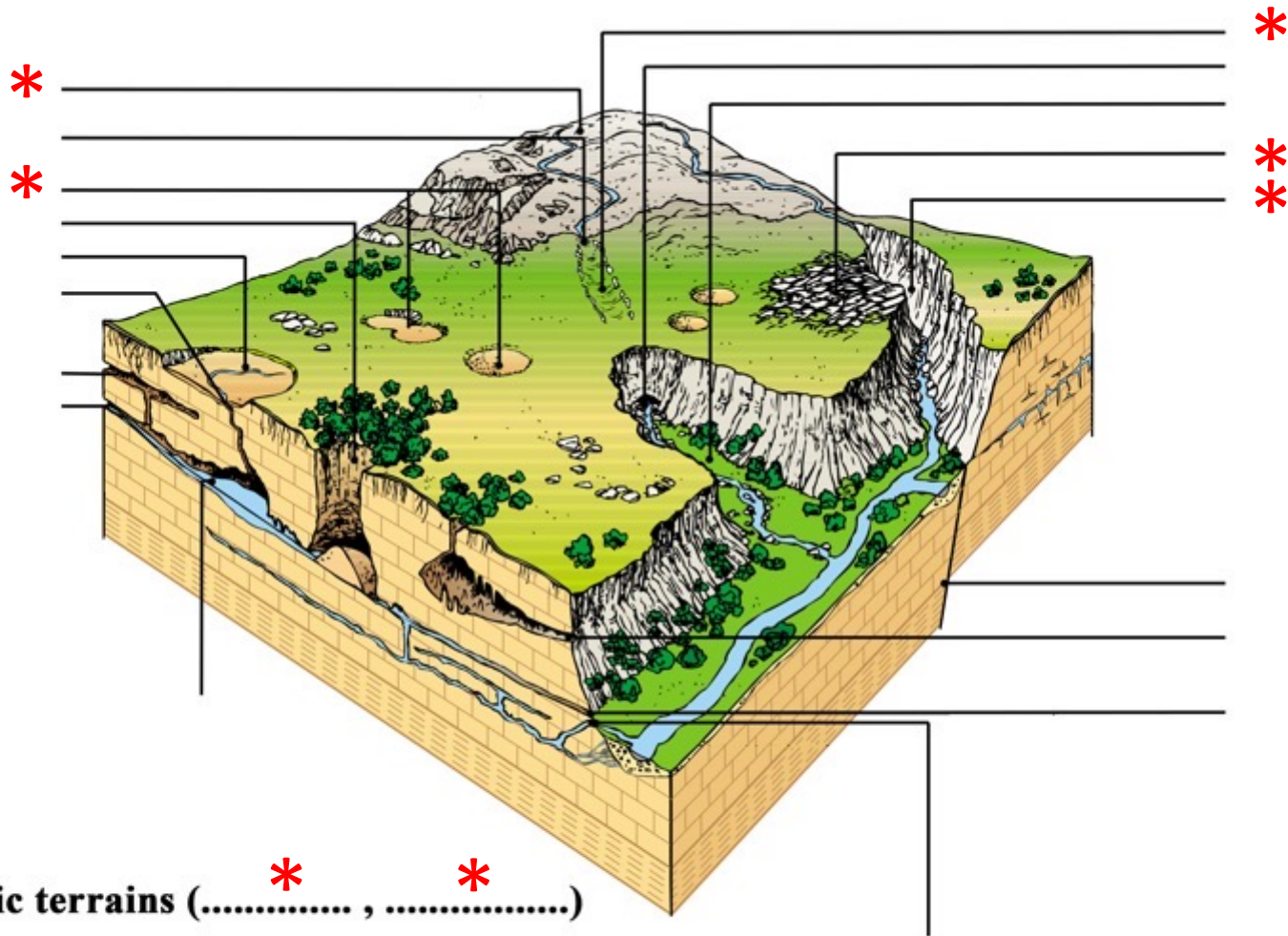
Lapiaz field*


(Champ de lapiaz)



B: soil covered Lapiaz (Hérault, France)

Lapiaz field

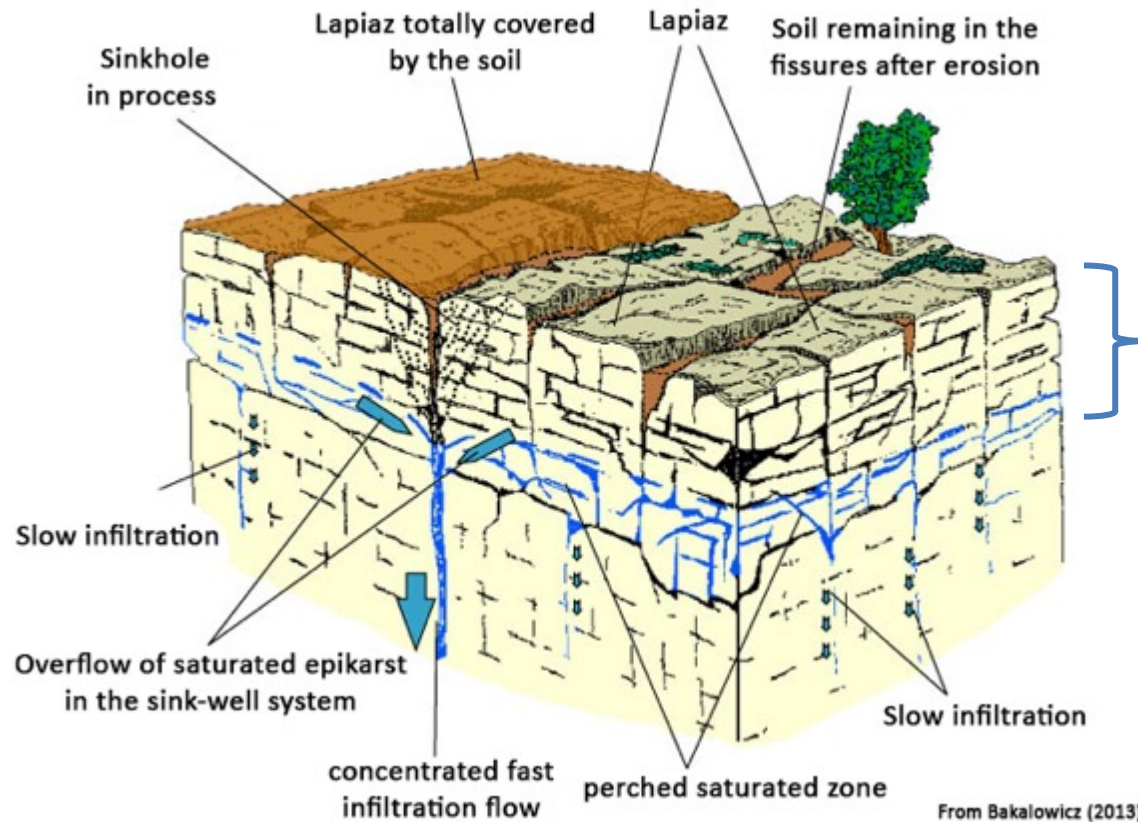


 Non-karstic terrains (.....,) *

 Karstic terrains (.....) *

(D'après Bakalowicz et al. , 1999)

