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RawMaterials  
Connecting matters

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# INTRODUCTION TO THE FIELD-TRIP

## 2nd REEBAUX WORKSHOP (on-line)

### Budapest 2020

# **Eocene bauxites of Gánt and Oligocene bauxites of Óbarok**

**LARGE-SCALE OPEN-CAST BAUXITE MINES OF HUNGARY  
1926 - 2007**

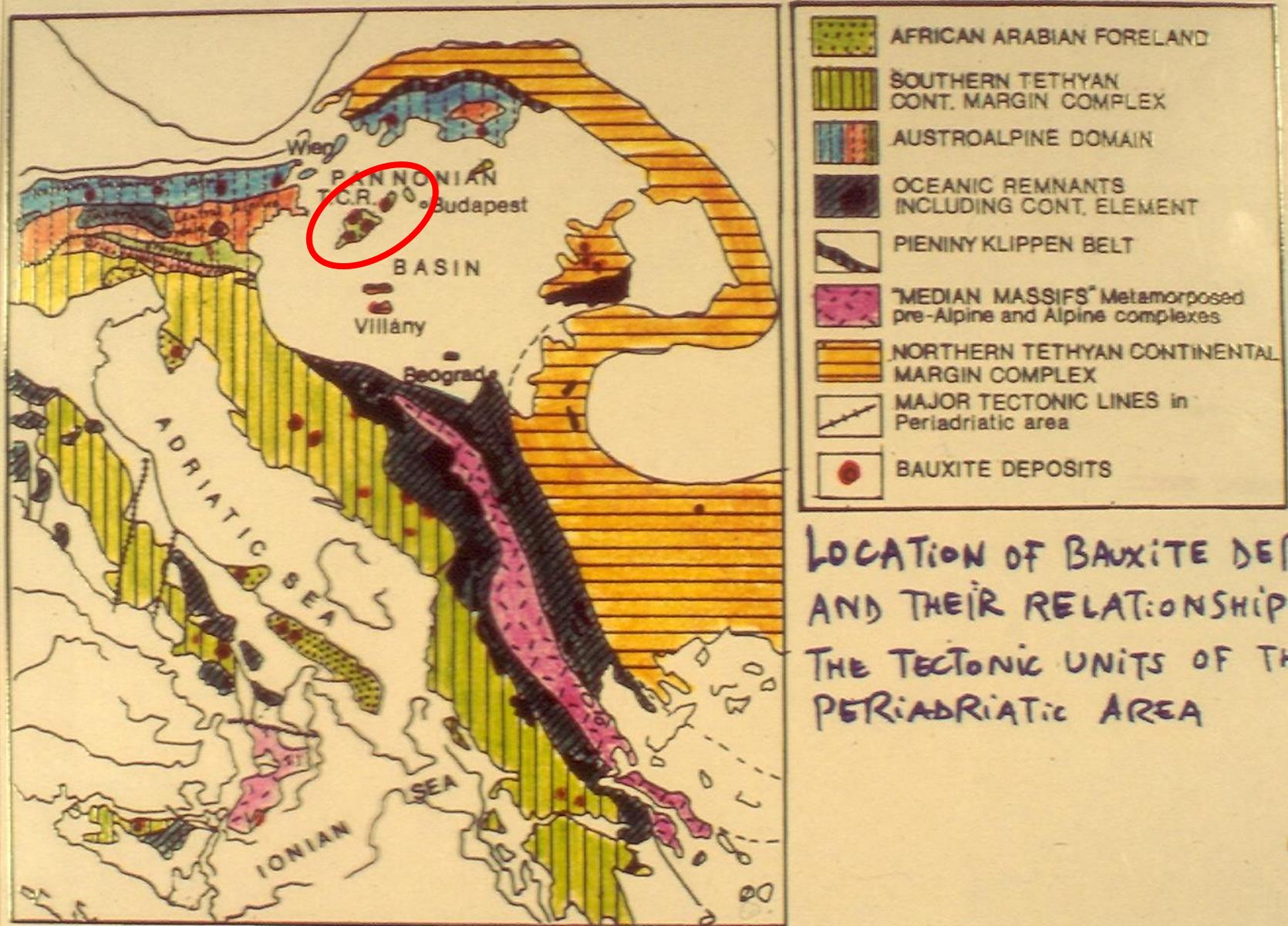
**Geological framework and  
sedimentology)**

