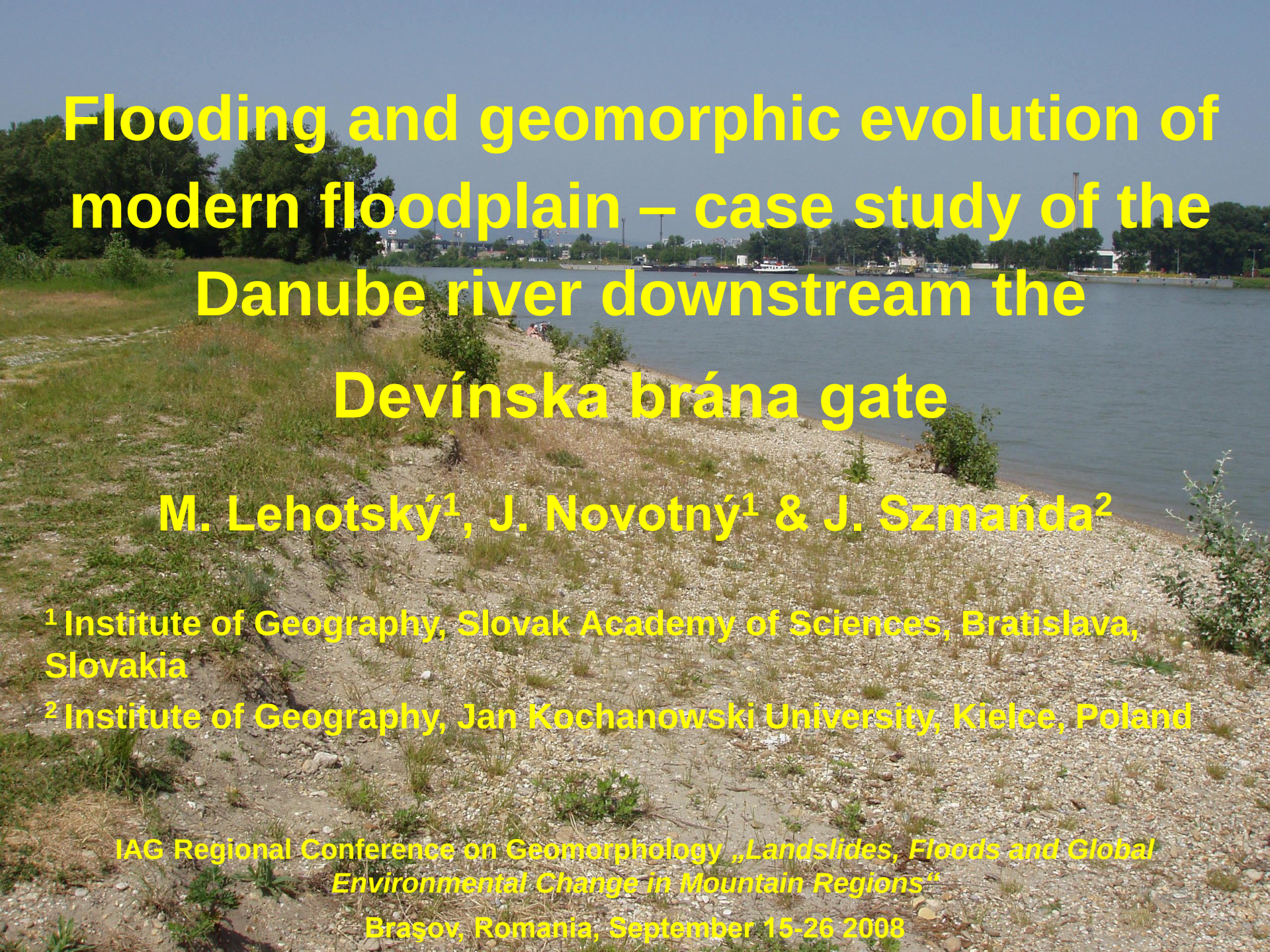

Flooding and geomorphic evolution of modern floodplain – case study of the Danube river downstream the Devínska brána gate

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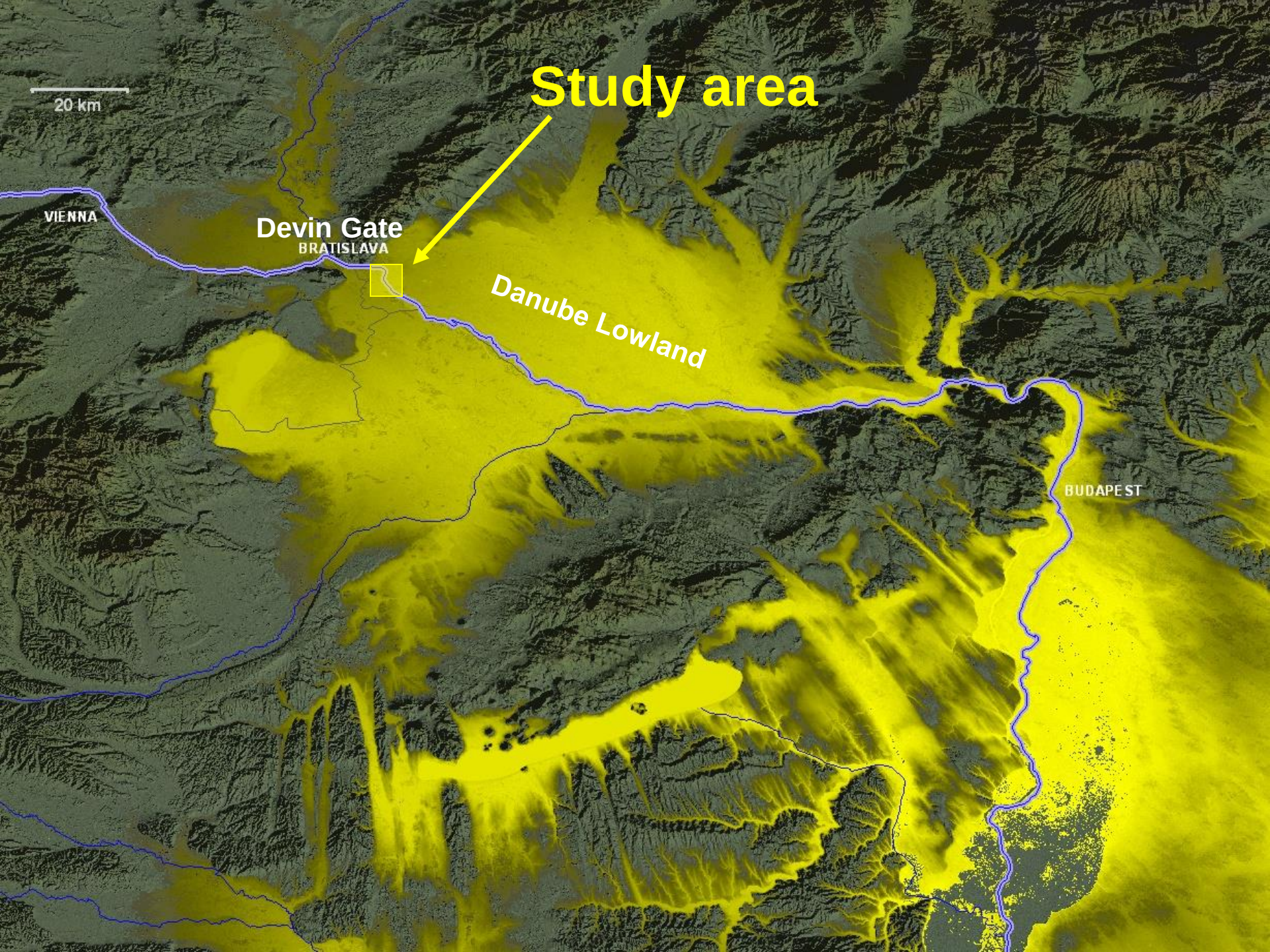
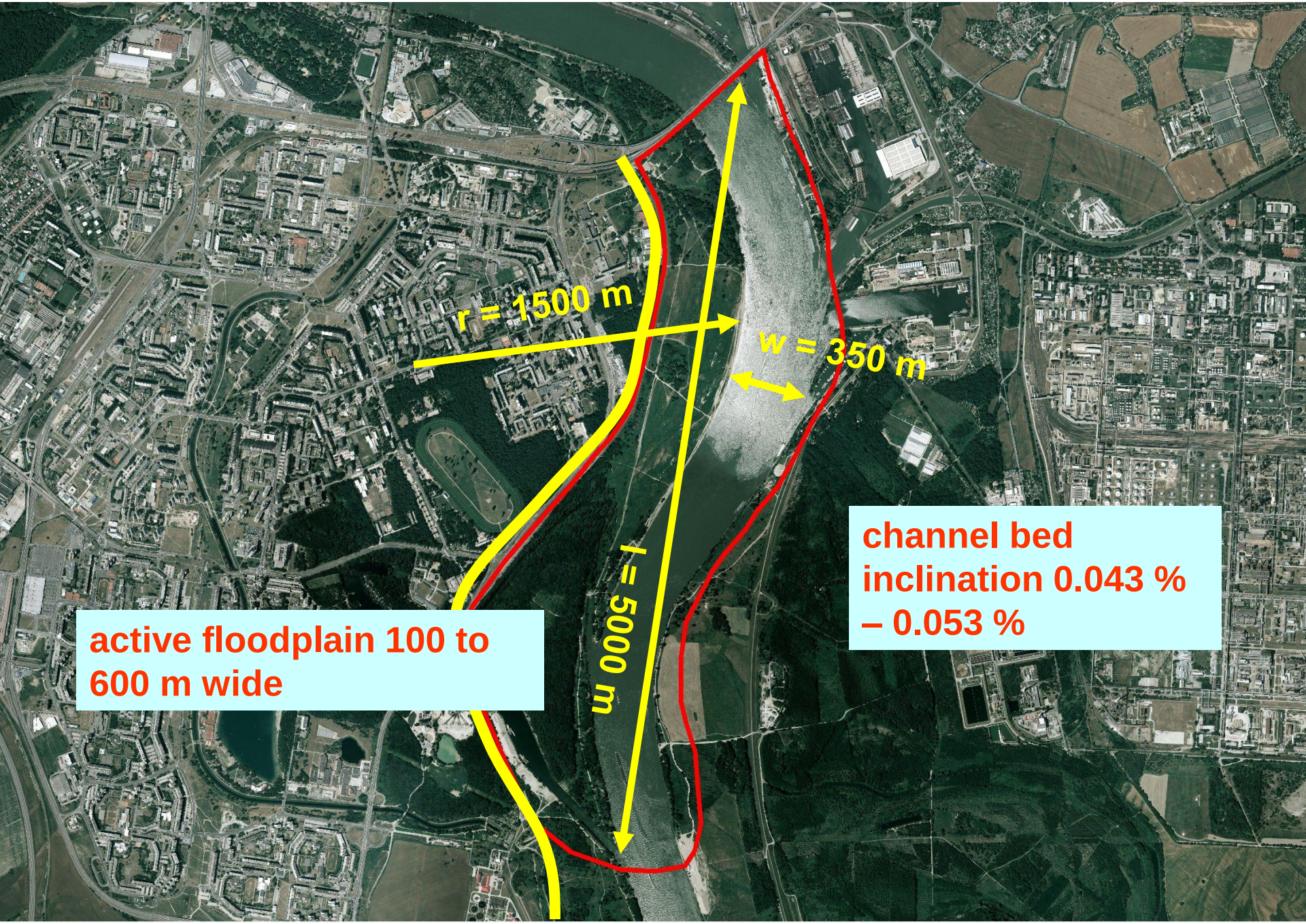
IAG Regional Conference on Geomorphology *„Landslides, Floods and Global Environmental Change in Mountain Regions“*