The paths of water : rain water infiltration

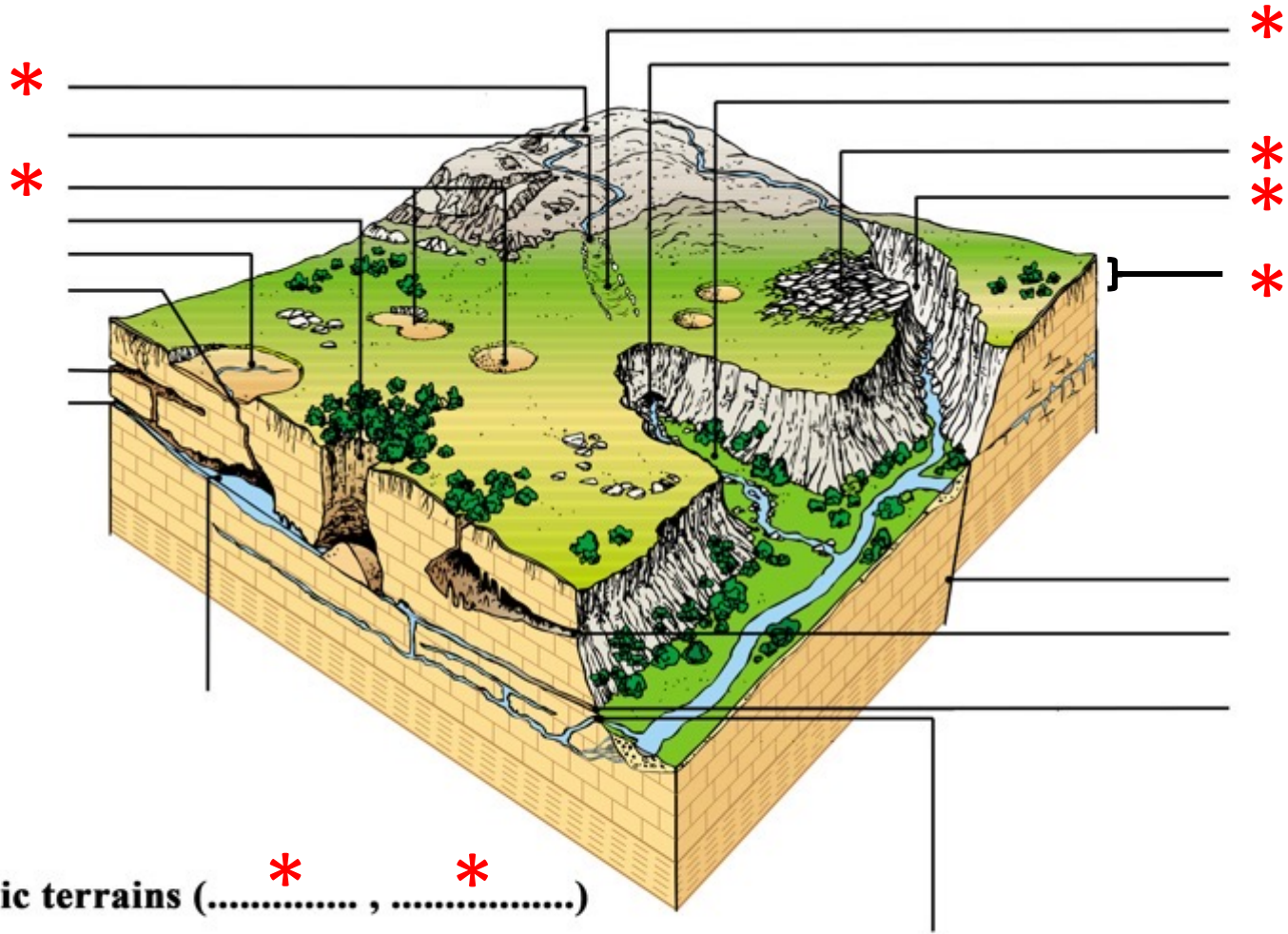



Epikarst*



Like a sponge, when they are dry, the soil and the epikarst retain and then slowly transmit rainwater

Epikarst

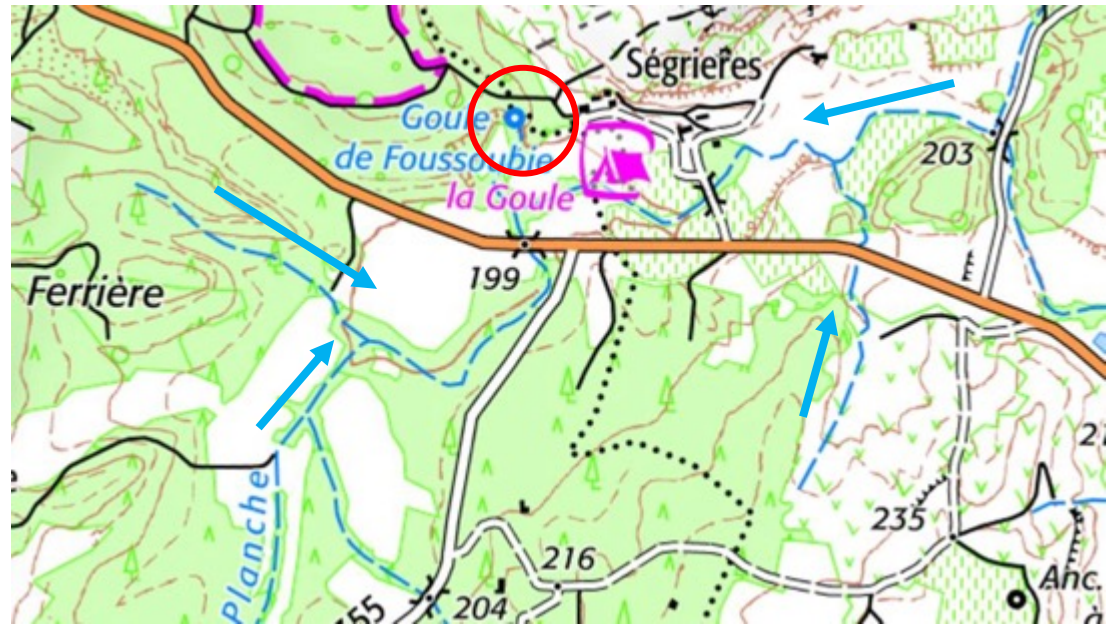


 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

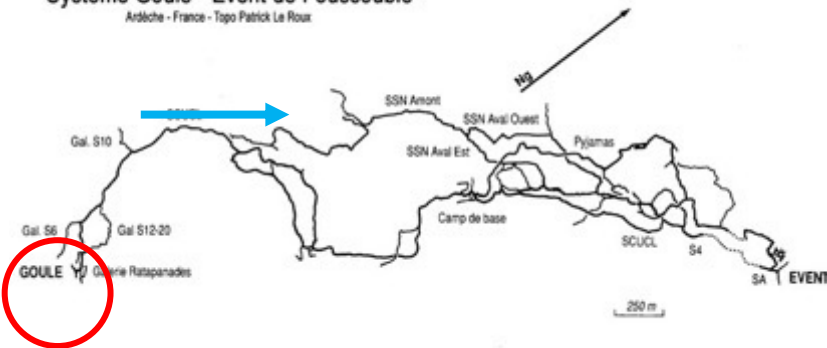
(D'après Bakalowicz et al. , 1999)

The paths of water : lost river* / Interrupted stream (Perte)



The "Goule de foussoubie" is a cave with a river flow

Système Goule - Event de Foussoubie
Ardèche - France - Topo Patrick Le Roux



The paths of water : lost river* /Interrupted stream (Perte)



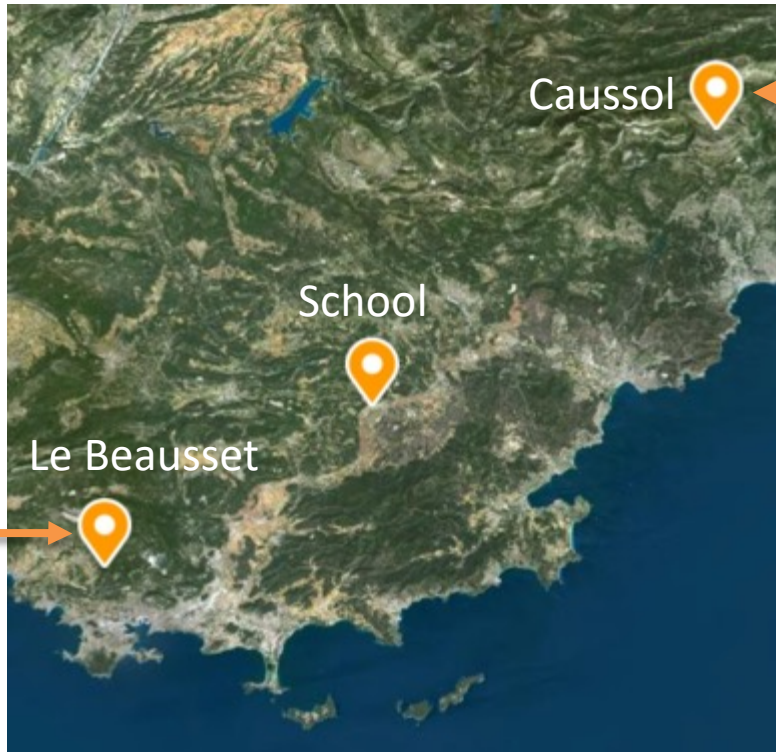
Picture : B. Arfib

« Perte et fracas »,
Evenos-Le Beausset



Use of a
fluorescent
tracer to find the
resurgence*

Picture : T. Lamarque
(« Pertes et fracas »,
Evenos-Le Beausset)