# **Gánt**

**The „cradle” of large-scale  
bauxite mining in Hungary**

**BAGOLYHEGY**

# Cretaceous/Tertiary Bauxites of Hungary and the Periadriatic Region



LOCATION OF BAUXITE DEPOSITS  
AND THEIR RELATIONSHIP TO  
THE TECTONIC UNITS OF THE  
PERIADRIATIC AREA

# Schematic reconstruction of the TR and Southern Alps (Héja G., Kövér Sz., Fodor L. 2019)

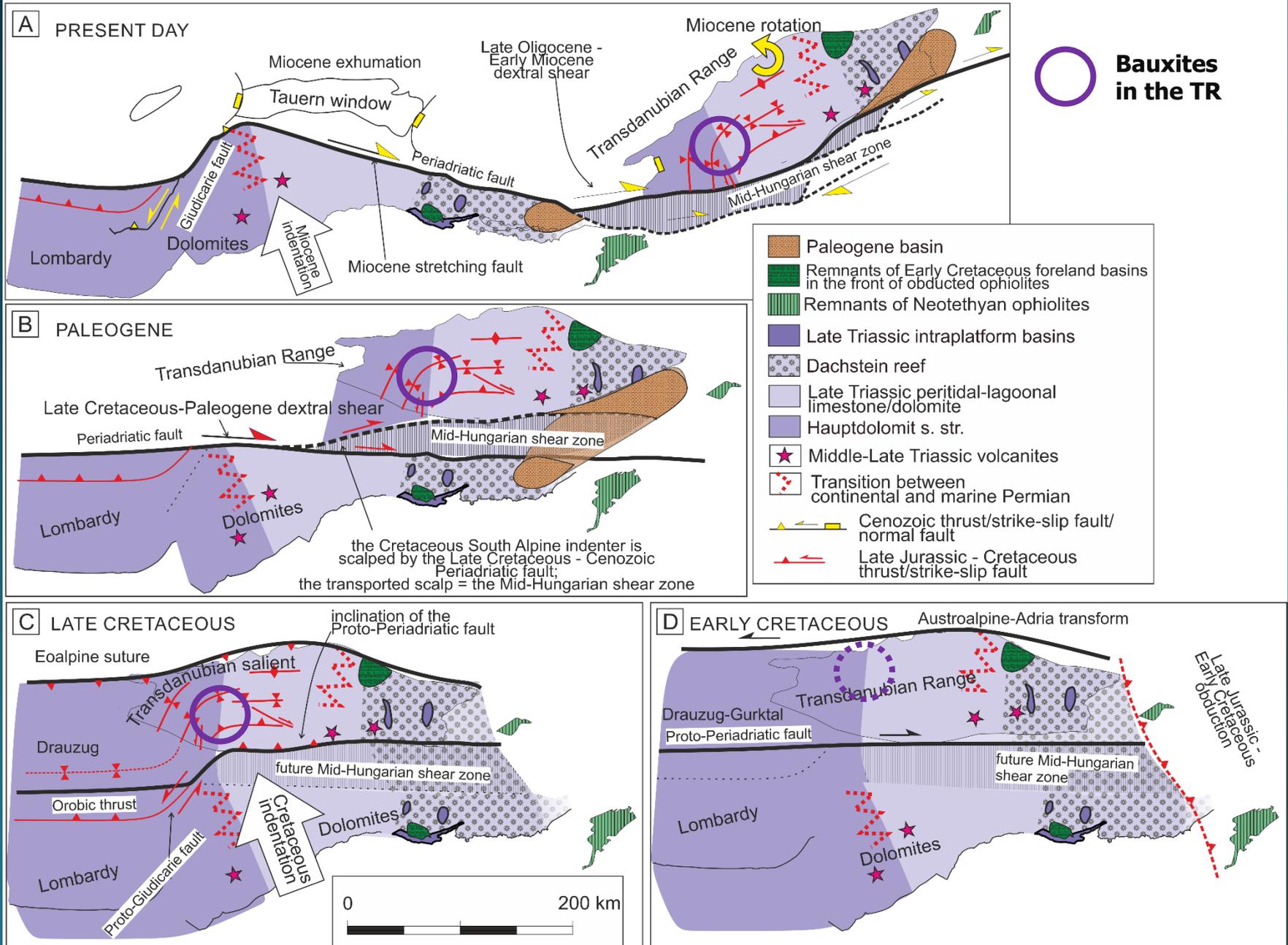
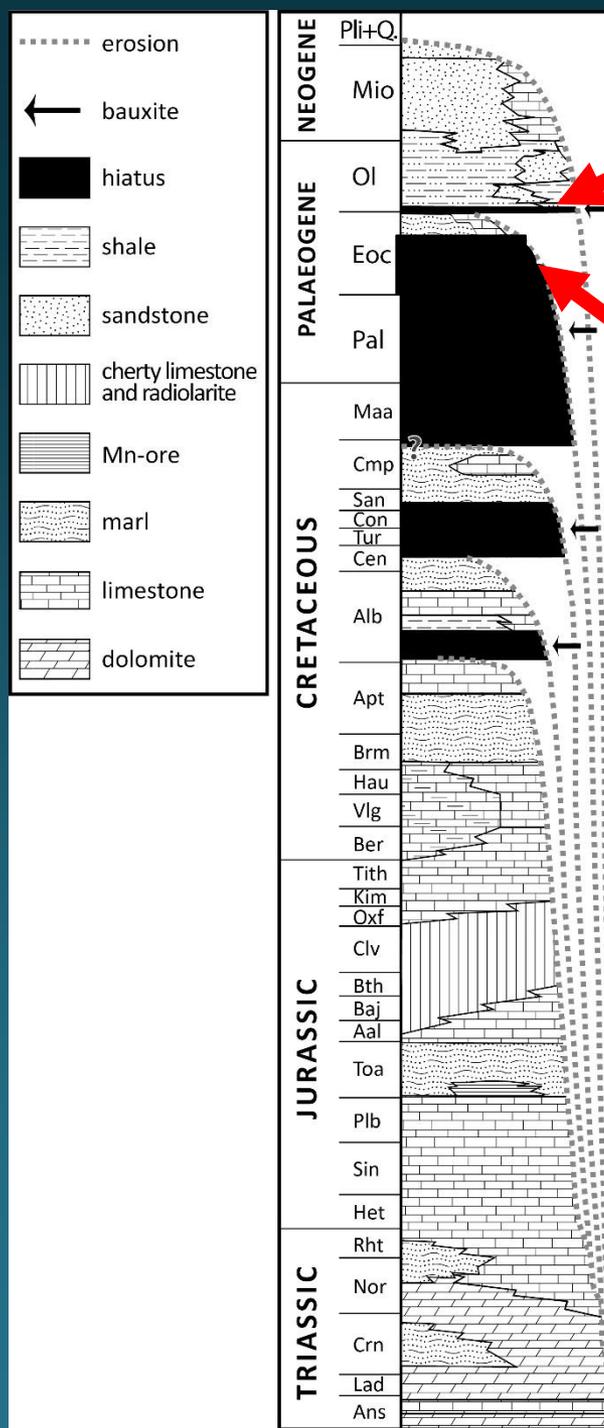


Fig.5: Simplified palinspastic restoration of the Periadriatic fault based on the works of Kázmér and Kovács (1985); Schmidt et al. (1991); Tari (1994); Haas et al. (1995); Fodor et al. (1998); Mandl (2000)