Braşov, Romania, September 15-26 2008


Study area
20 km
VIENNA
Devin Gate
BRATISLAVA
Danube Lowland
BUDAPEST

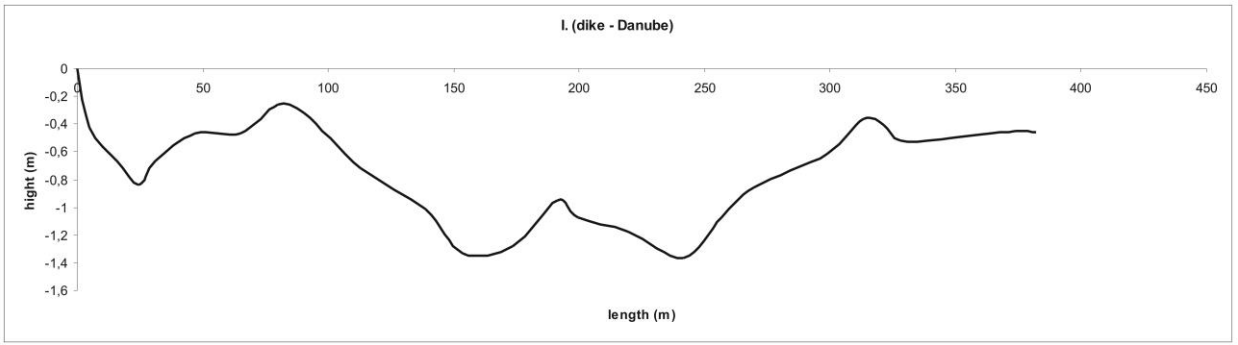

r = 1500 m
w = 350 m
l = 5000 m
active floodplain 100 to 600 m wide
channel bed inclination 0.043 % – 0.053 %

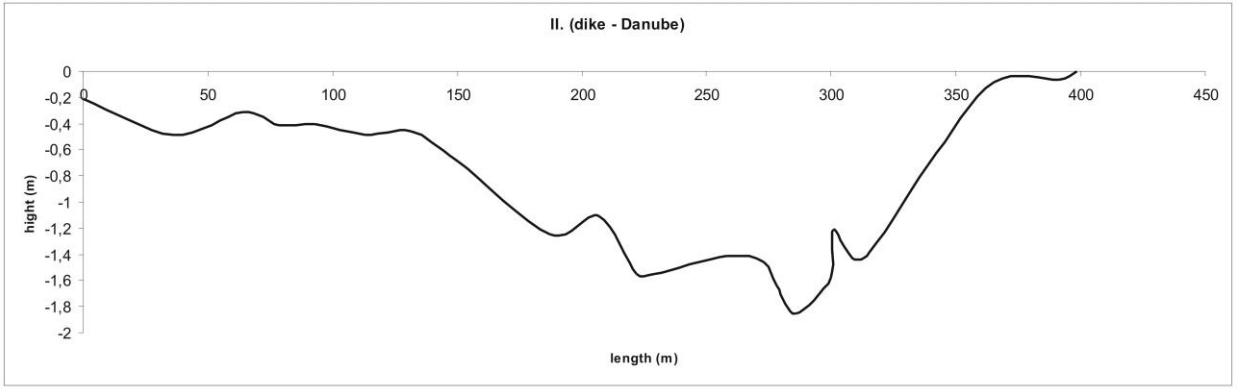
objectives

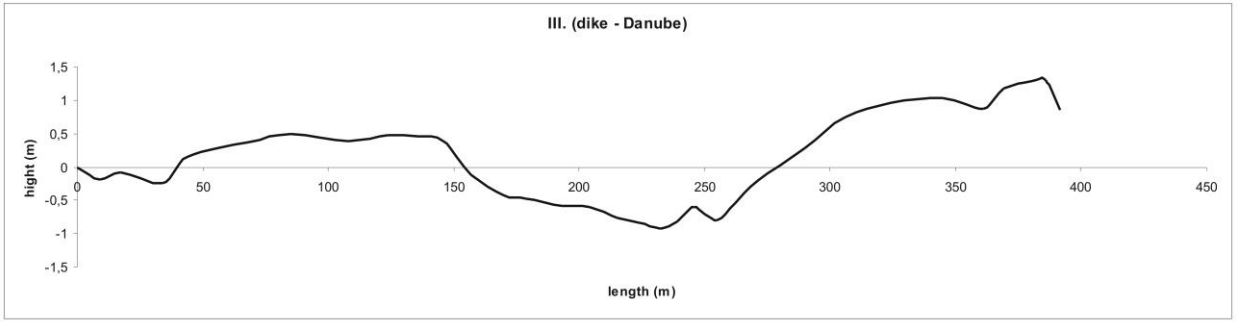
- **floodplain geodiversity and modern landform changes**
- **vertical accretion and depositional conditions during flooding**
- **period – from 1949**
- **flood protective embankment constructed at the beginning of the 1950s**
- **inundation space in urbanized area**
- **Gabčíkovo waterworks downstream**