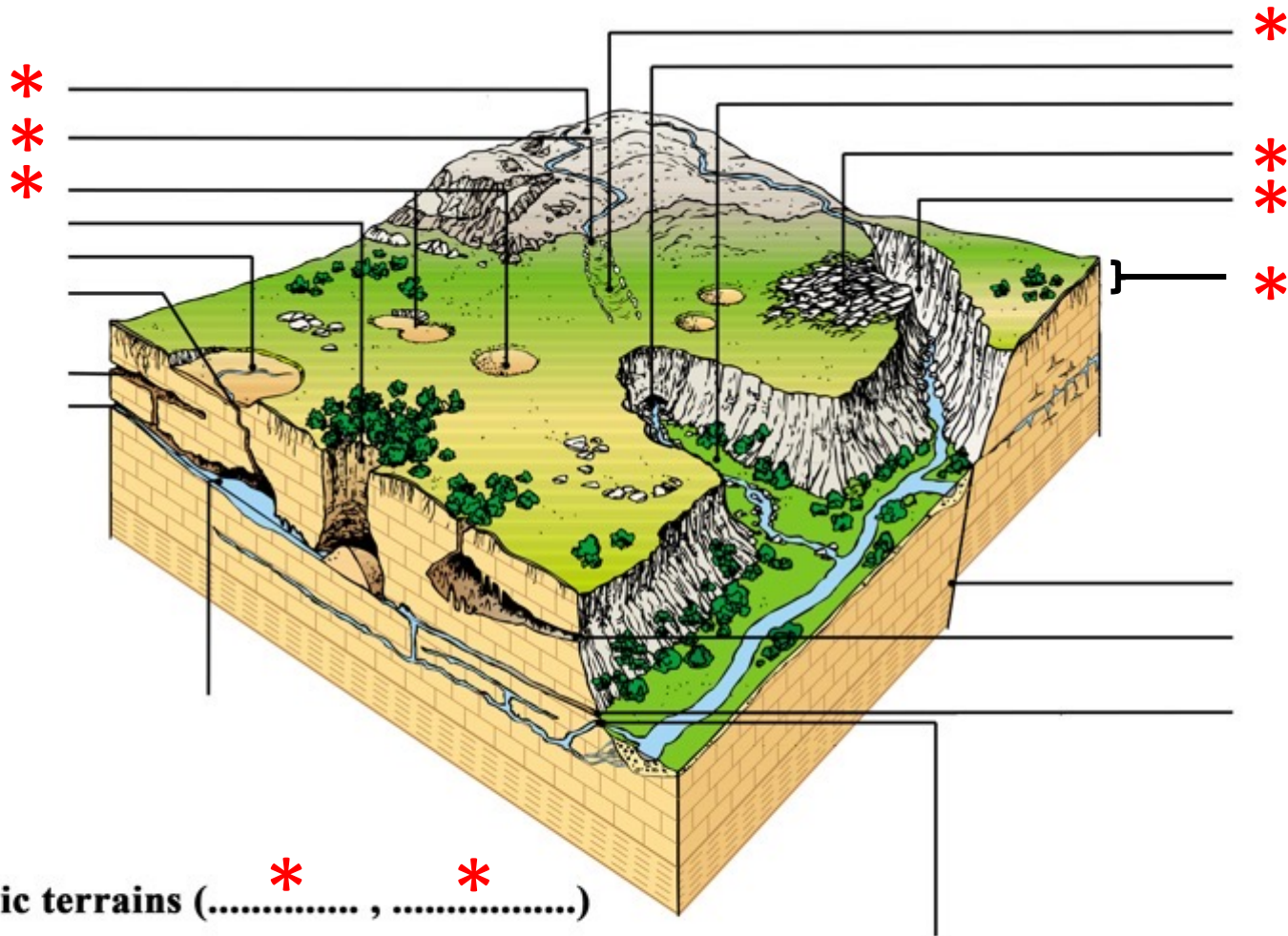



Picture : P. Crochet



« L'embut de Caussol » (06),
A temporary karstic lost river

Lost river



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

The paths of water : Polje* and Ponor*



Regulating valve at the entrance of the Ponor from Cerknica polje

Picture : E. Sanson (2003)

Cerknika lake (Slovenia) during winter (Picture : wikipédia)



Cerknika lake (Slovenia) during summer (Picture : wikipédia)

By Janez Vajkard
Valsavor (1641-1693)

First karstic hydrogeologist



Polje*



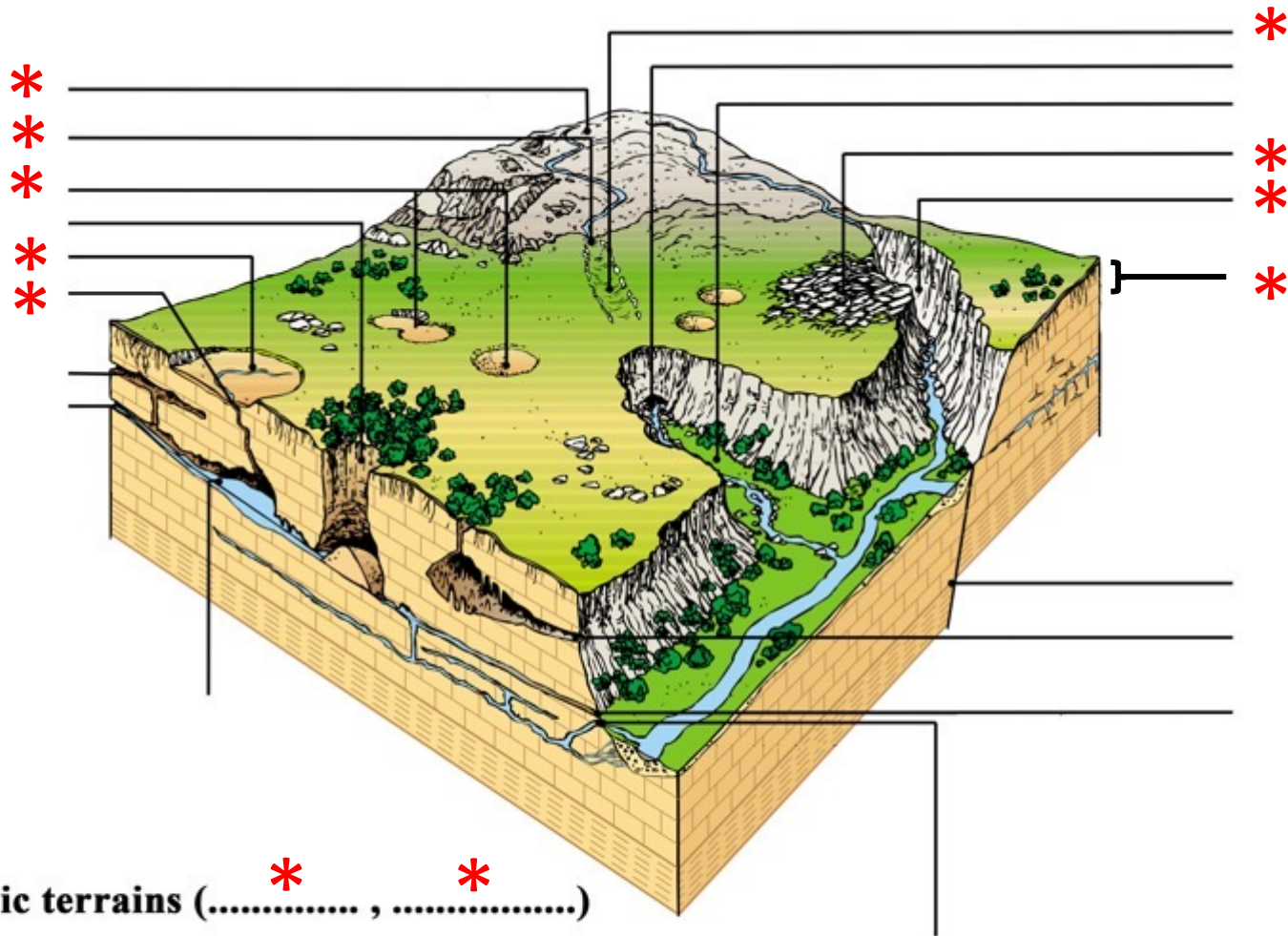
the polje and the ponor
from Plan d'Aups




Ponor*



Polje - Ponor



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

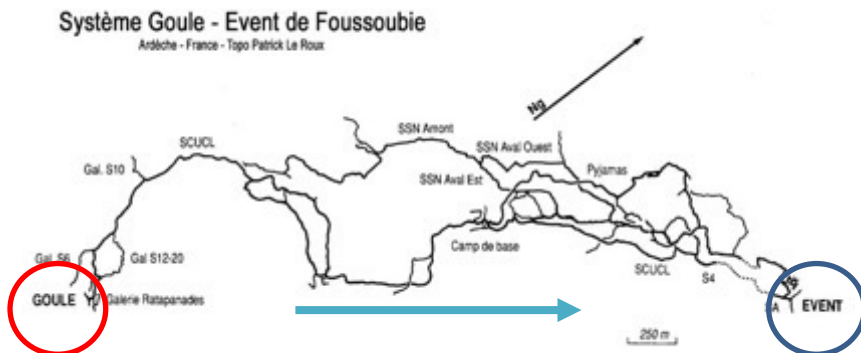
(D'après Bakalowicz et al. , 1999)