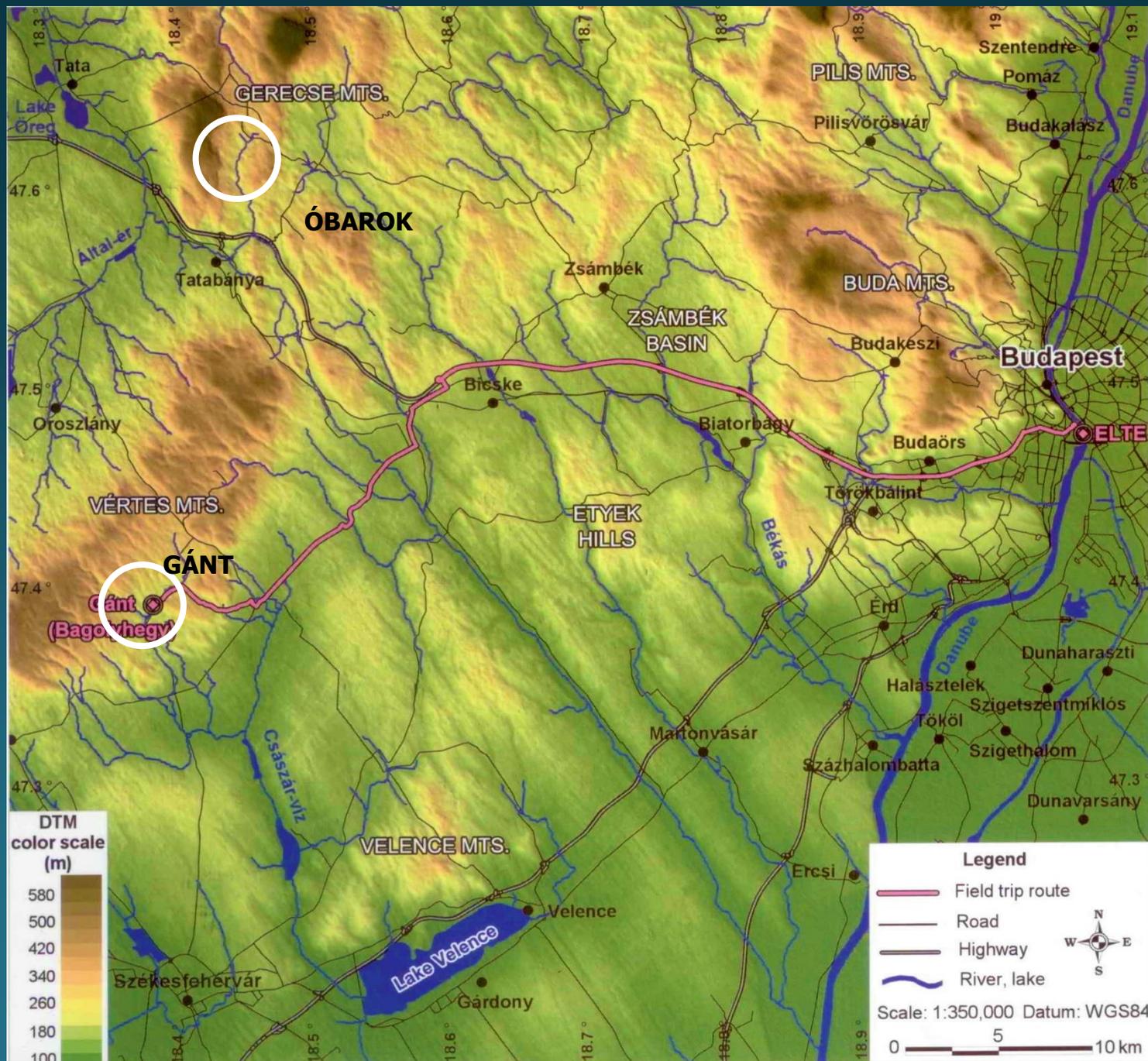
# Stratigraphic position of bauxite deposits in the Transdanubian Range



**Óbarok Oligocén bauxite)**

**Gánt (Eocene bauxite)**





# The Gánt Bauxite Formation (Eocene) exposed by the abandoned Bagolyhegy open-pit

Eocene limestone

coal seams

fresh-water  
limestone and marl

dolomite outcrop

bauxite





bauxitic mudstone

Bauxitic grainstone (=conglomerate)









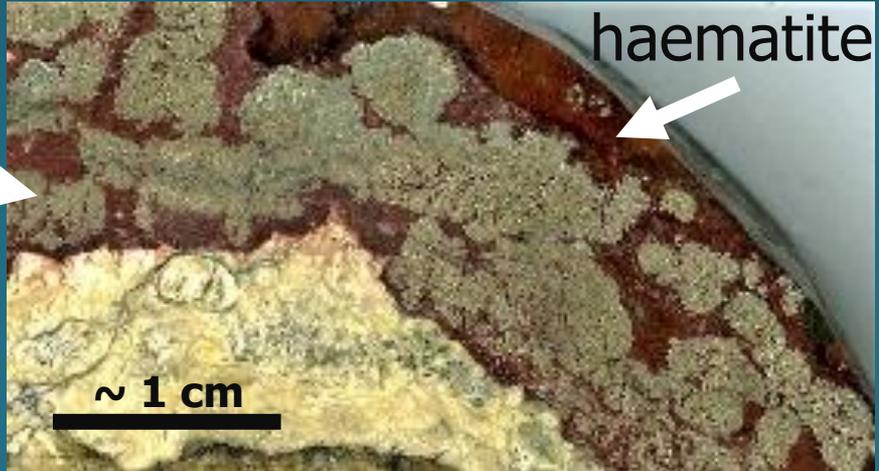
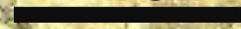
pyrite



haematite



~ 1 cm



## How to get pyrite first, then haematite???

To make **pyrite** we need sulphur and  $\text{Fe}^{2+} \rightarrow$  **reducing conditions!!!** ?? organic matter ?? + saturated pores  
Fe may come from the bauxite when conditions are reducing!