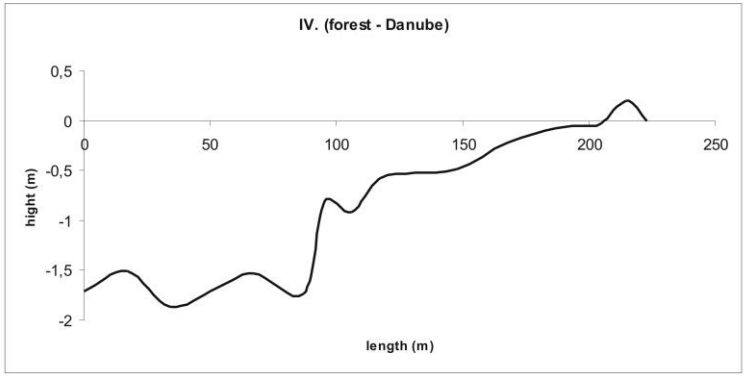
Methods

profile levelling









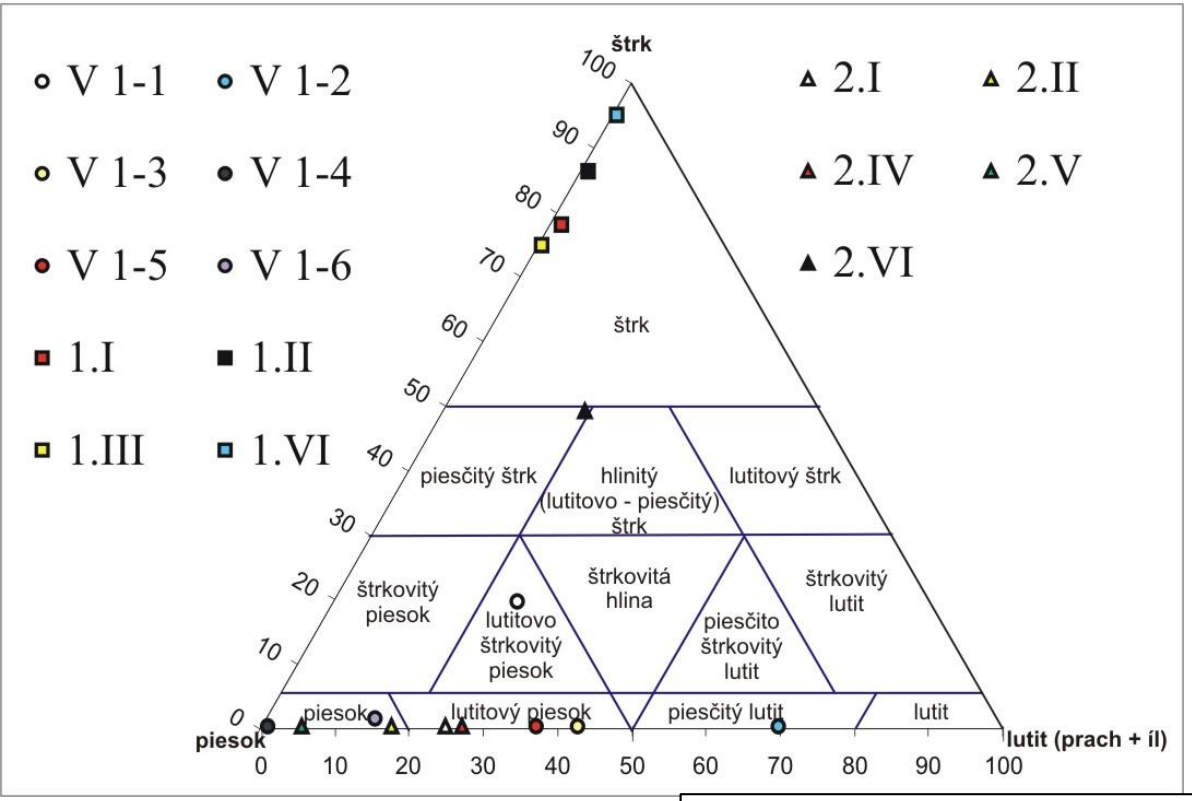
GPS - position

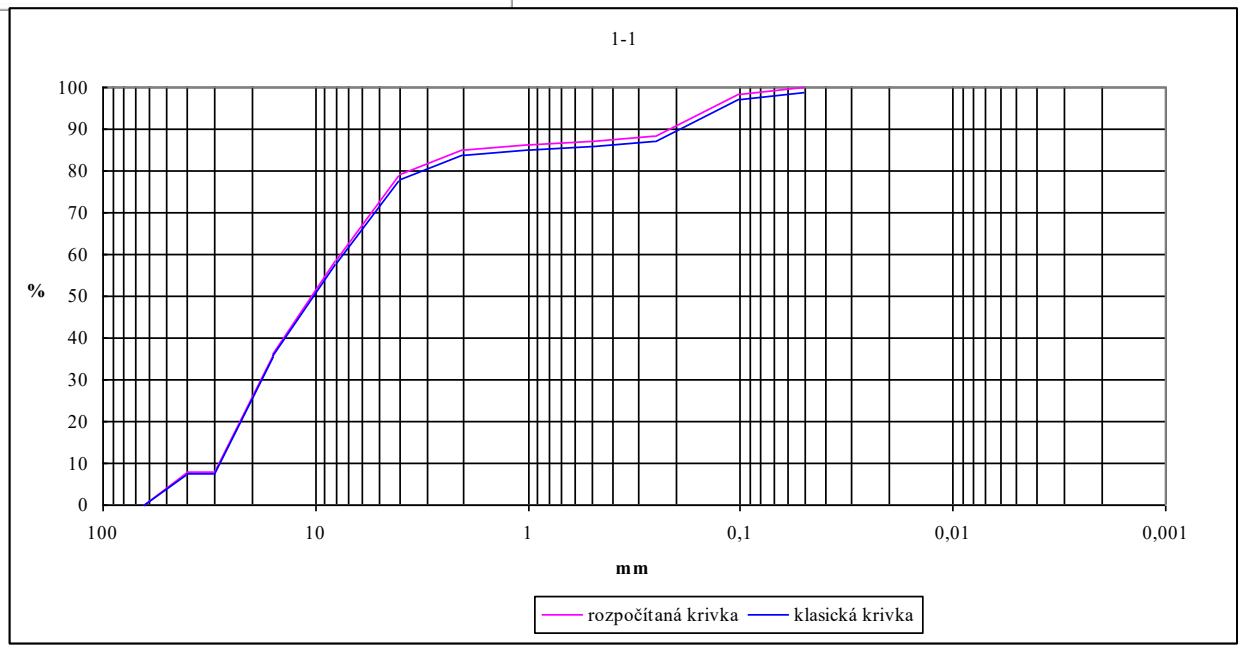

pit exposures

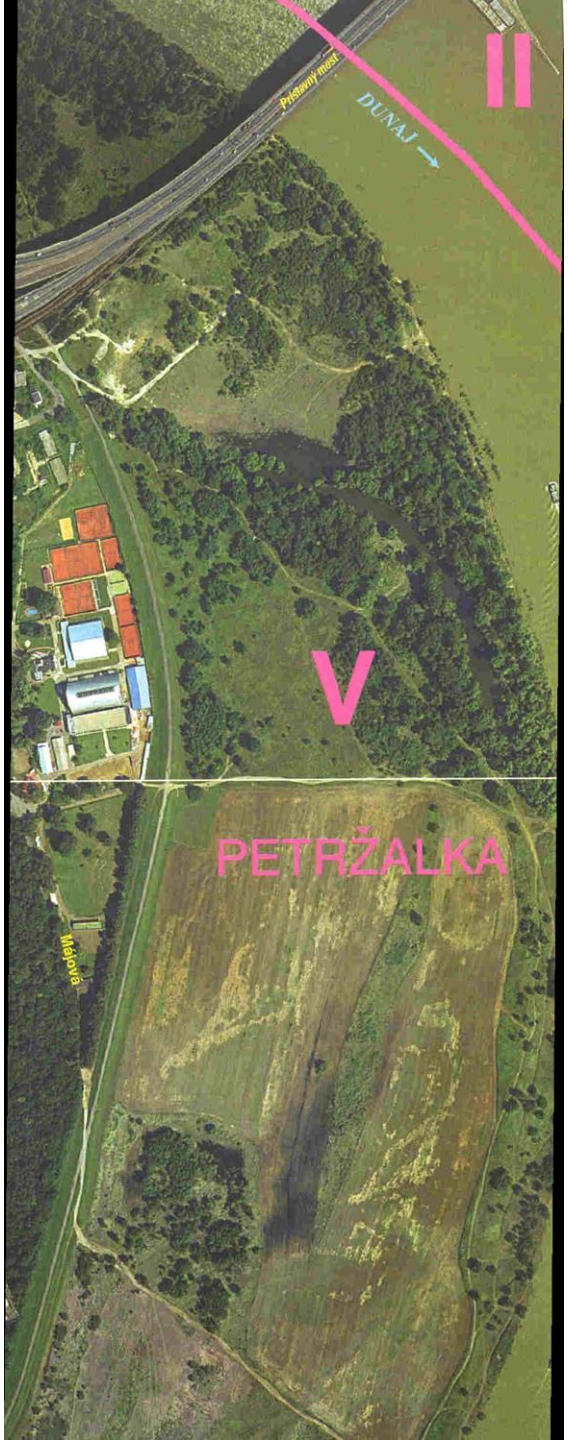

borings


sampling

grain size analyses

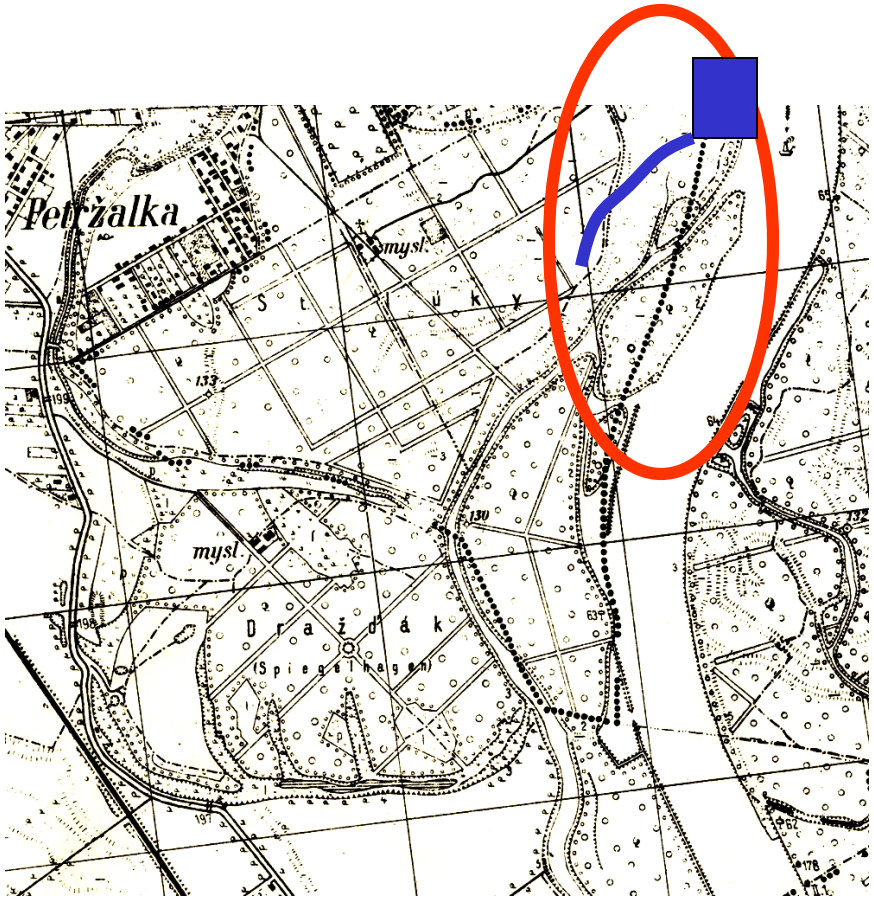




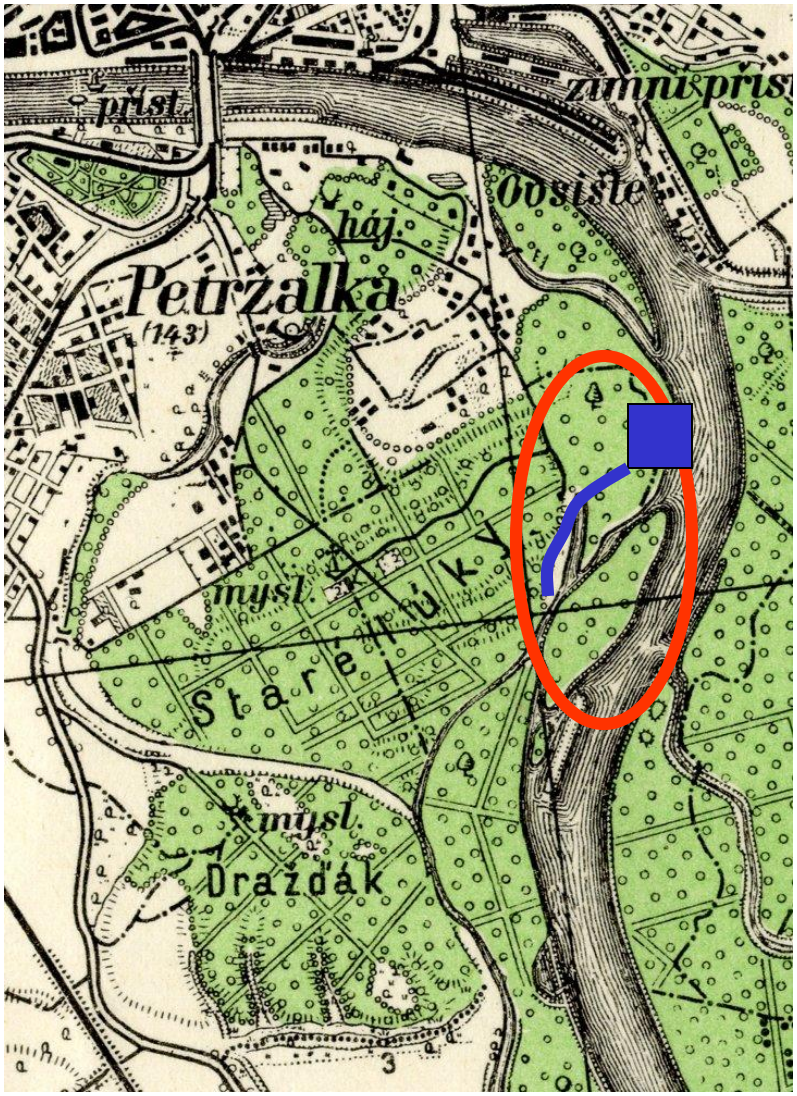


aerial photos and orthophotomaps (1949, 1969, 1985, 1997, 2004)