The paths of water : resurgence*

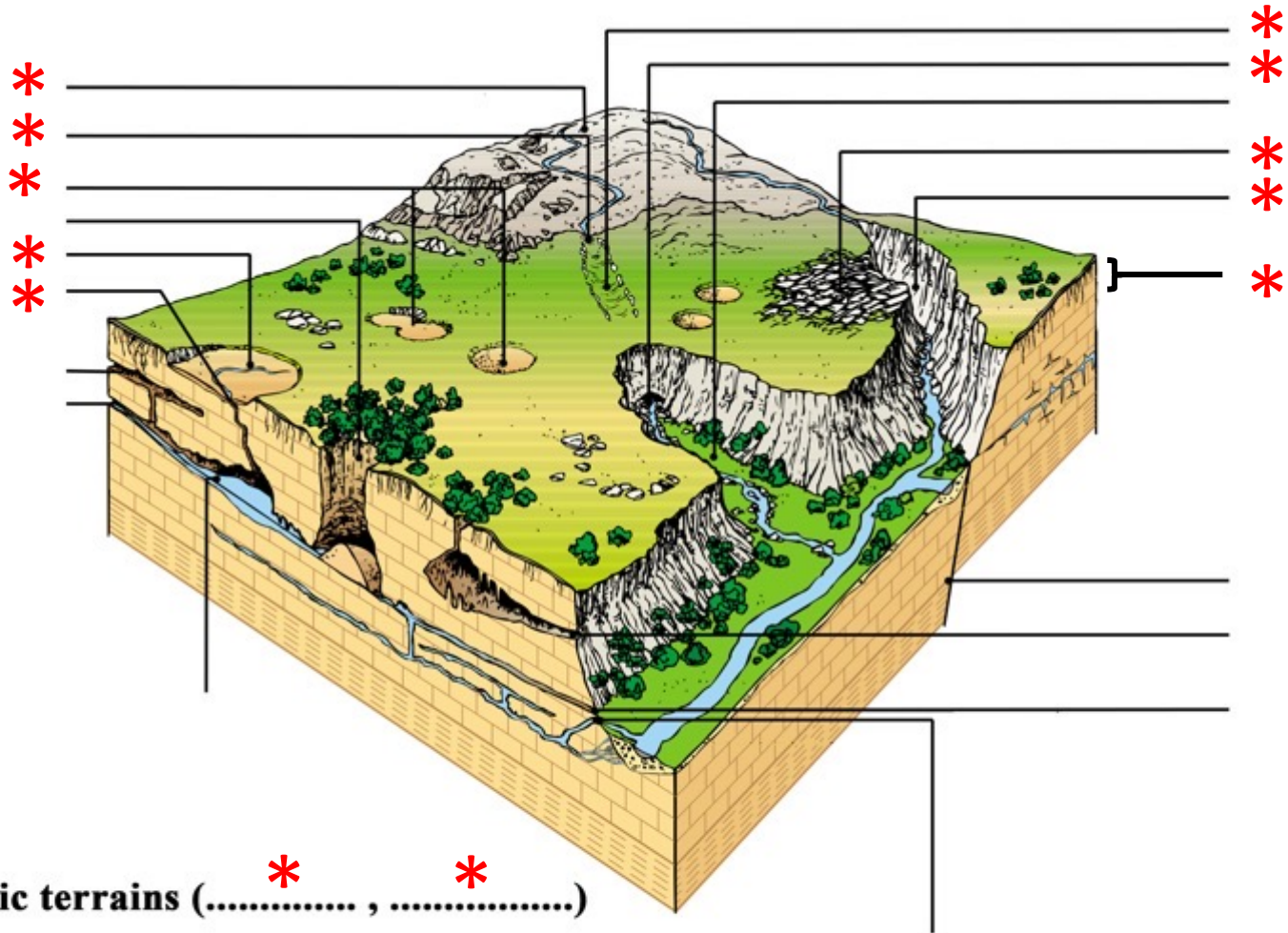



Event de Foussoubie (Ardèche, France)

When water emerges at the surface and has **already** circulated to the surface



Resurgence



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

First artificial (and involuntary) tracing of history

Karstic loss/resurgence system between the Doubs river and the Loue spring

On Sunday, August 11, 1901 at noon, a violent storm hit the city; at 12:20 pm, lightning struck the **absinthe** factory and the fire was almost instantaneous.

The general explosion that everyone feared did not take place because the huge tanks of alcohol and dyes let their contents flow into the courtyard and from there into the Doubs river.

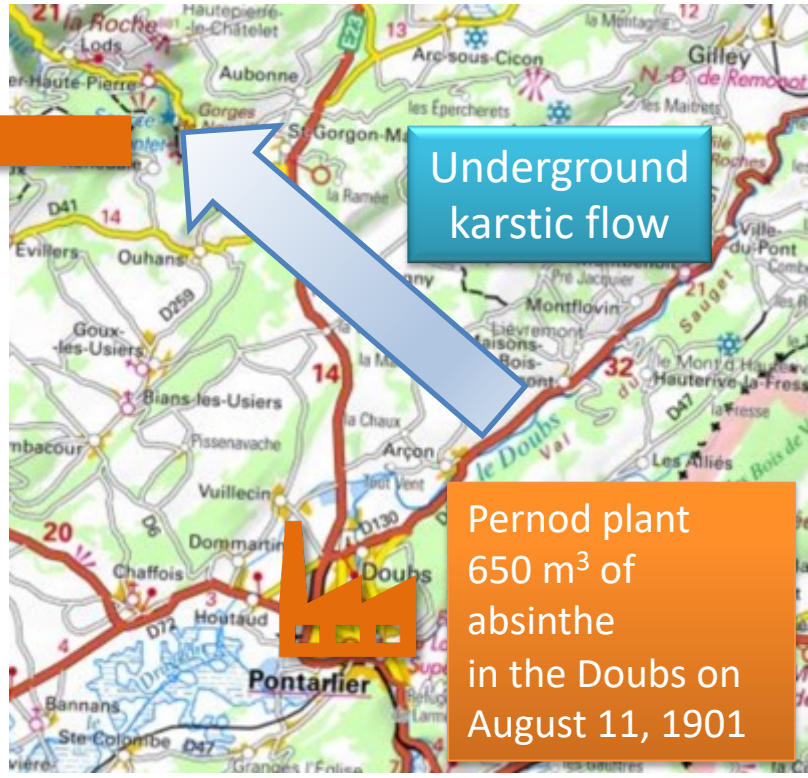
L'usine PERNOD FILS l'incendie à 2 heures



Absinthe is historically described as a distilled, highly alcoholic beverage (45-74%). It is an anise-flavoured spirit derived from plants, including the flowers and leaves of *Artemisia absinthium* ("grand wormwood"), together with green anise, sweet fennel, and other medicinal and culinary herbs. (from Wikipedia)