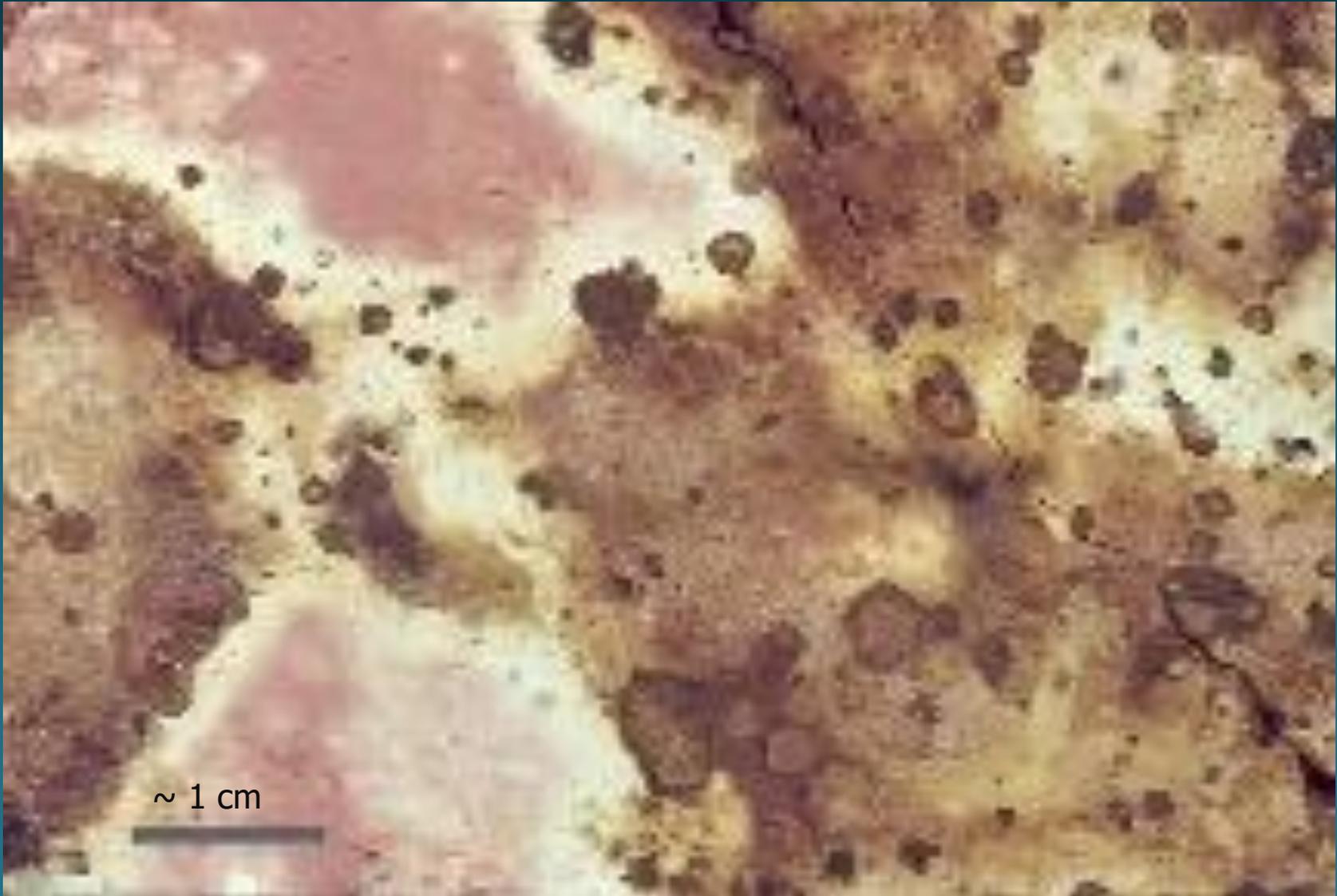
To make **haematite** we need  $\text{Fe}^{3+} \rightarrow$  **oxidizing conditions,** (=unsaturated pores)  
Pyrite will alter to Fe-oxide +  $\text{SO}_4^{2-}$  under oxidizing conditions

**CHANGING REDOX CONDITIONS!!!!**  
**!!!changing hydrology!!!**

pore-water ( $\text{H}_2\text{O}$ ) functions also as the solvent for the chemical reactions

# Redox-changes result in repeated mobilization and reprecipitation of Fe-compounds and therefore also in color-changes of the bauxite

Fe is easily mobilized from porous areas. More lithified, mineralogically already stable textural elements may resist Fe-mobilization!

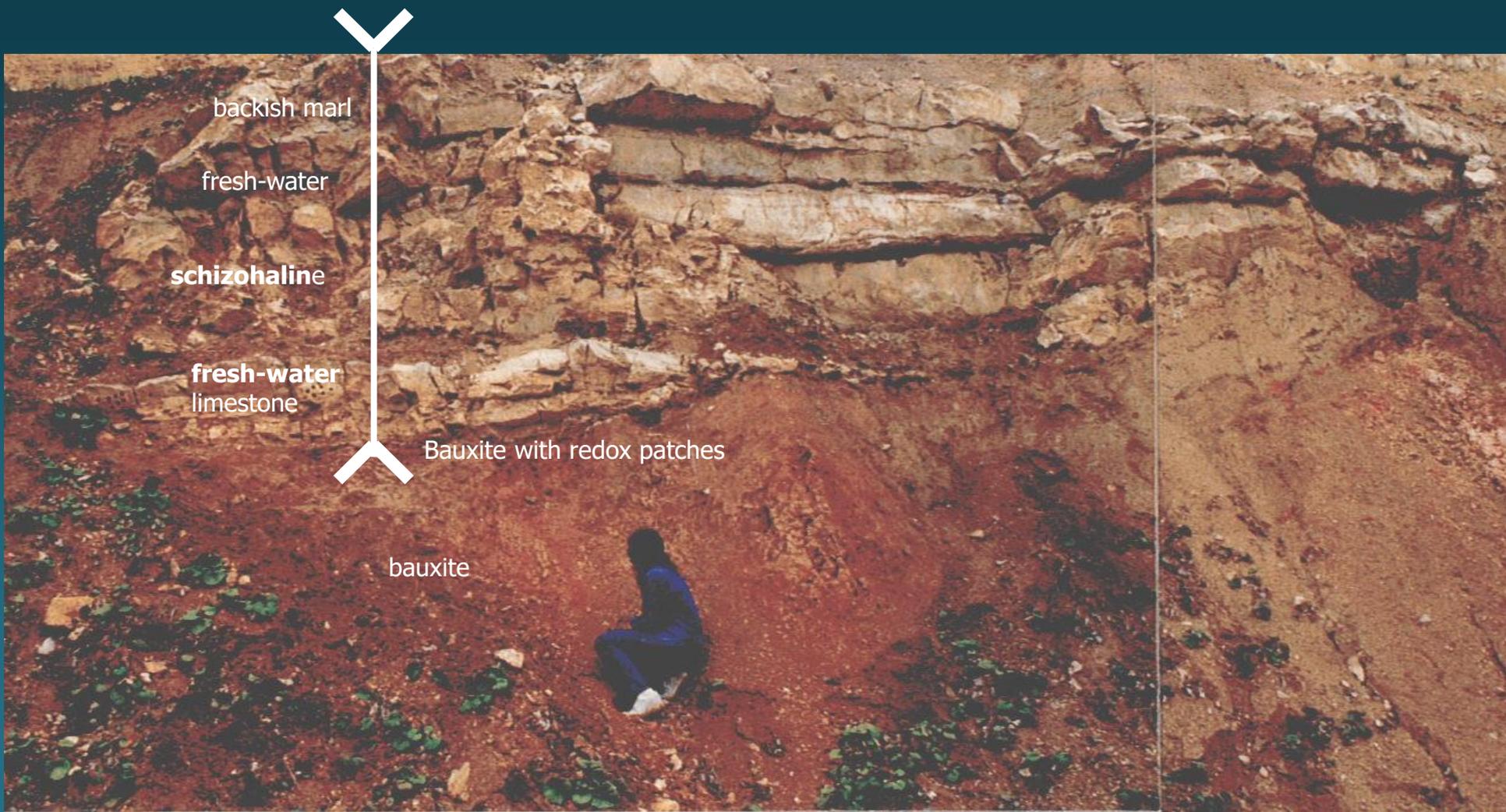


**Let's see how pore-water chemistry  
may change during the deposition  
of the cover-beds!!!**

**Bauxitization** needs **vadose** (oxidizing) **conditions**  
(unsaturated pore spaces)

**Transgression would raise the water-table,**  
The bauxite will be soaked (saturated)  
first by freshwater,  
then by brackish and  
finally by marine water