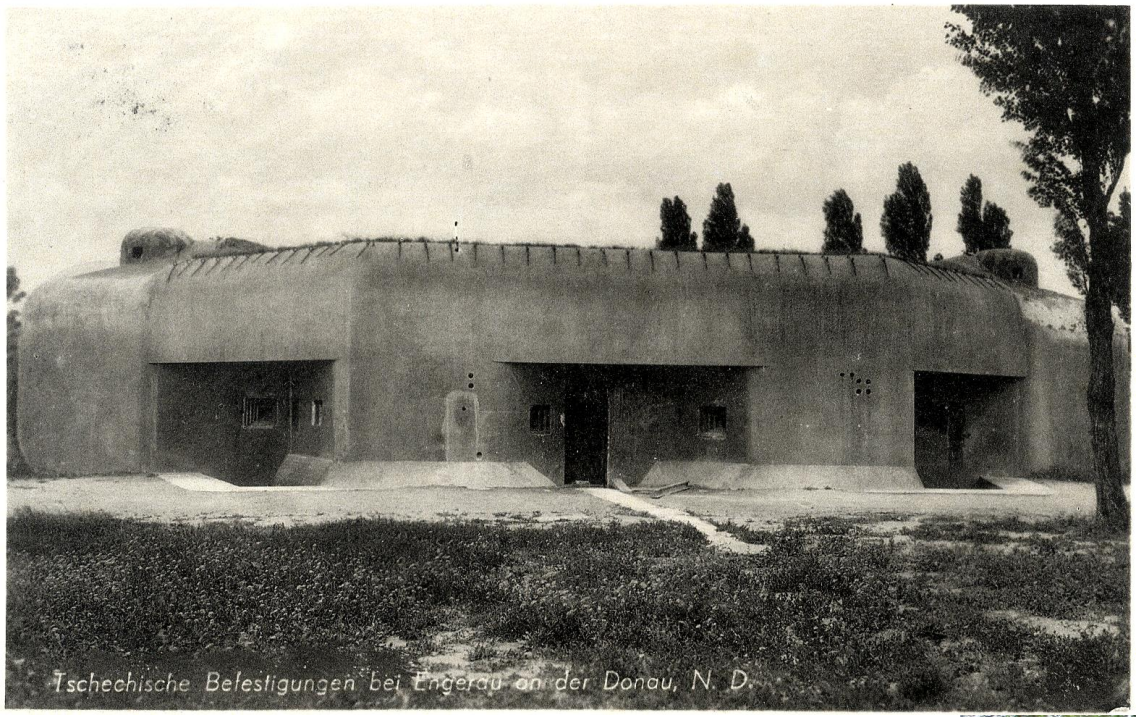
1929



1947



historical maps



military bunker - 1937

historical artefacts

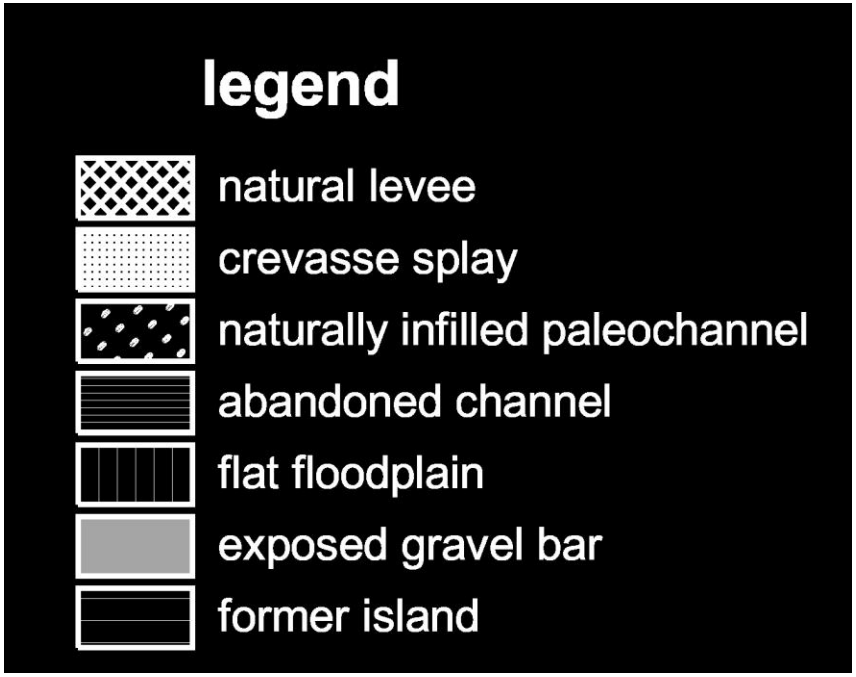
dendrochronology

geodiversity

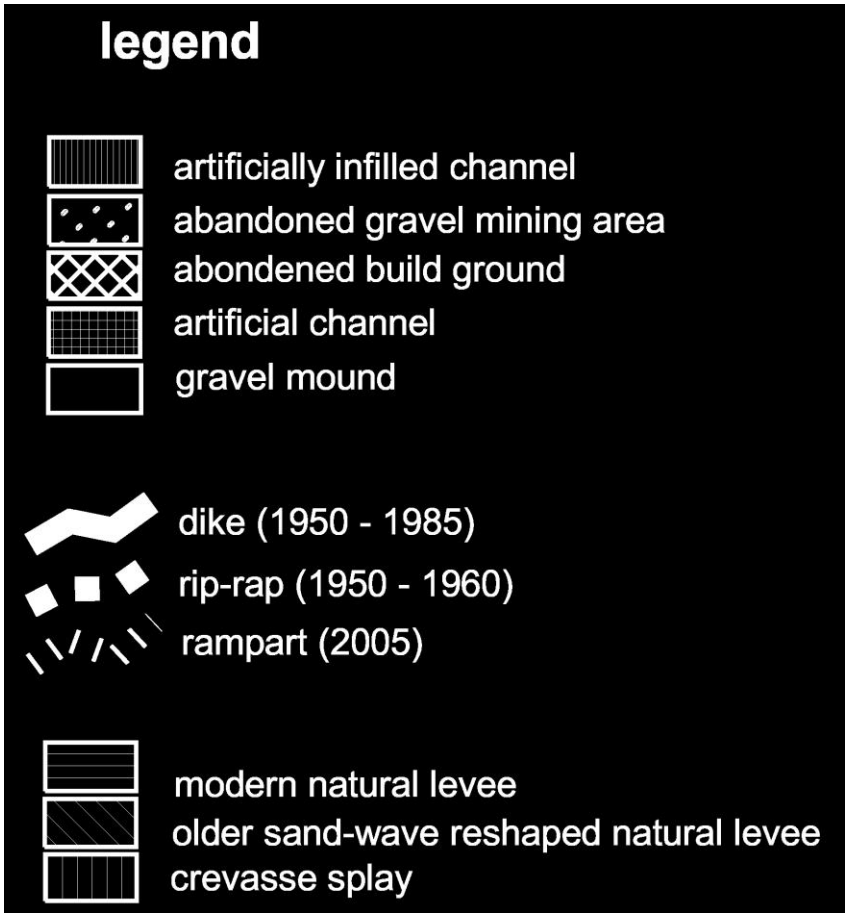
- **floodplain landform units – geology and morphology**

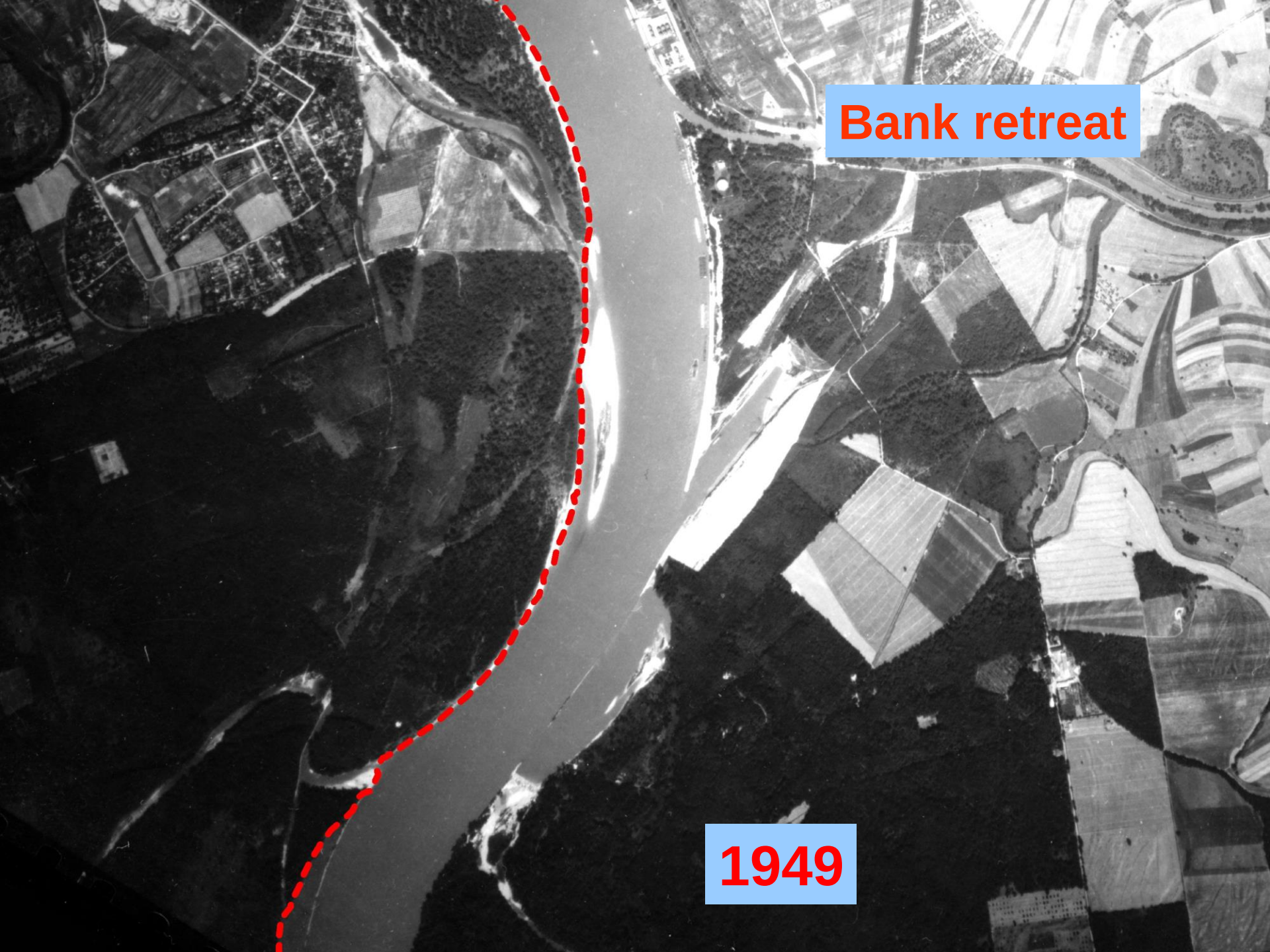

legend
natural levee
crevasse splay
naturally infilled paleochannel
abandoned channel
flat floodplain
exposed gravel bar
former island
0
0.2
0.4
0.6
0.8
1
km
N

landforms

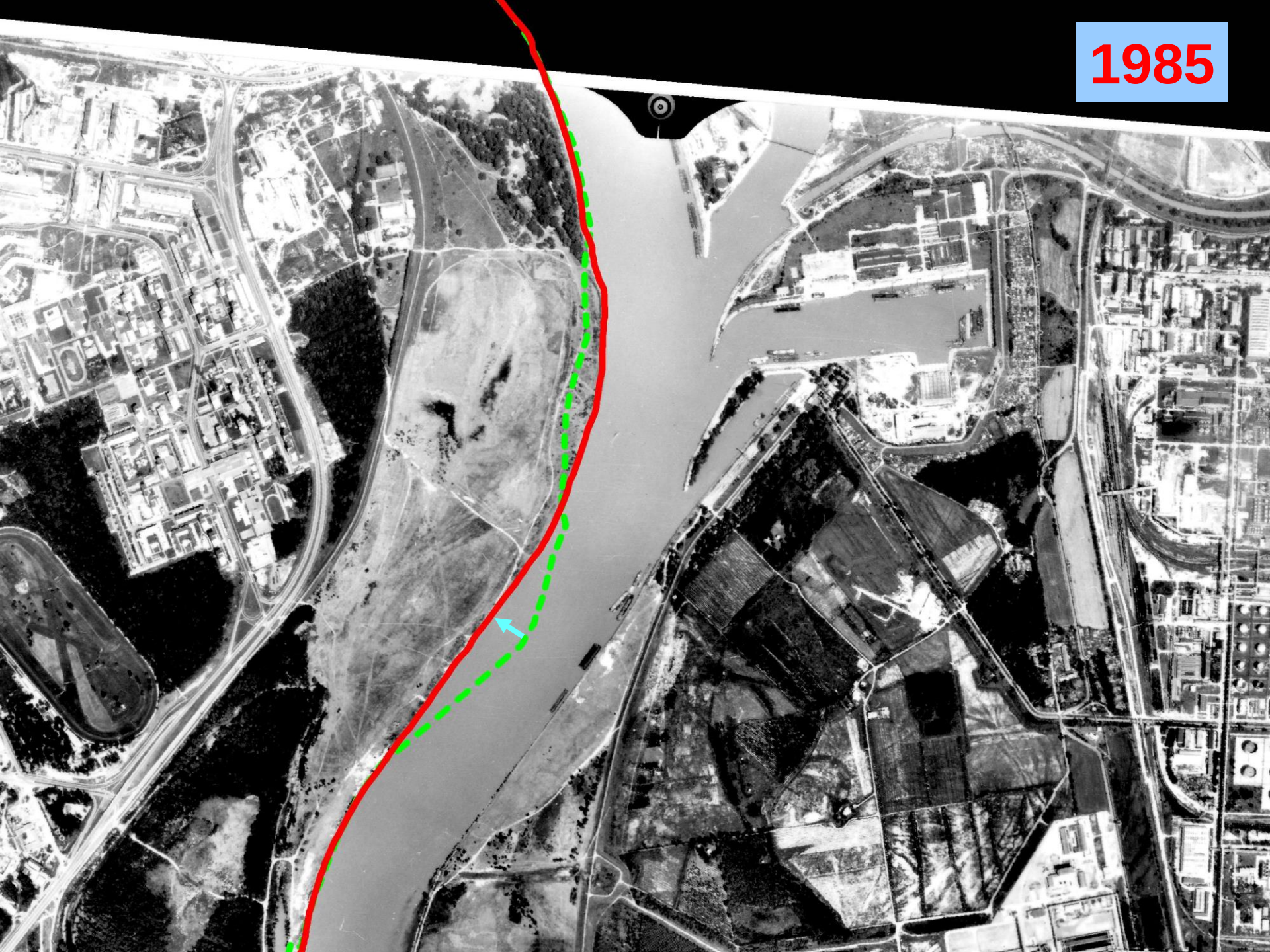

legend
natural levee
crevasse splay
naturally infilled paleochannel
abandoned channel
flat floodplain
exposed gravel bar
former island