Blind valley*

Strong odor at the source of the Loue 2 days later



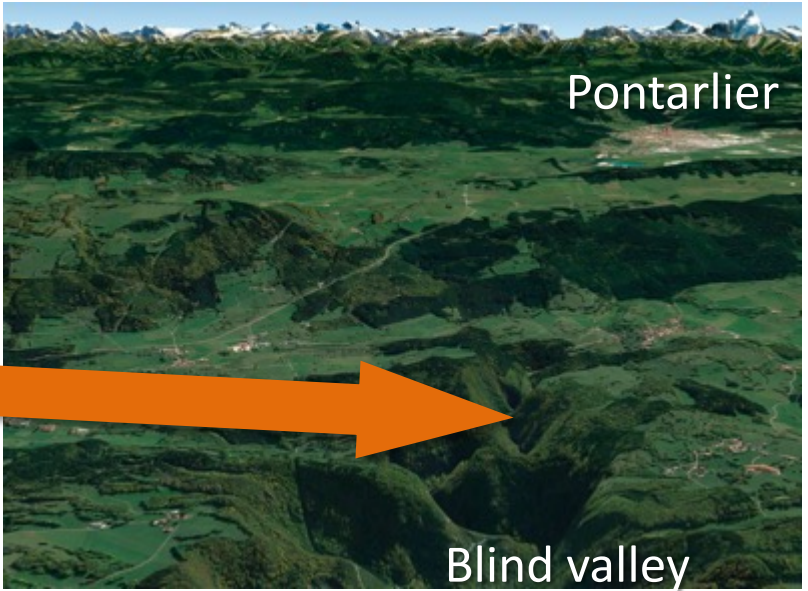
Underground karstic flow

Pernod plant
650 m³ of absinthe
in the Doubs on
August 11, 1901



Loue spring

School

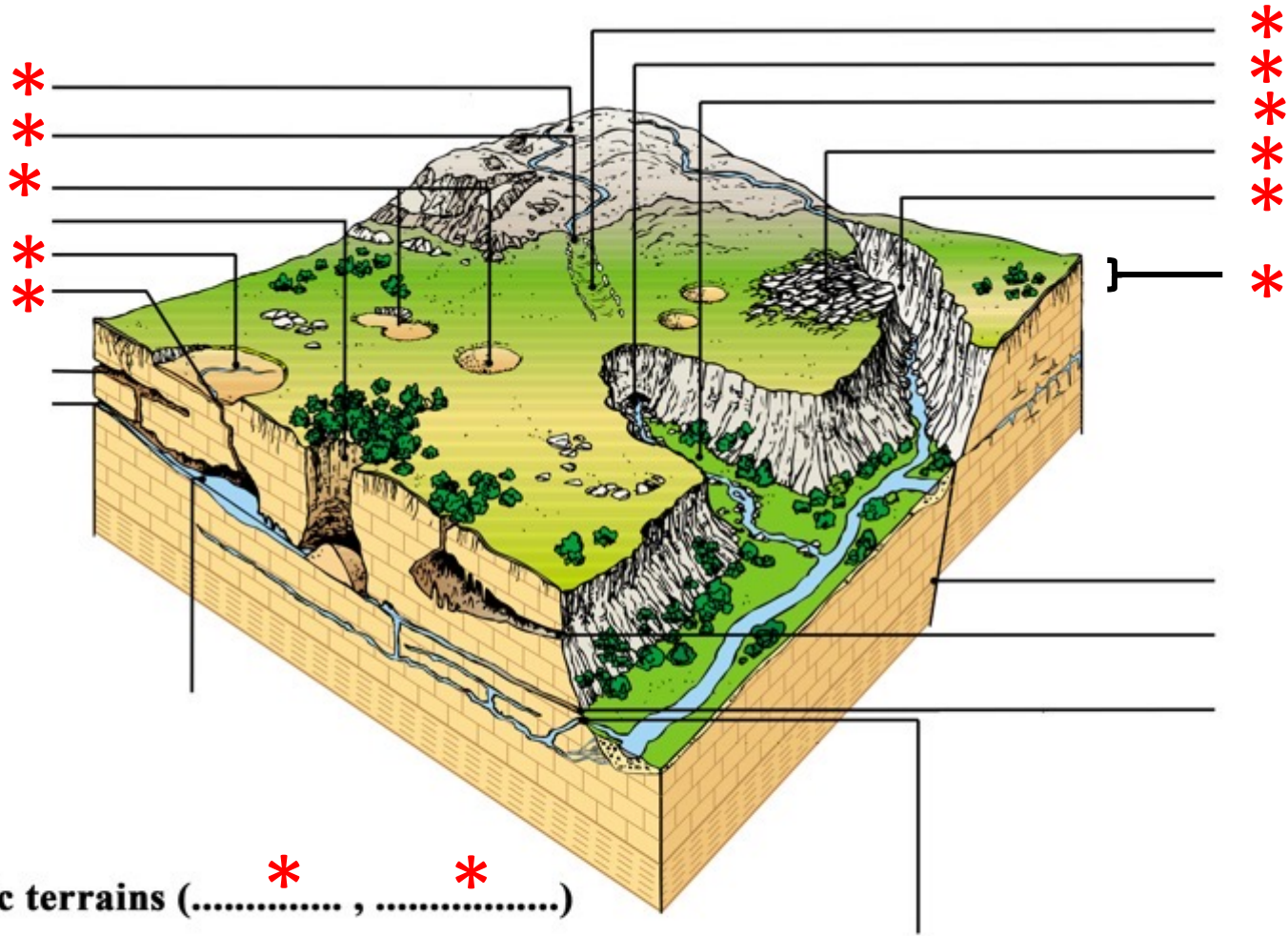



Pontarlier

Blind valley

Source de la Loue
(Picture : P. Crochet)

Blind valley



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

Exploring the Underground World : the cave*



A cave is a horizontal entrance to the underground world



Grotte des Rampins

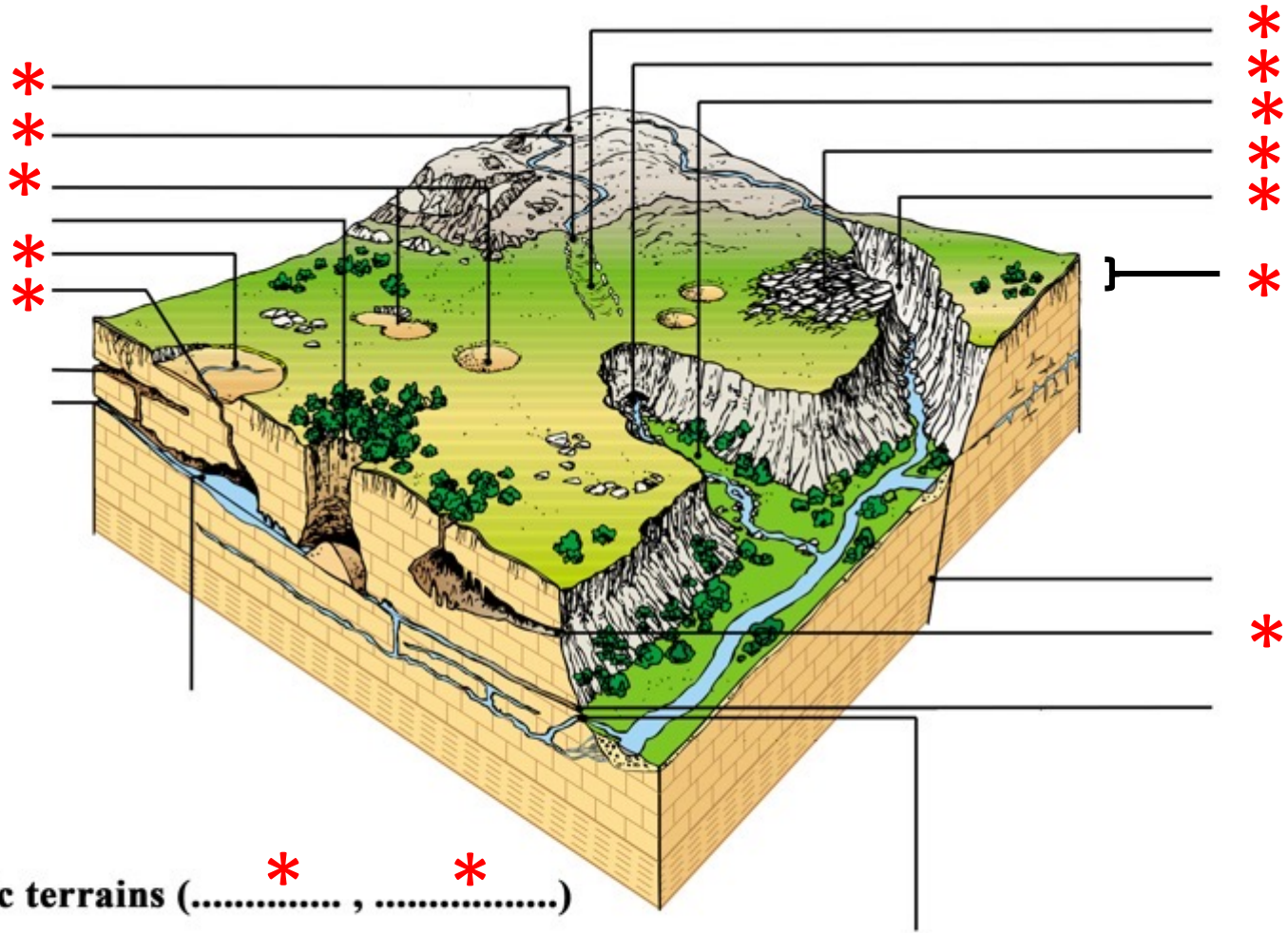
Photo F. Mourau 2020


The cave* : a horizontal entrance....



... and it doesn't matter how big it is!

Cave



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

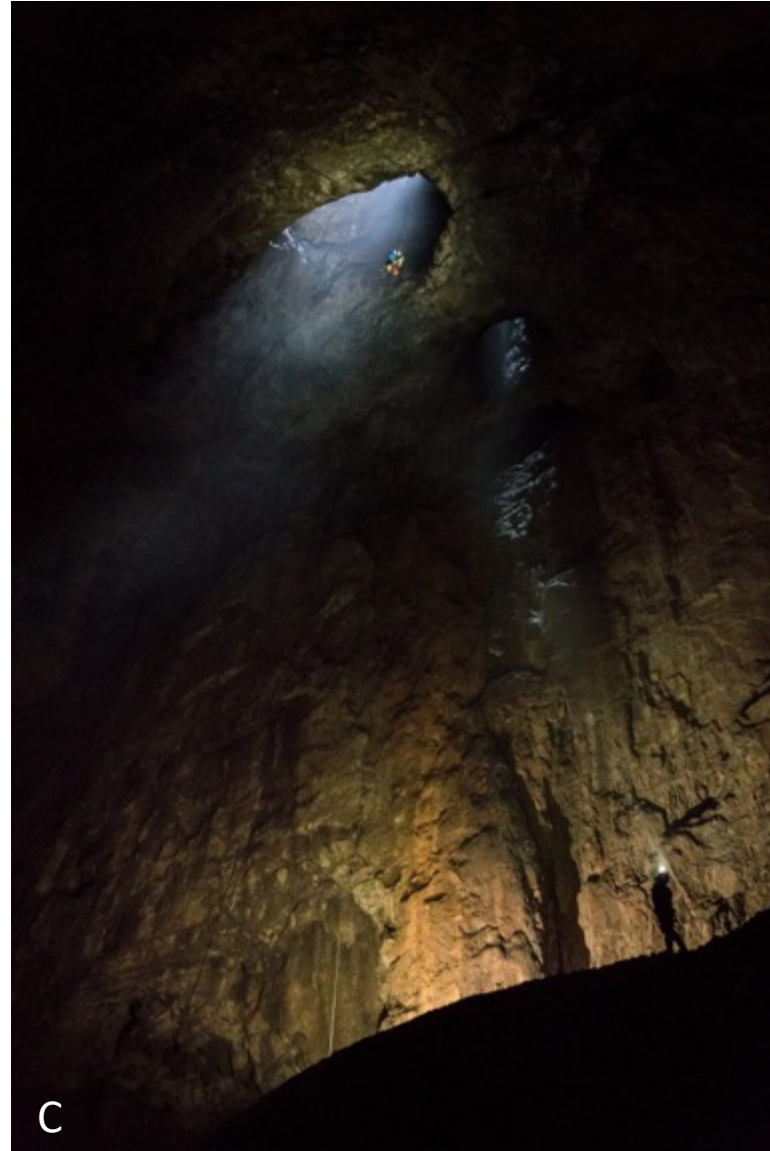
Exploring the Underground World : the chasm/abyss*



A: Aven du Palan (Siou Blanc, Var) ; B : Aven de la Solitude (Siou Blanc, Var) ; C : Le Vieux Mouni (Signes)

Pictures : F. Mourau (EDSC83)

Exploring the Underground World : the chasm/abyss*



... and it doesn't matter how tall it is!