# The cover-sequence of GÁNT, BAGOLYHEGY-North



backish marl

fresh-water

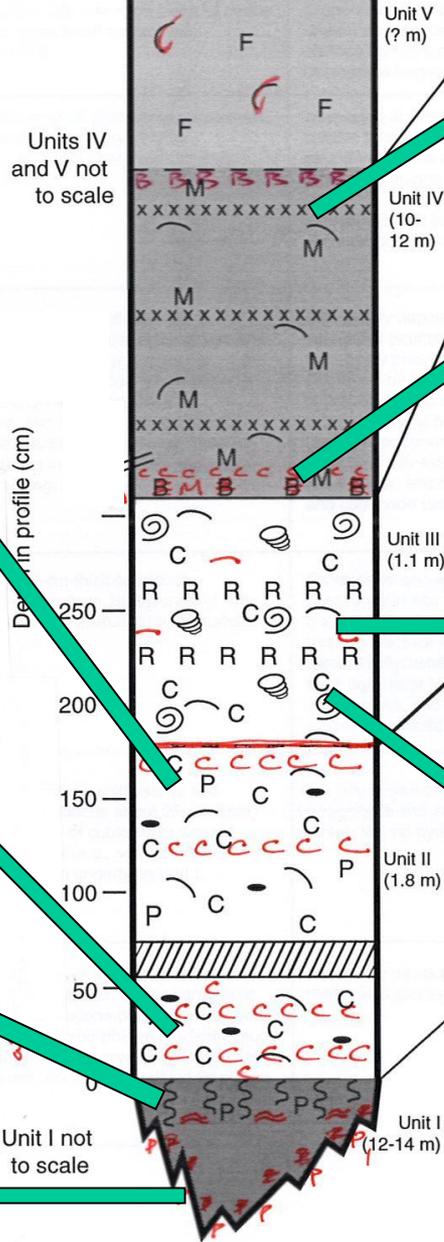
**schizohaline**

fresh-water  
limestone

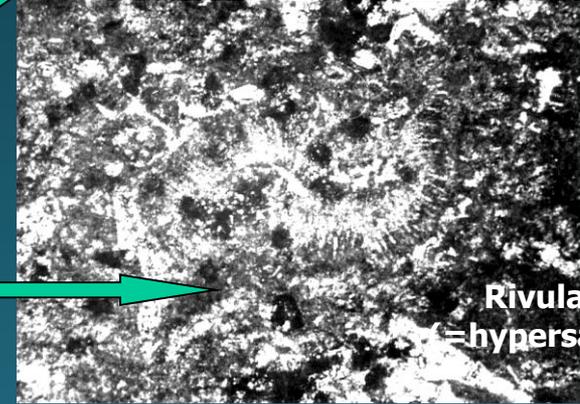
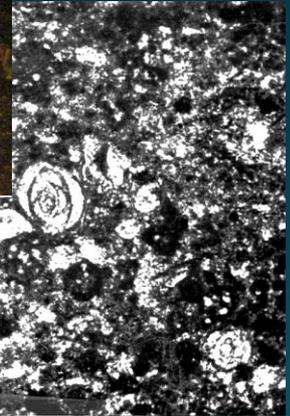
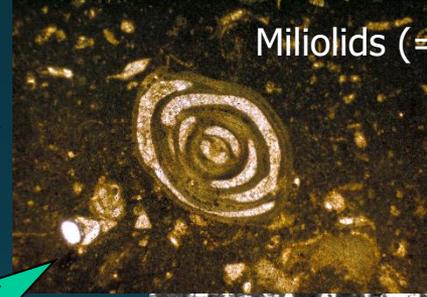
Bauxite with redox patches

bauxite

# GÁNT - BAGOLYHEGY



Miliolids (=restricted marine!)



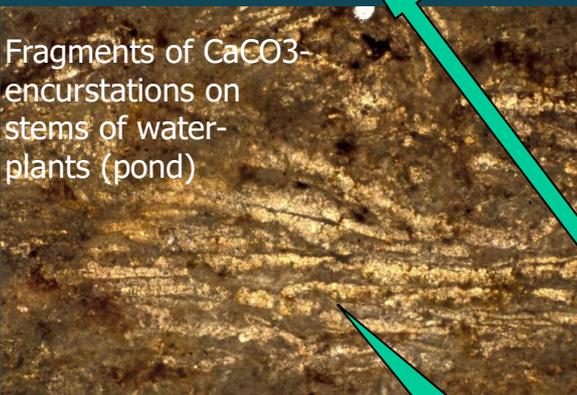
Rivularia  
(=hypersalinity)



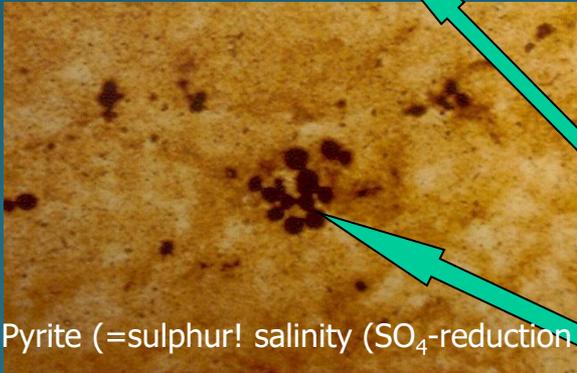
Characeans + Gastropods  
(=freshwater)



Characeans = freshwater pond!