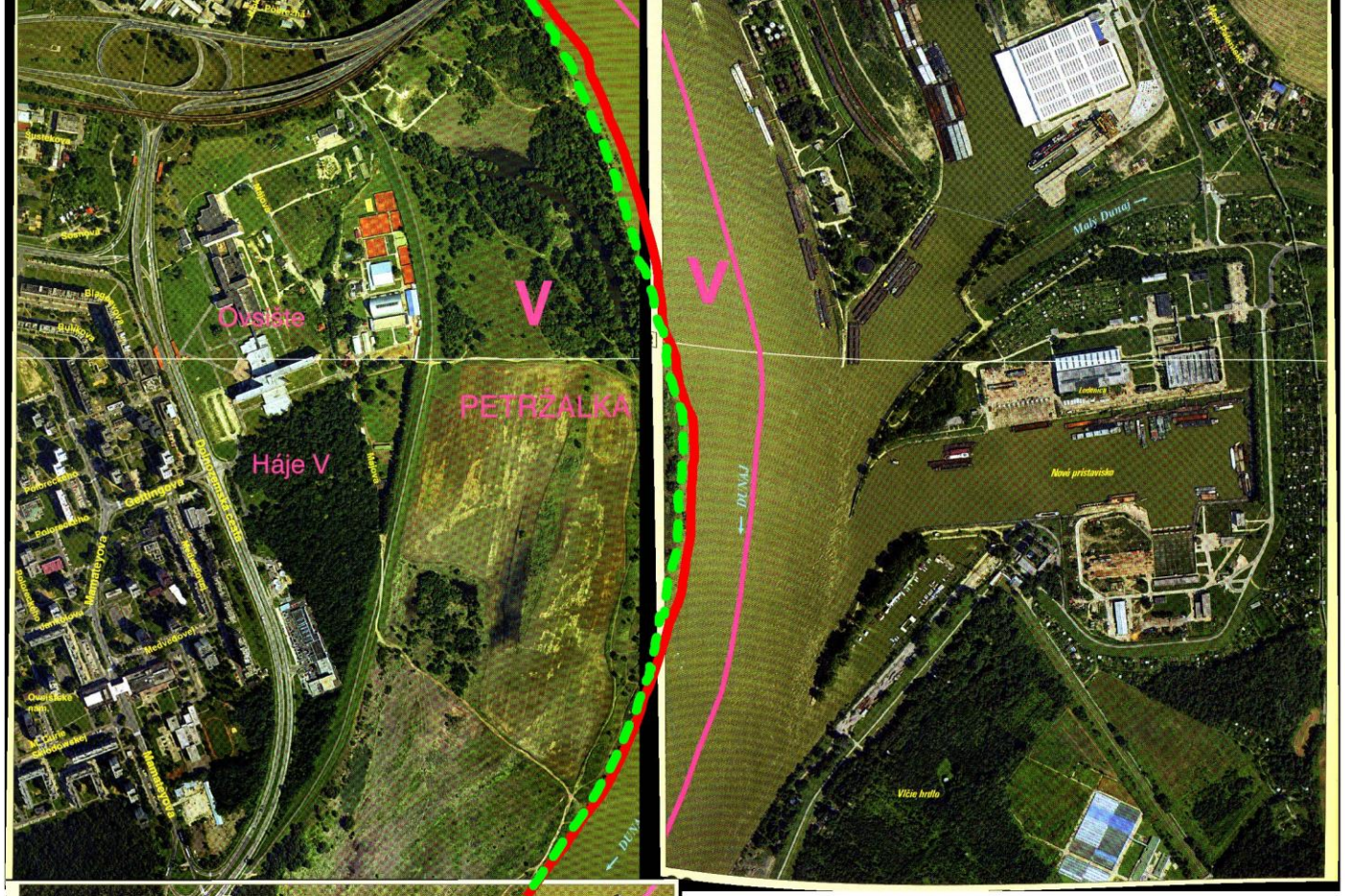
modern landform changes

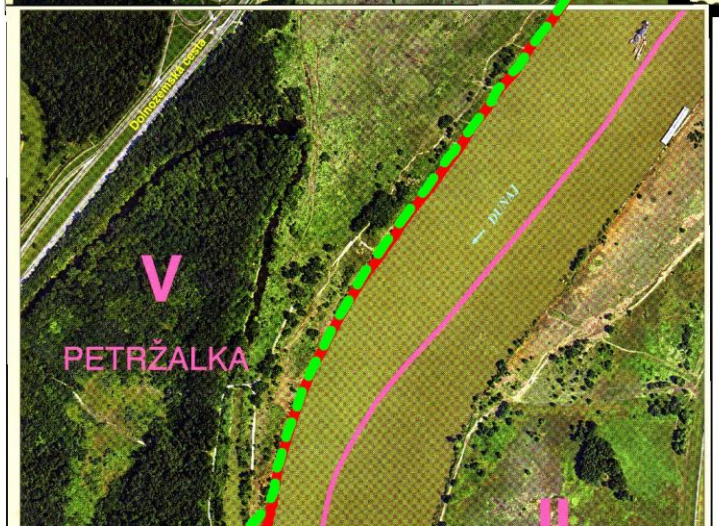



Bank retreat
1949

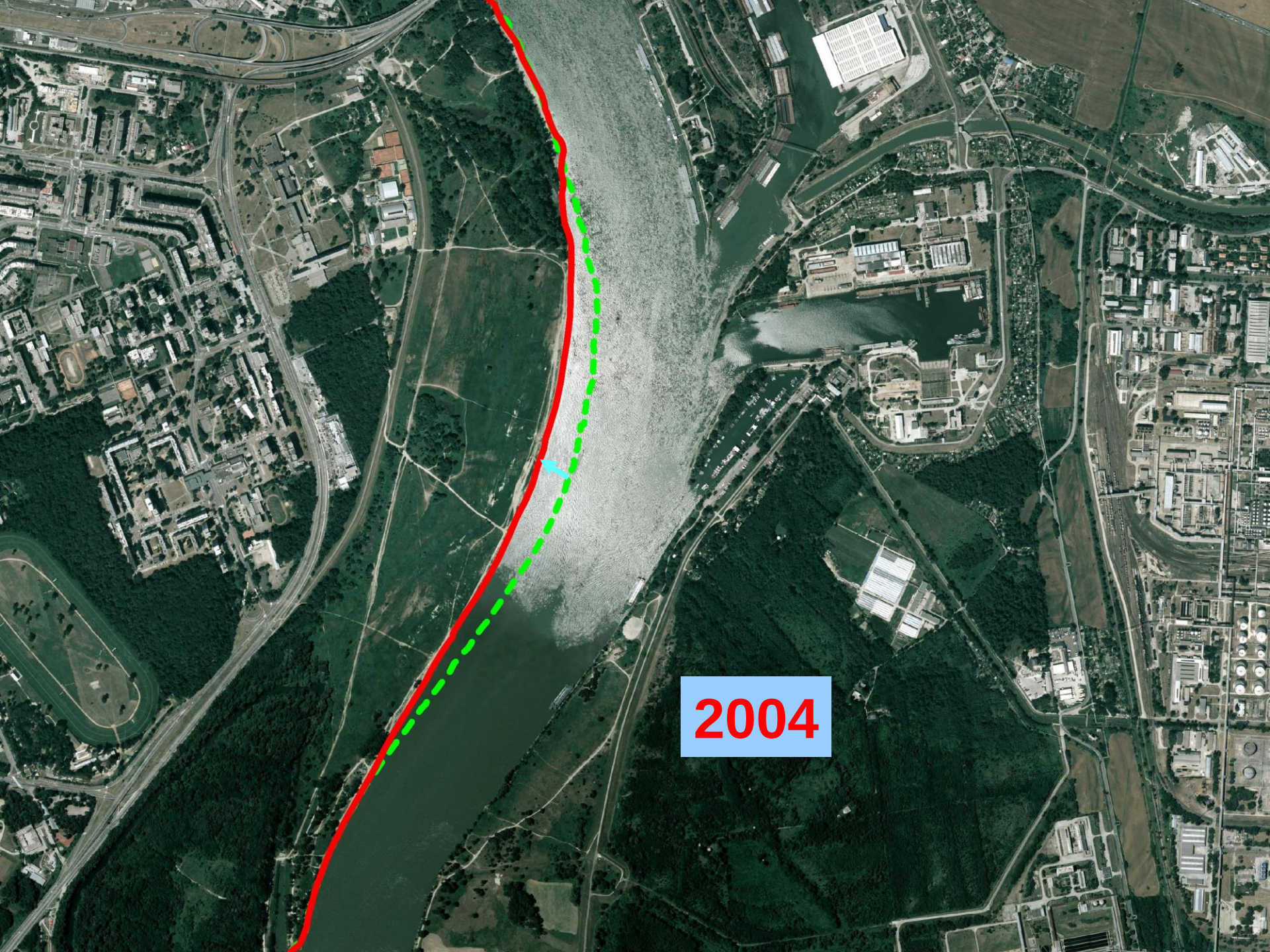
1969

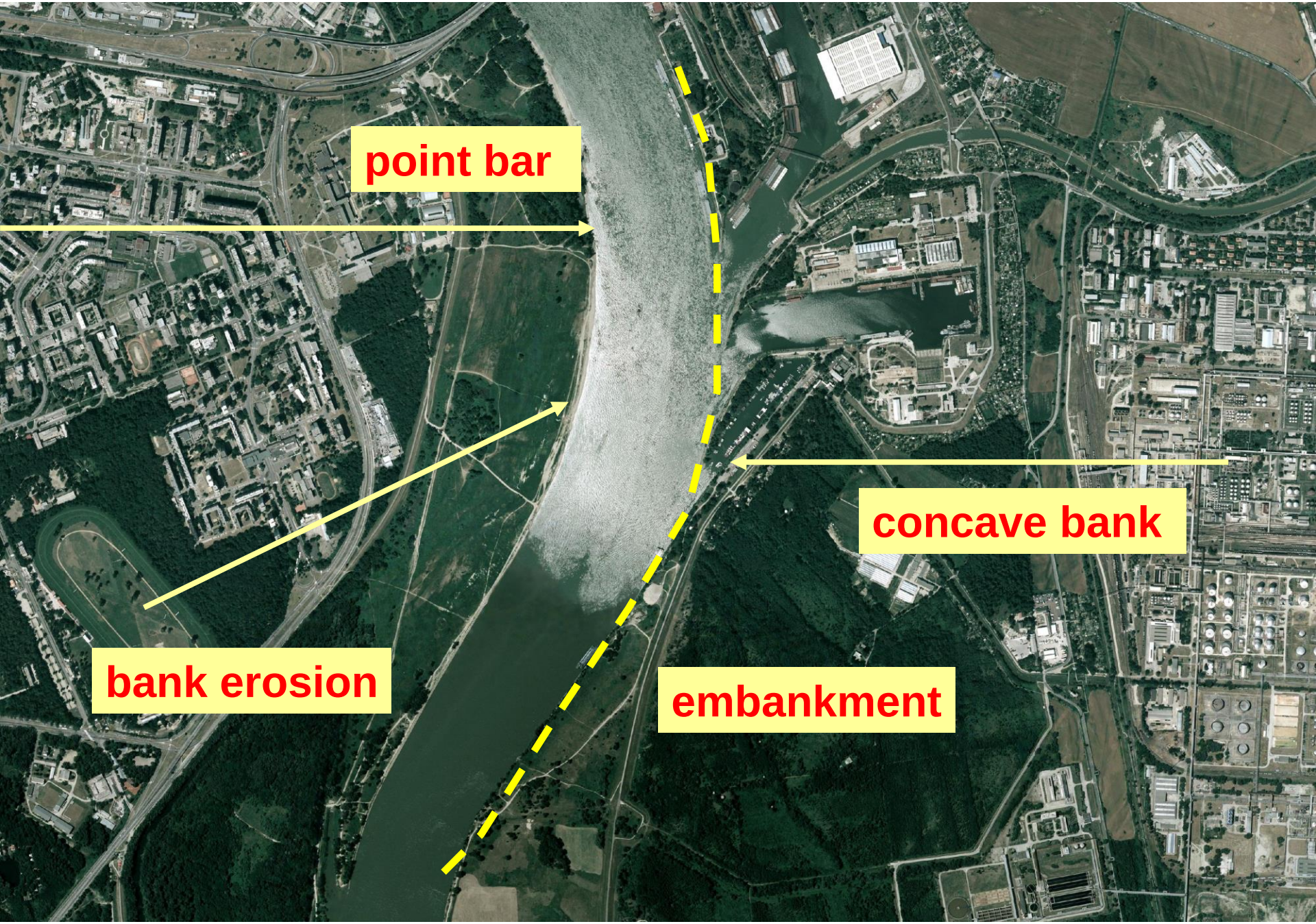

1985


Ovsište
V
PETRŽALKA
Háje V
Malý Dunaj
Nové prístaviská
Vŕčie hrdlo
DUNAJ


V
PETRŽALKA
DUNAJ

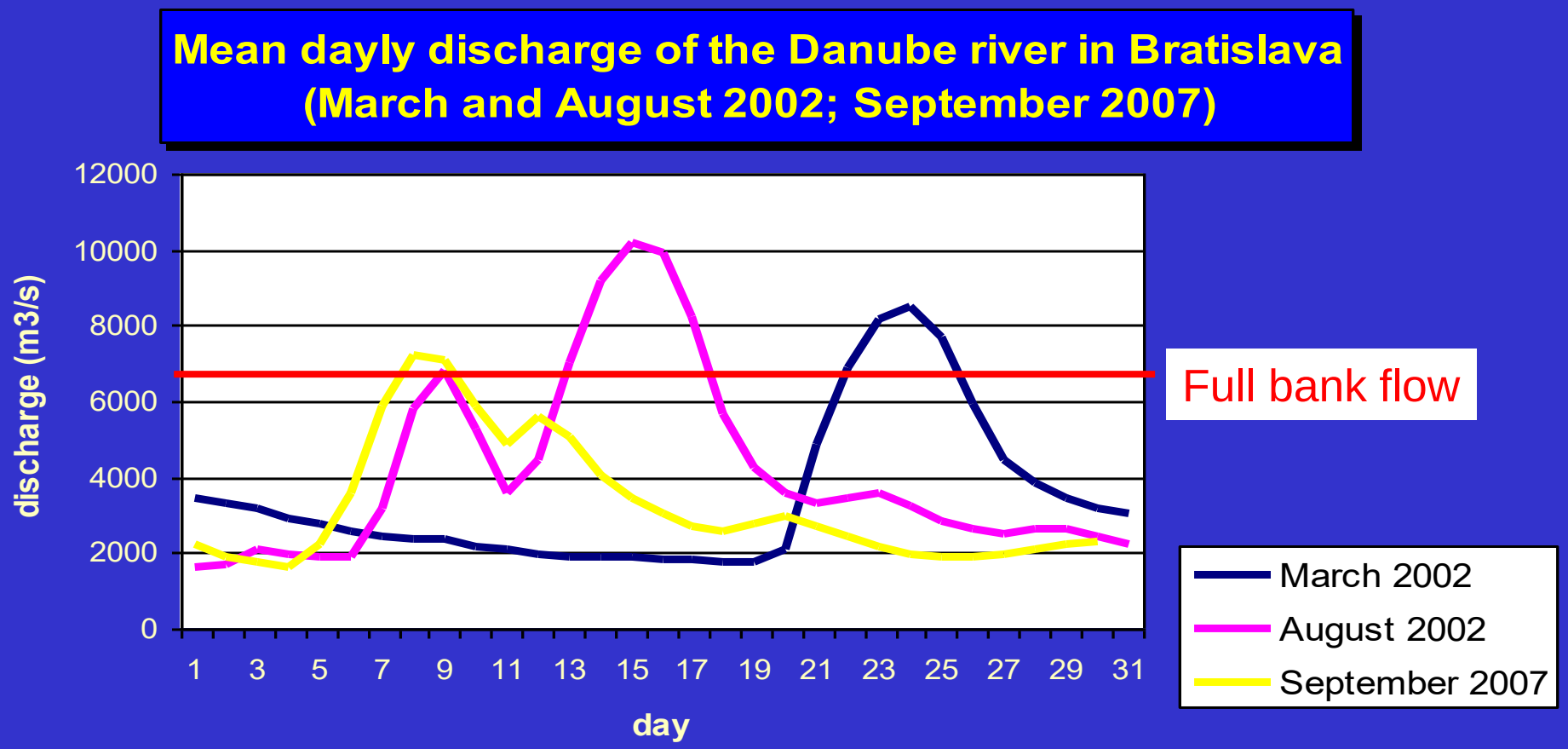
1997


2004


point bar
concave bank
bank erosion
embankment