In the fossil galleries*,
water no longer digs the cave.



A: Students working in a fossil gallery
B: A « box-letter » shaped fossil gallery
C: A penstock shaped fossil gallery



A



B



C

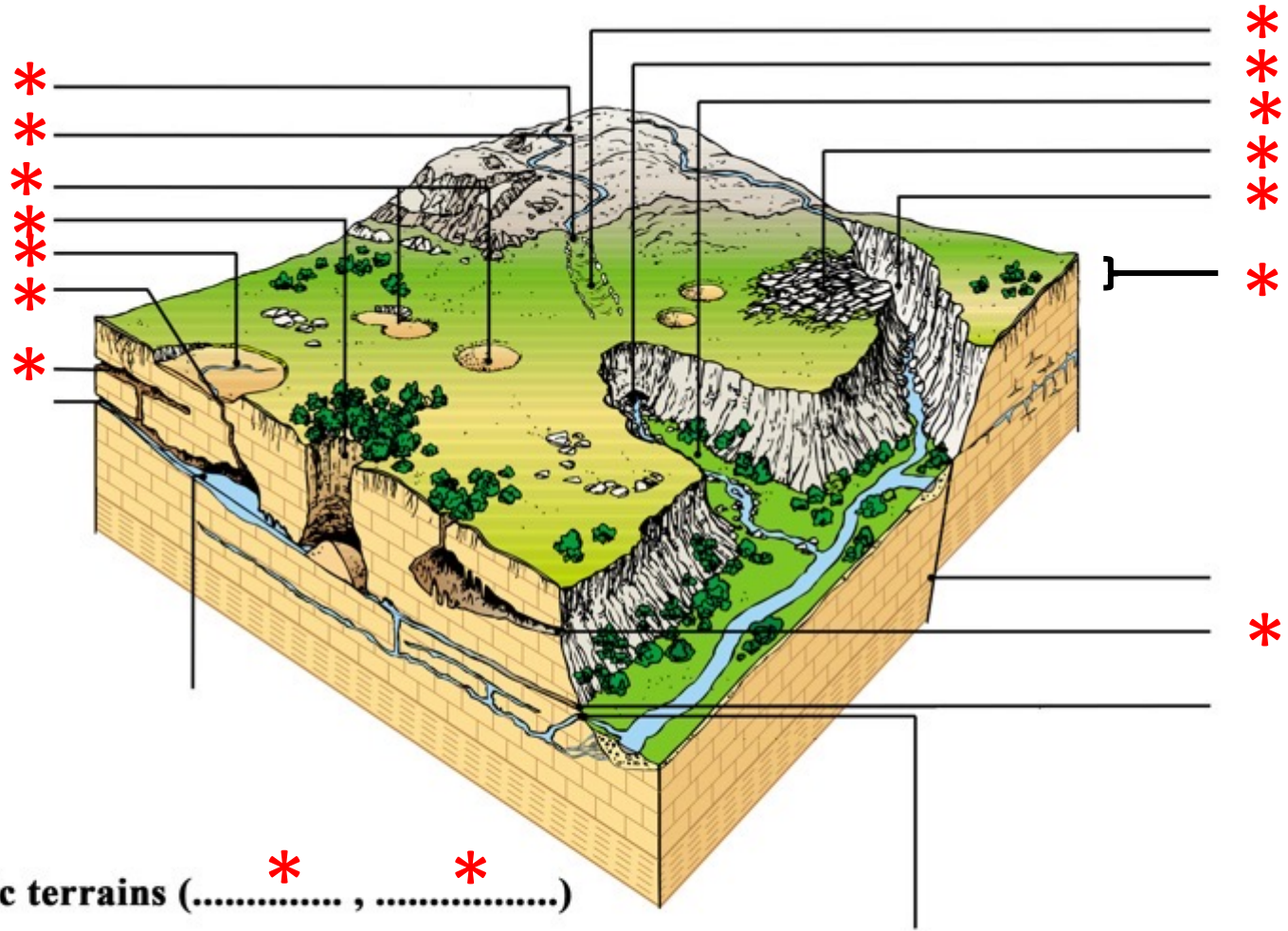
Pictures : Rampins cave
F. Mourau (2020)



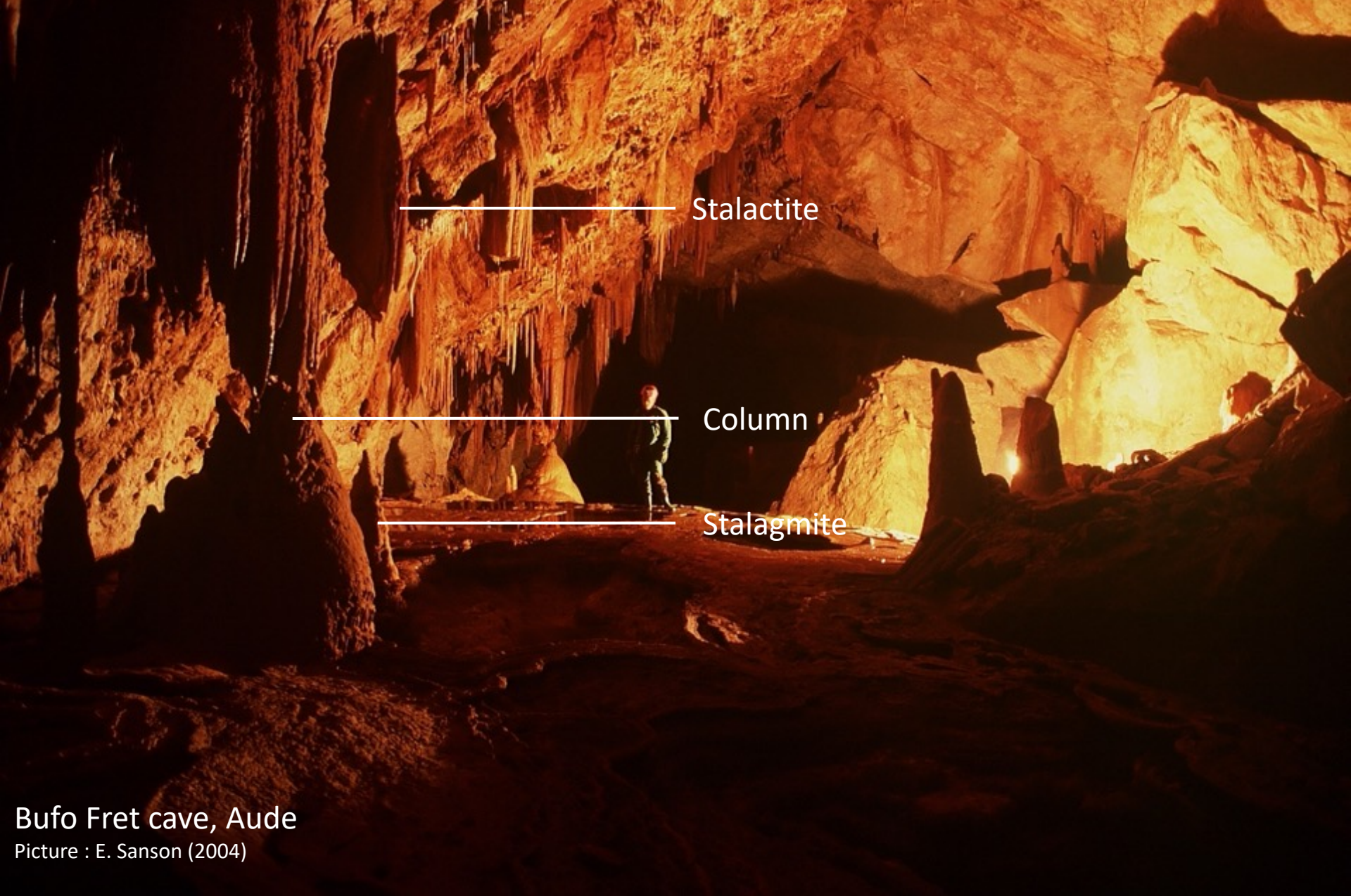
Huge fossil galleries in Sardinia

Picture: E. Sanson (2002)

Fossil galleries



(D'après Bakalowicz et al. , 1999)