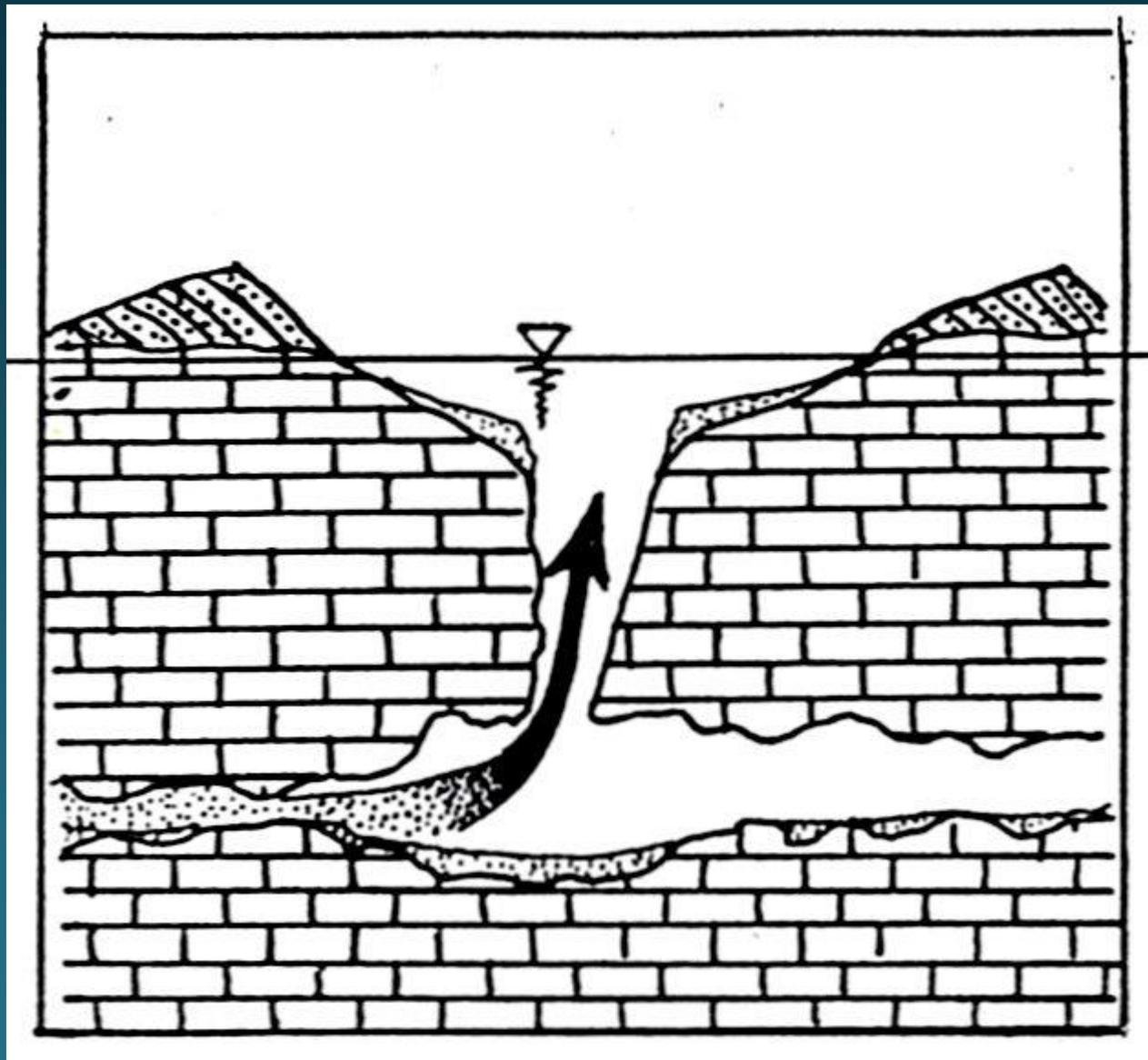
Fragments of CaCO<sub>3</sub> encrustations on stems of water-plants (pond)



Pyrite (=sulphur! salinity (SO<sub>4</sub><sup>-</sup>-reduction)

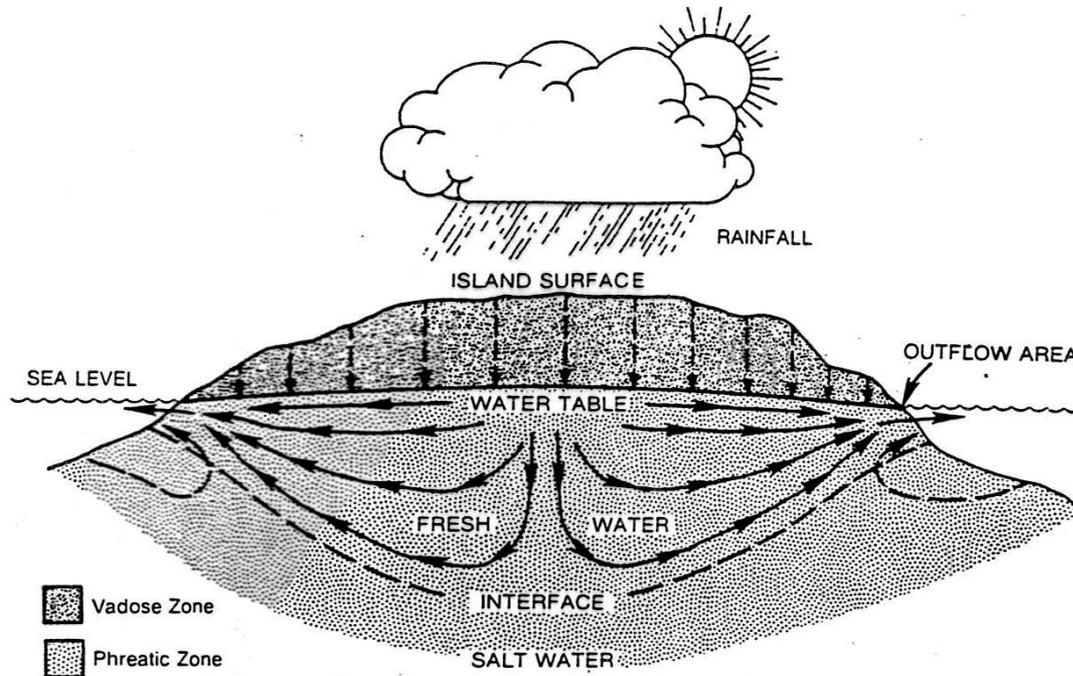


Unit I not to scale



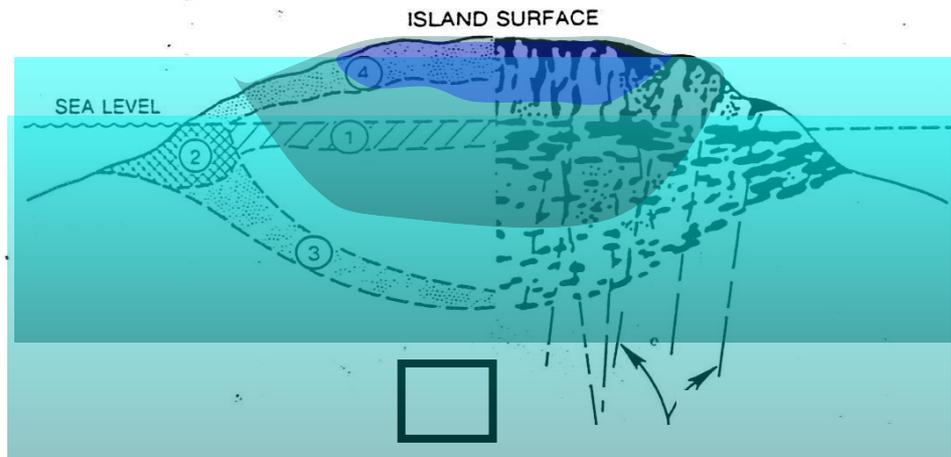
# Ghyben-Herzberg's island-hydrological model