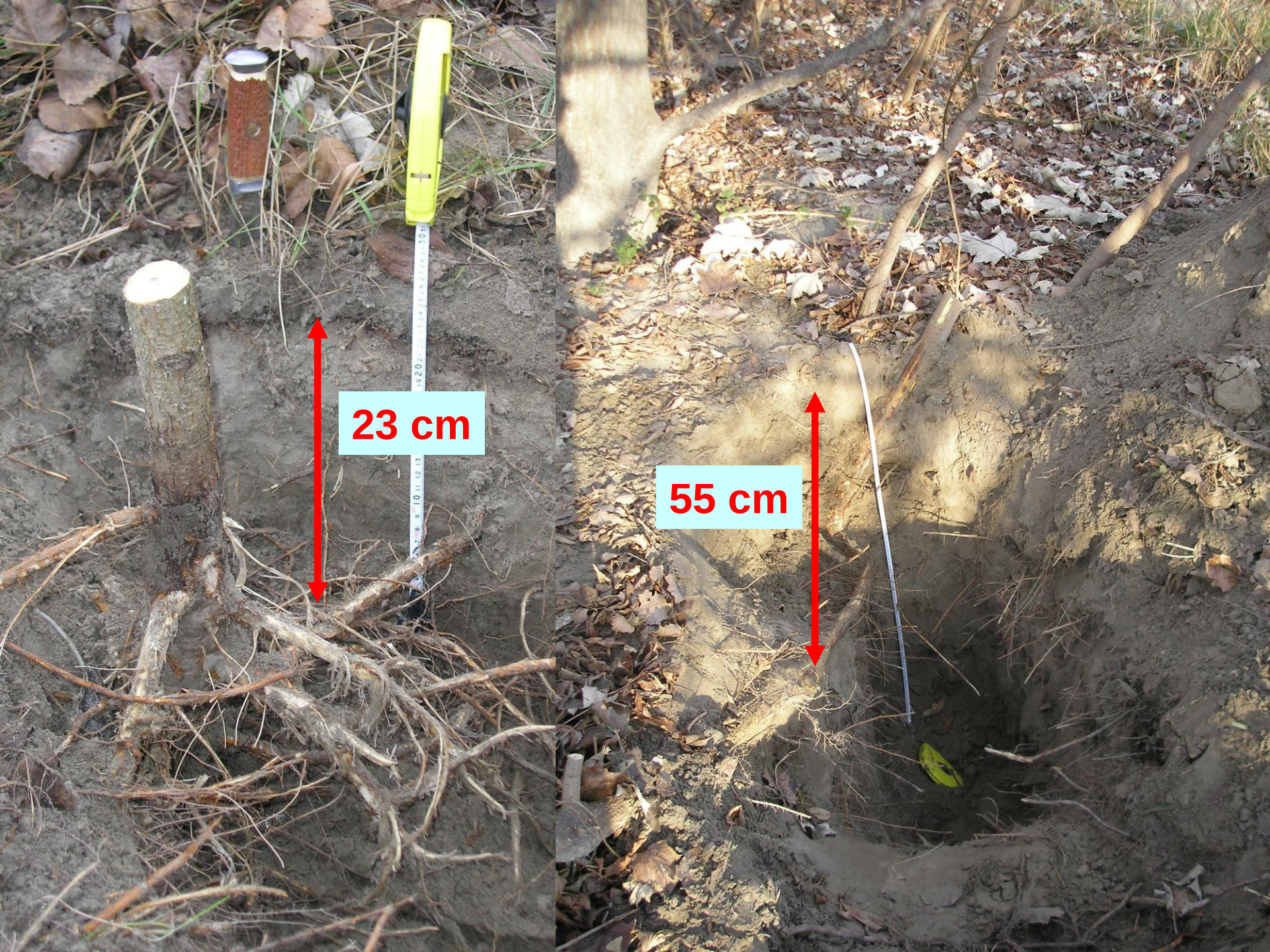
bank failures

analysed floods




August 2002


sandy cover

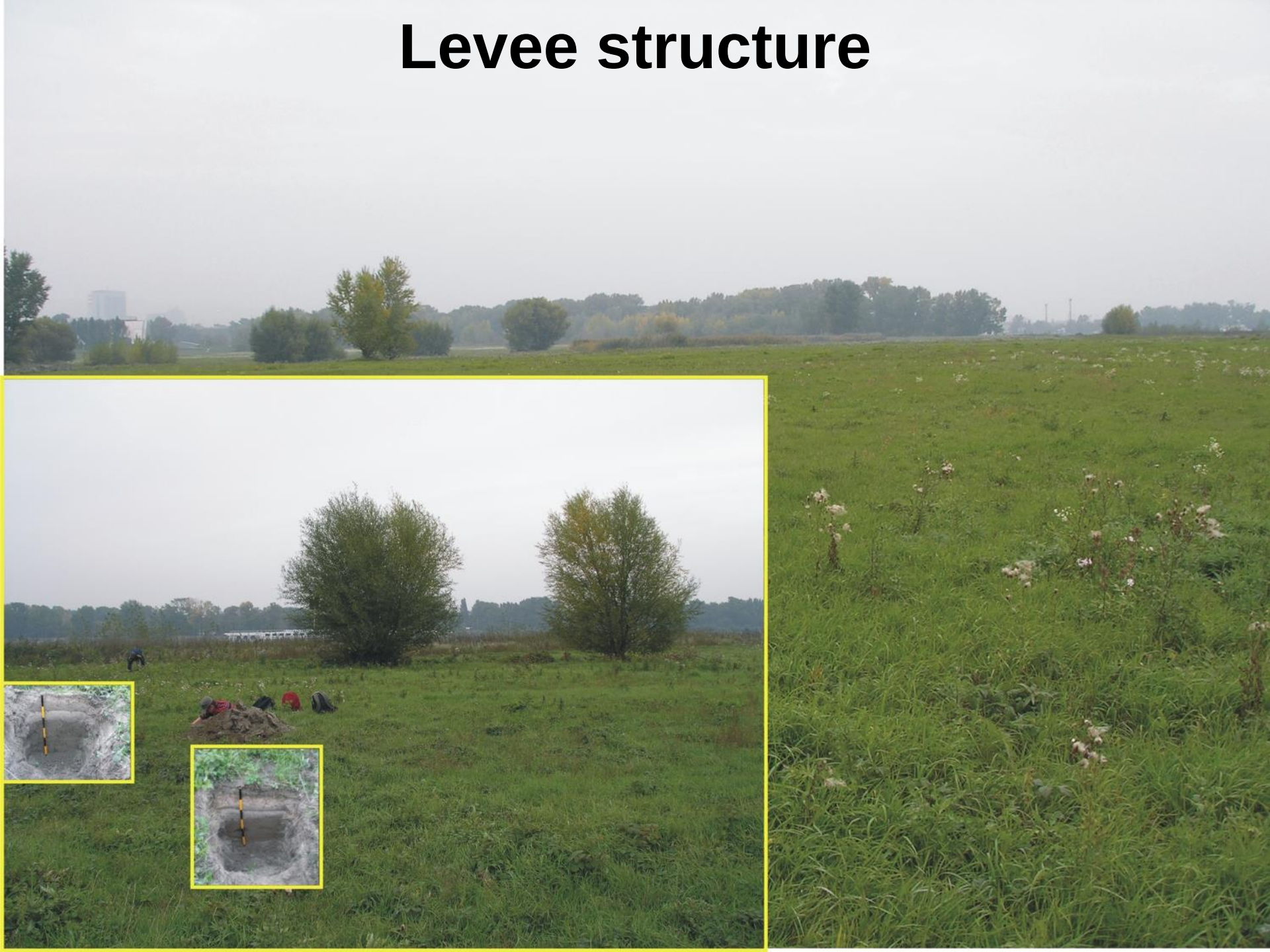

23 cm
55 cm

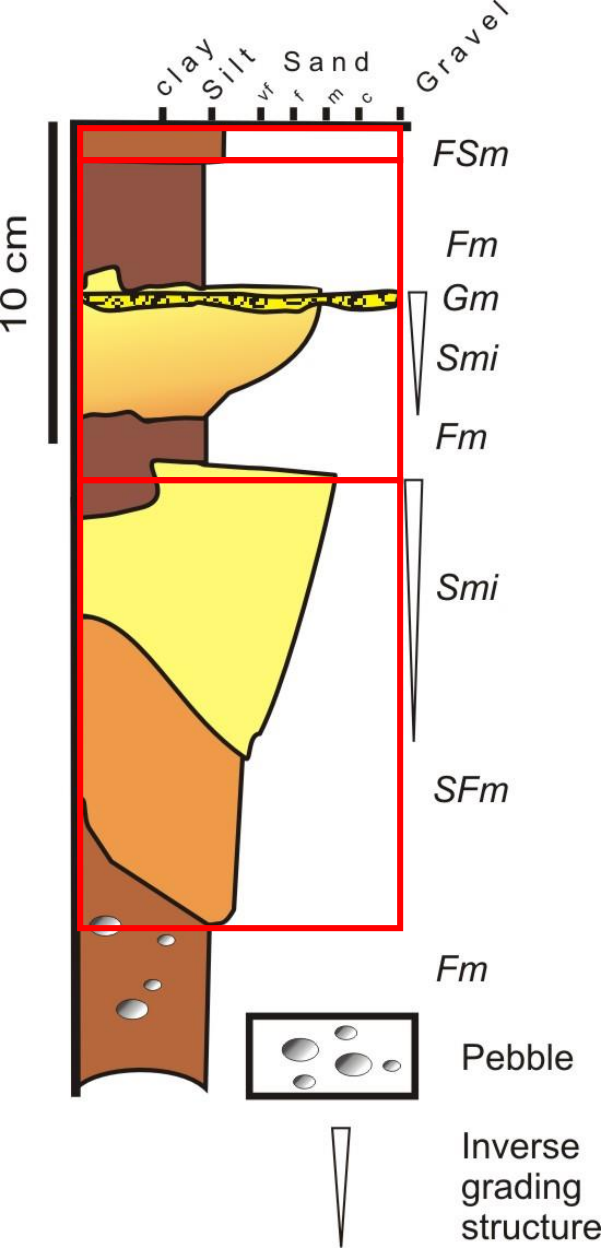

September 2007

sedimentary records of floods

- **flood phases – rising, culmination, fall**
- **complete flood record – set of three layers**
- **three unit cyclothem – fine (mud) – coarse (sand) – fine (mud)**