Stalactite

Column

Stalagmite

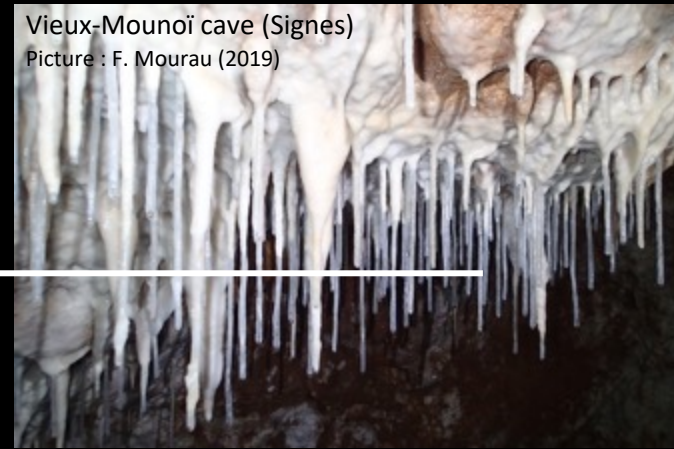
Bufo Fret cave, Aude

Picture : E. Sanson (2004)

In the galleries, we found Concretions or speleothems



Vieux-Mounoï cave (Signes)
Picture : F. Mourau (2019)



Soda straws

Flowstone

Rimstone dams



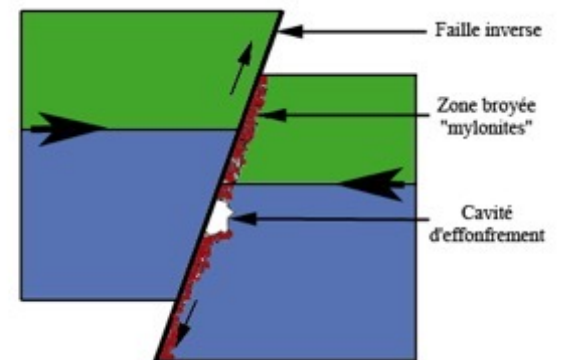
Le Regaï de Néoules

Vieux-Mounoï cave (Signes)
Picture : F. Mourau (2019)

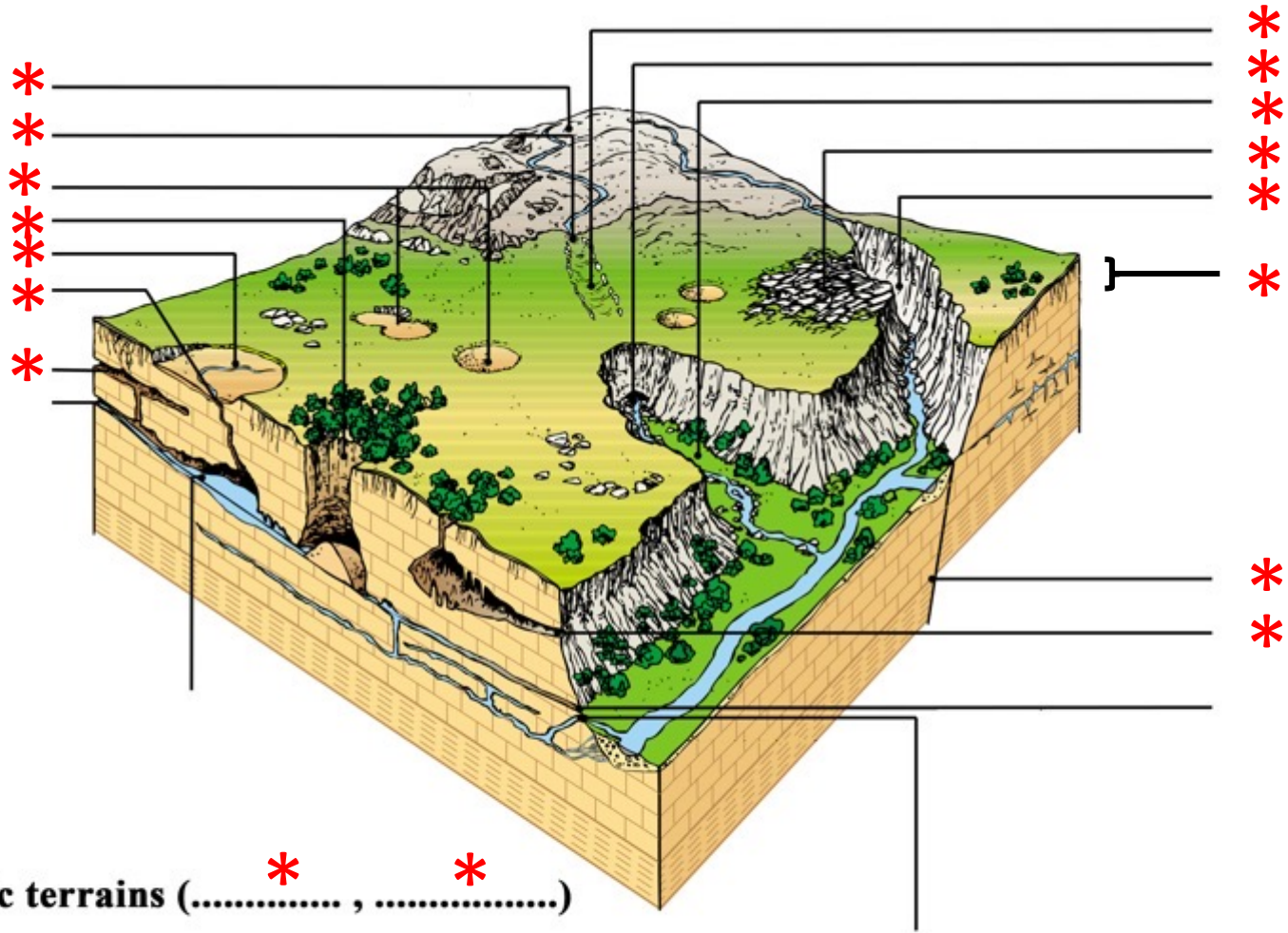
In the galleries, we found Concretions or speleothems


A fault*

Slickenside (miroir de faille)



Fault

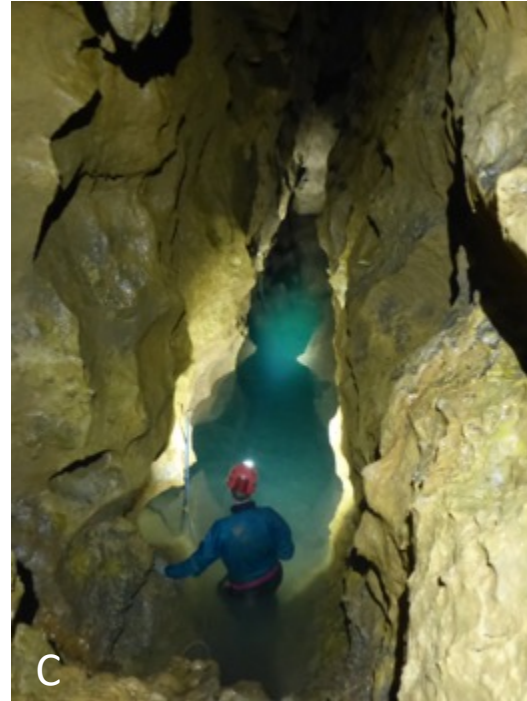


 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)

In the active galleries*,
the water still circulates and digs the rocks.



Pictures : Regai cave (Néoules)
A,B : F. Mourau (2019)
C,D : B. Arfib (2021)



The students of the Pierre de Coubertin middle school have been studying the water in the Néoules cave since 2014!