(Hubbert 1940, Thraikill 1968, Fetter 1974, Craig 1988 szerint)



A

A: groundwater flow-paths



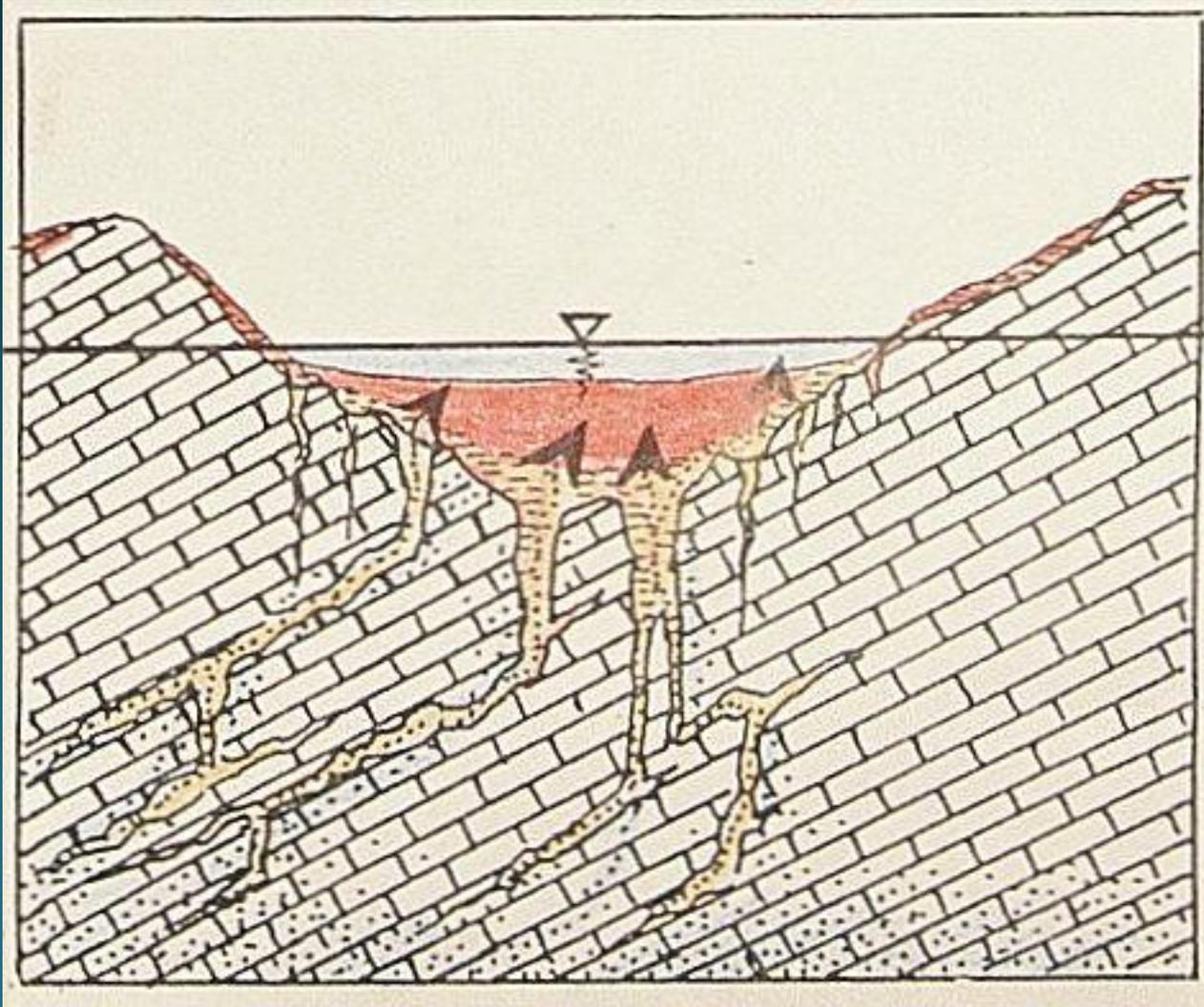
B

B: zones of intense dissolution



# „The Eocene blue-hole“ of Gánt

## Redox-changes and the story of the formation of the pyritic crust



When the bauxite is thoroughly soaked by water, fine plant detritus (=organic matter) begins to decay & consumes oxygen. The porewater becomes reducing and  $\text{Fe}^{3+}$  is converted into  $\text{Fe}^{2+}$ . It may be mobilized from the not yet full mineralized textural elements.

When the water is saline (eg. brackish) and when there is still some available OM, microbial sulphate reduction would start sulphate ions become converted into sulphide and **pyrite ( $\text{FeS}_2$ )** would form!

Sulphide precipitation is most probable at the bottom of the bauxite-filled dolina, where OM was likely to accumulate.