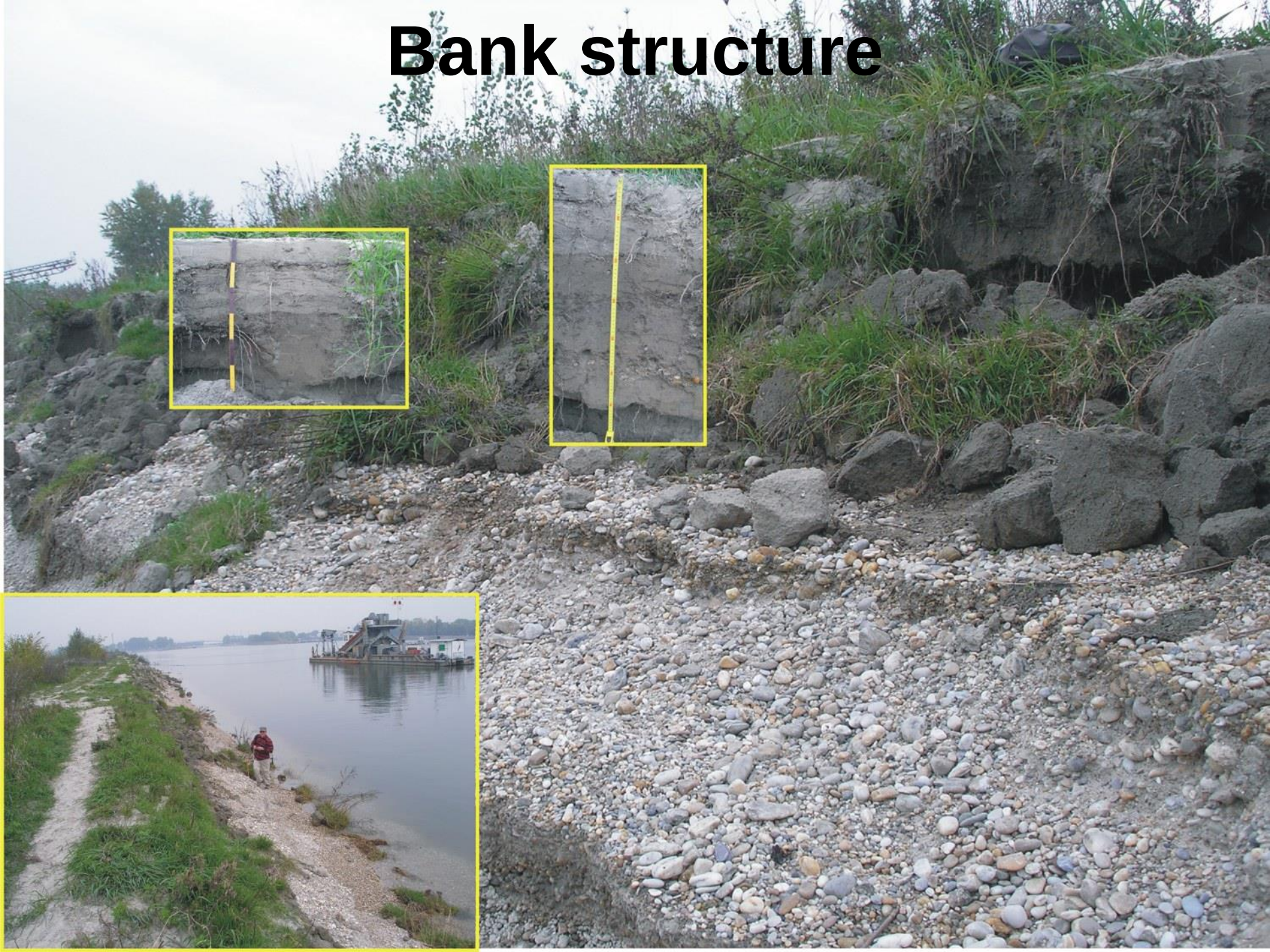
Levee structure

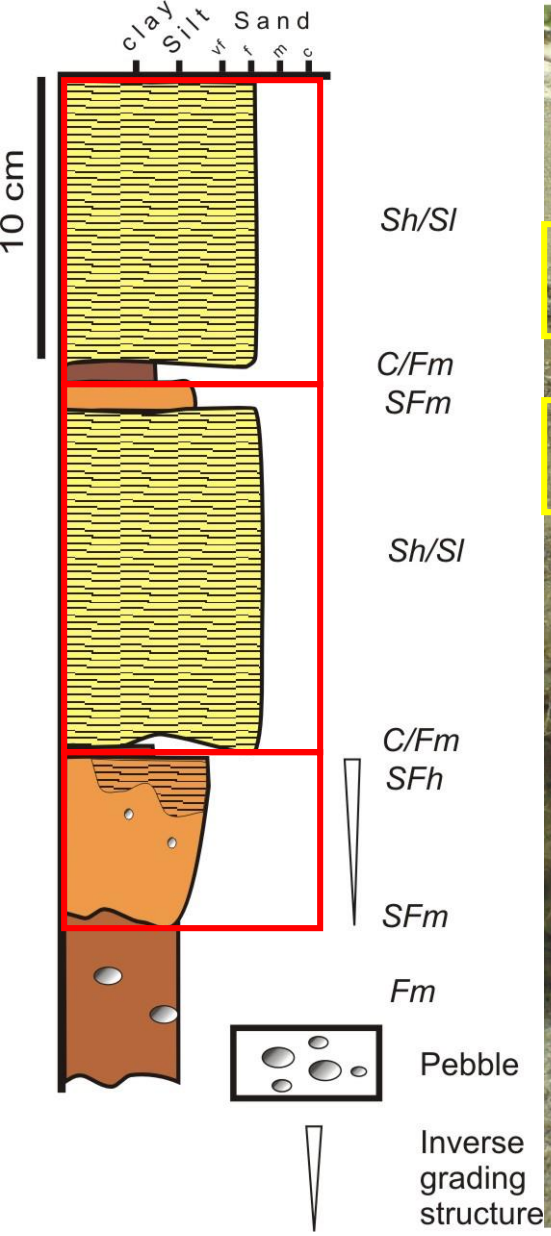


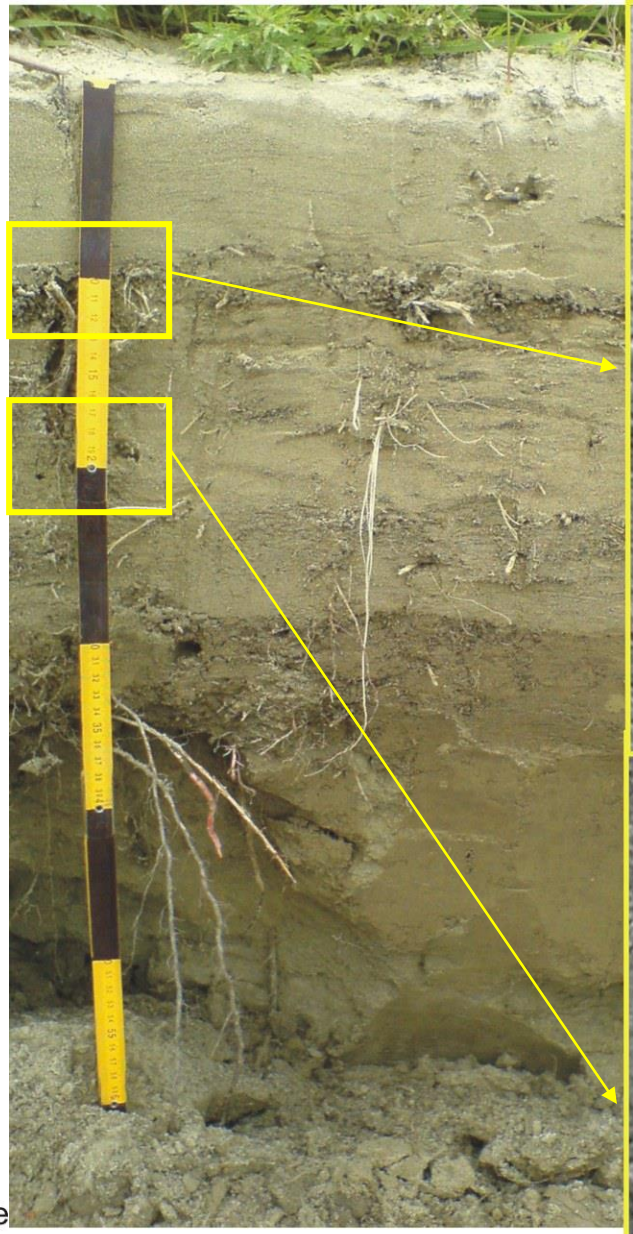


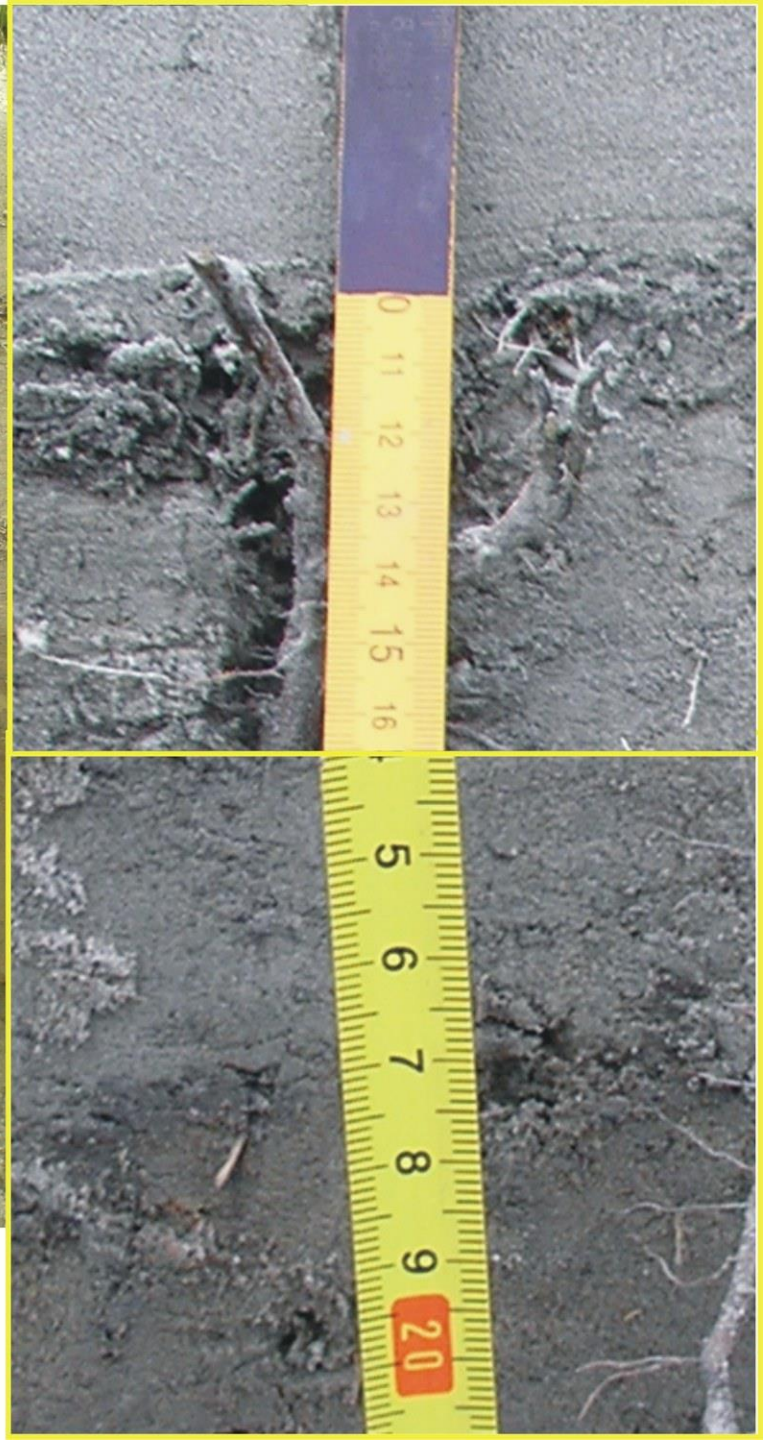
Sandy cover lithofacial structure on the roof of natural levee

Bank structure

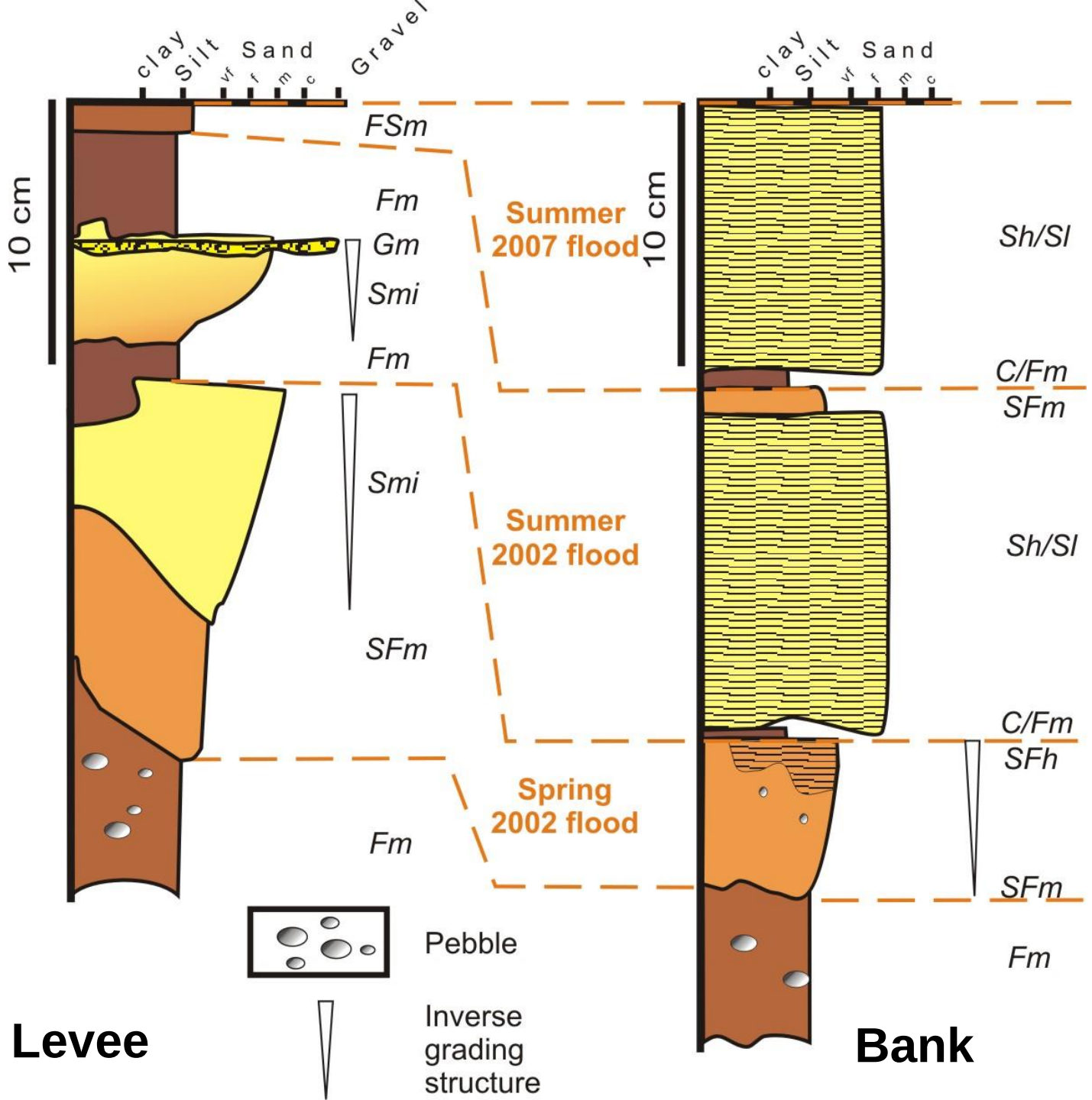


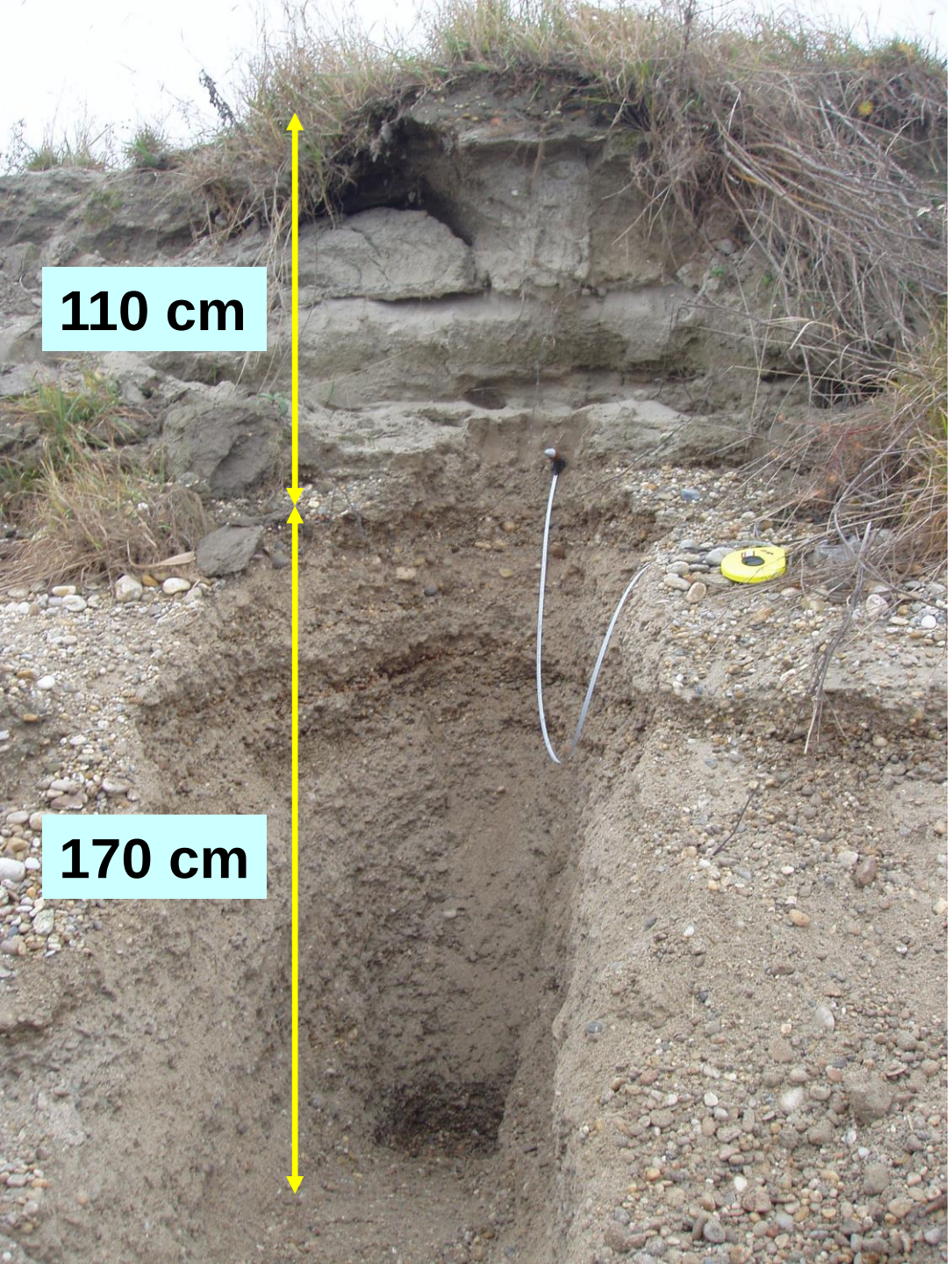






Bank lithofacial structure


clay
Silt
Sand
vf
f
m
c
Gravel
10 cm
FSm
Fm
Gm
Smi
Fm
Smi
SFm
Fm
Summer
2007 flood
Summer
2002 flood
Spring
2002 flood
Pebble
Inverse
grading
structure
Levee
10 cm
Sh/Sl
C/Fm
SFm
Sh/Sl
C/Fm
SFh
SFm
Fm
Bank



Bank profile

More than 1 m of new sediments after construction (1 – 1,5 cm/year)

conclusions

- **floodplain is not simple – but complex system**
- **radical change in evolution – man impact**
- **climatic changes – higher frequency of floods**
- **Gabčíkovo waterworks – rise of cnannel bed**
- **great challenges for flood protection in Bratislava**


Thank you very much for your attention!