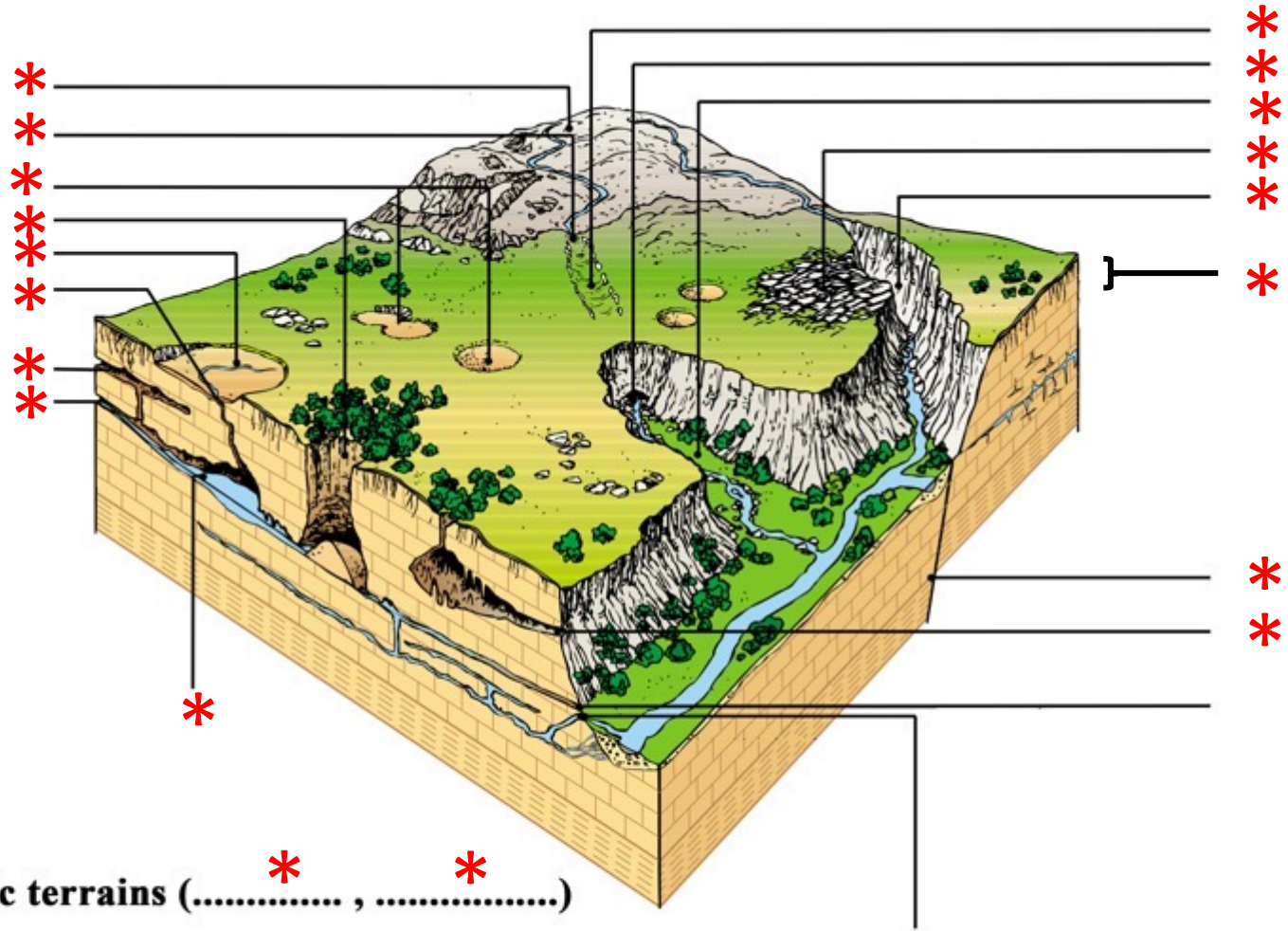
Sensors record
temperature
and water level



Active galleries* : TM71 Underground river*

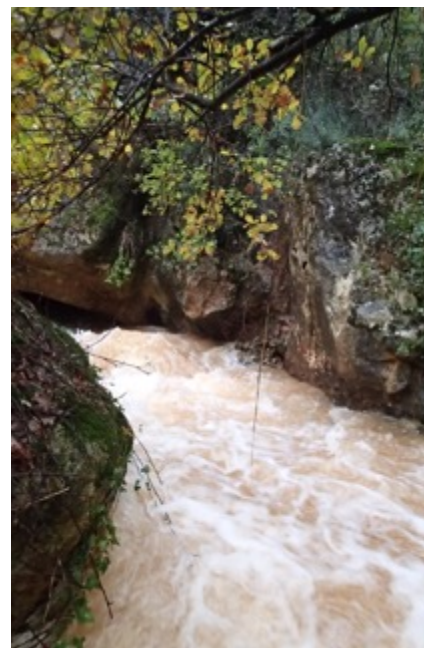


Active galleries, underground river

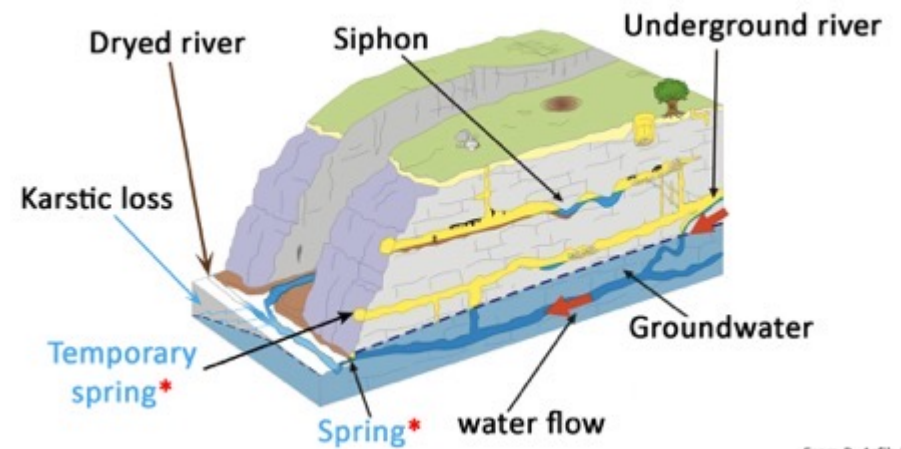


 Non-karstic terrains (..... ,)

 Karstic terrains (.....)



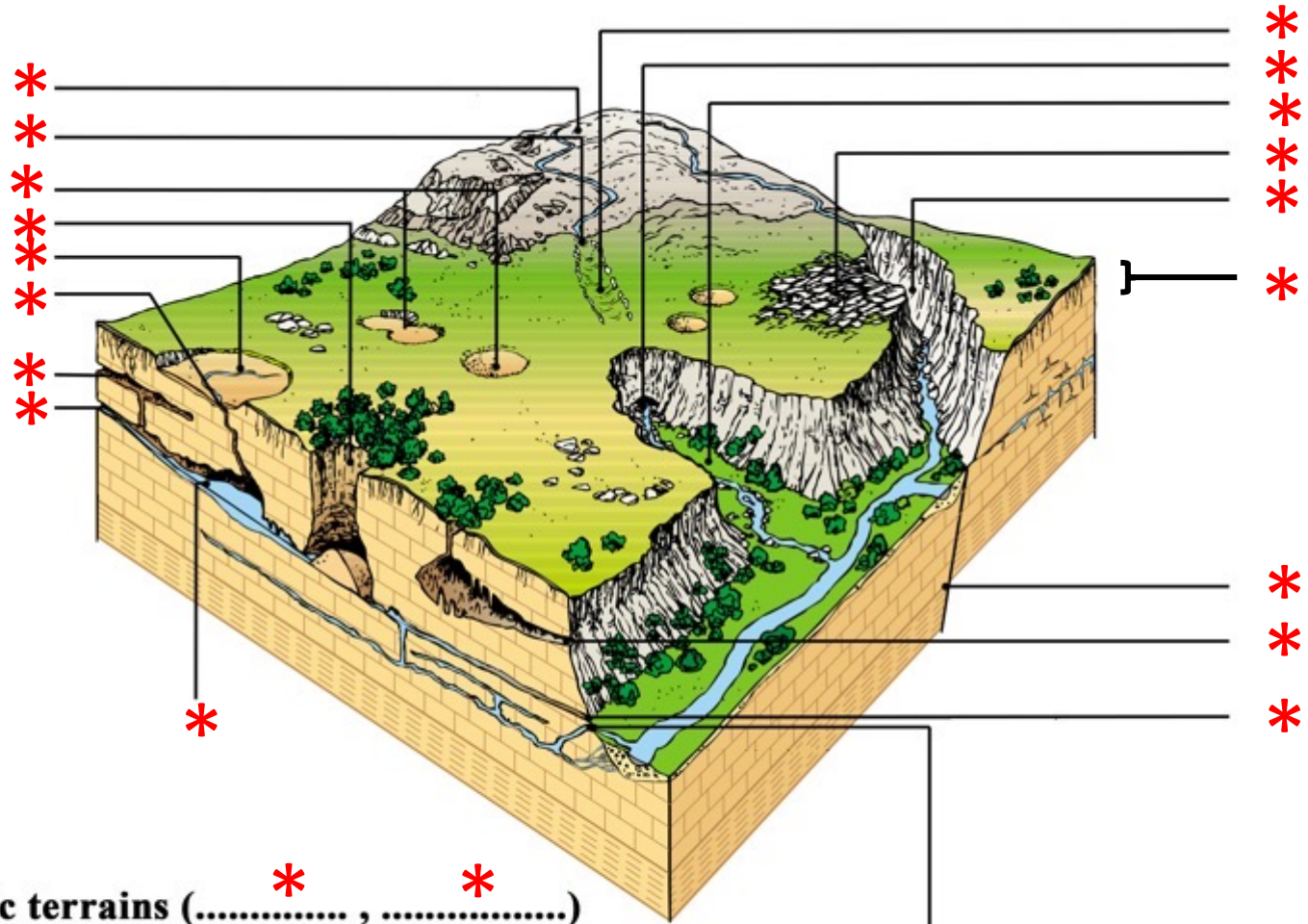
The Regai cave is a
intermittent spring*




From B. Arfib (2017)

The Foux spring in « La Roquebrussane »
Is a permanent spring*

Permanent spring-intermittent spring



 Non-karstic terrains (..... ,)

 Karstic terrains (.....)

(D'après Bakalowicz et al. , 1999)