# The Eocene transgression sequence covering the Gánt bauxite



**limestone (marine)**

**calcareous marls  
(restricted marine))**

**freshwater marls with  
coal-seams**

**bauxite (subaerial)**

# Tectonics

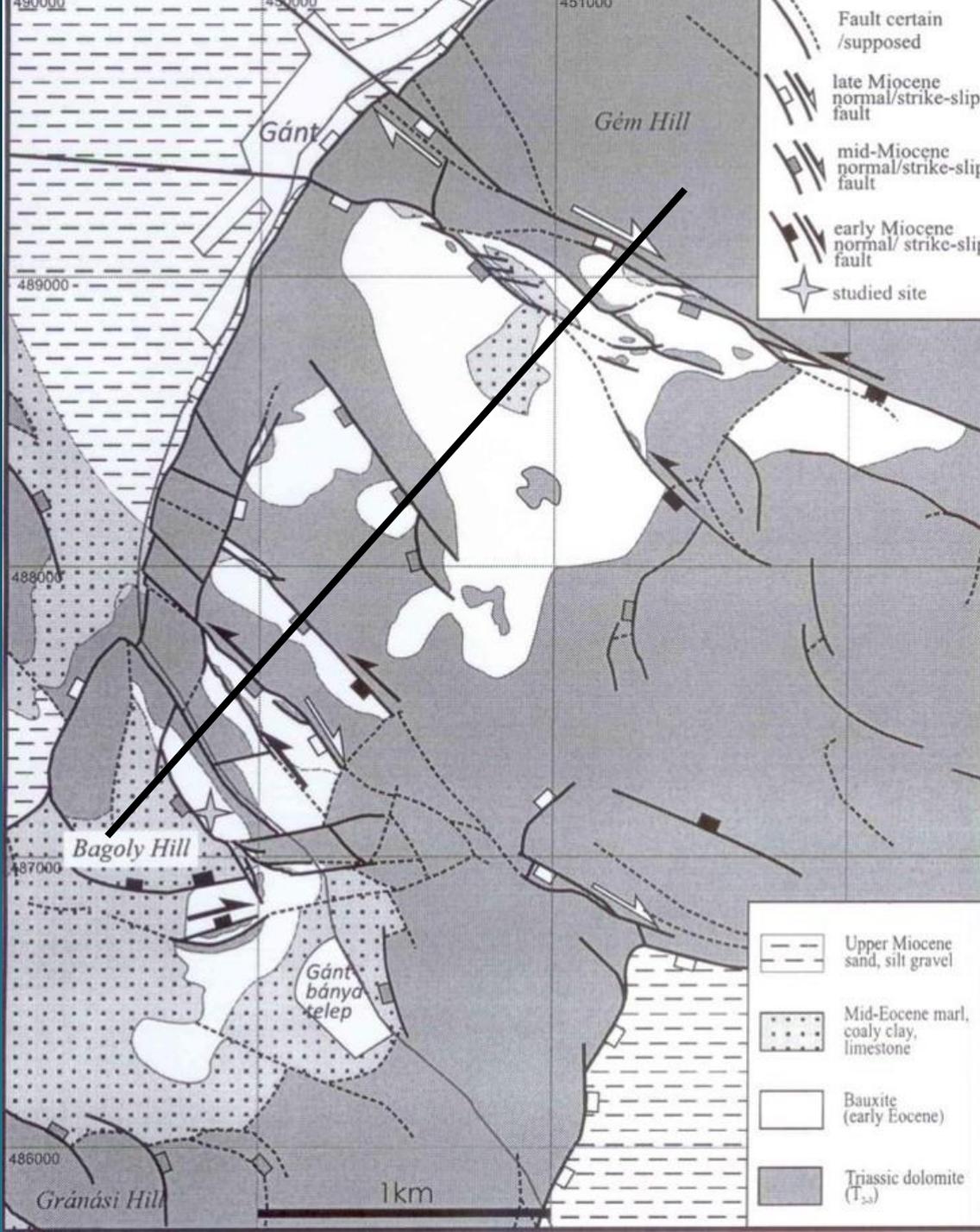
synsedimentary  
faults rejuvenated  
in post-Eocene times

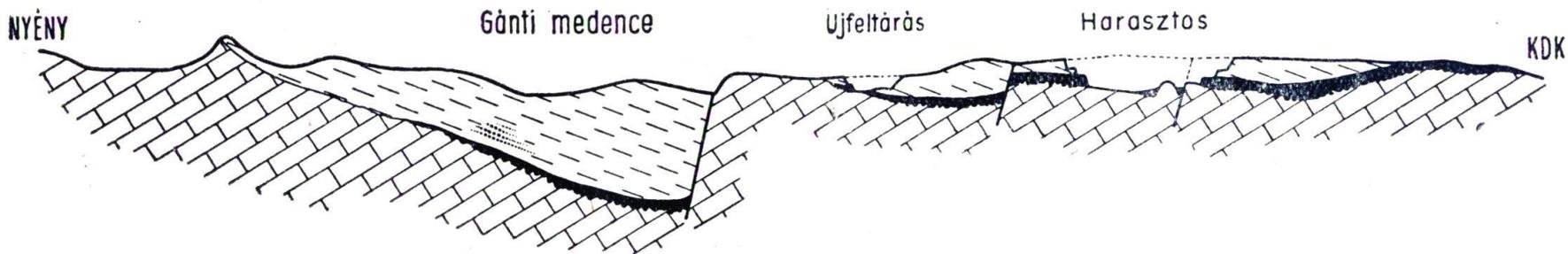
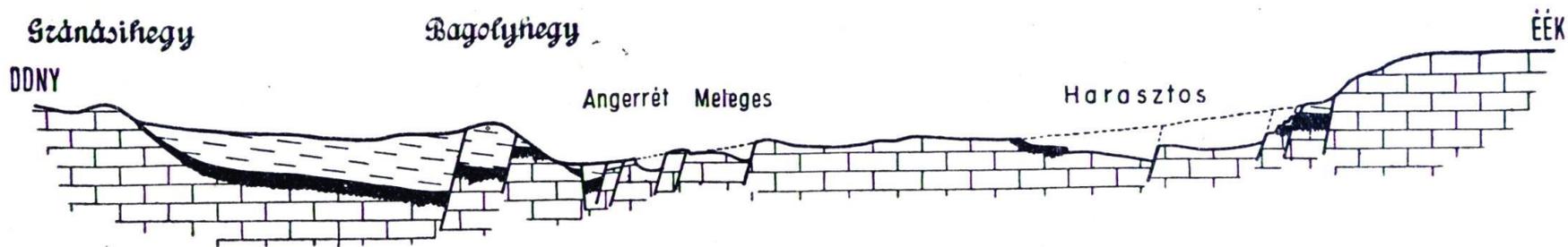




# Geological map of Gánt and its surroundings

Fodor L. (2002, 2020)





— Eocén

▨ Kőszén nyomok

■ Bauxit

▤ Triász dolomit

A wide-angle photograph of a large-scale earthmoving or mining operation. The site is characterized by deep, terraced pits of reddish-brown soil. In the center, a large, irregularly shaped pond with greenish water sits within one of the terraces. The background shows a steep, forested hillside under a cloudy sky. The foreground is filled with lush green plants and weeds. The overall scene is one of industrial activity in a natural setting.

*Enjoy the field-trip!*

8.

### VETŐFAL

A vetők a bauxitot és a fedő eocén rétegsort is elmozdították. A déli vetőfalat a bányászt kibontotta, az északi vető helyét a bauxitból kibúvó dolomitbörök eltűnése mutatja.

