

Flood risk from dike failure

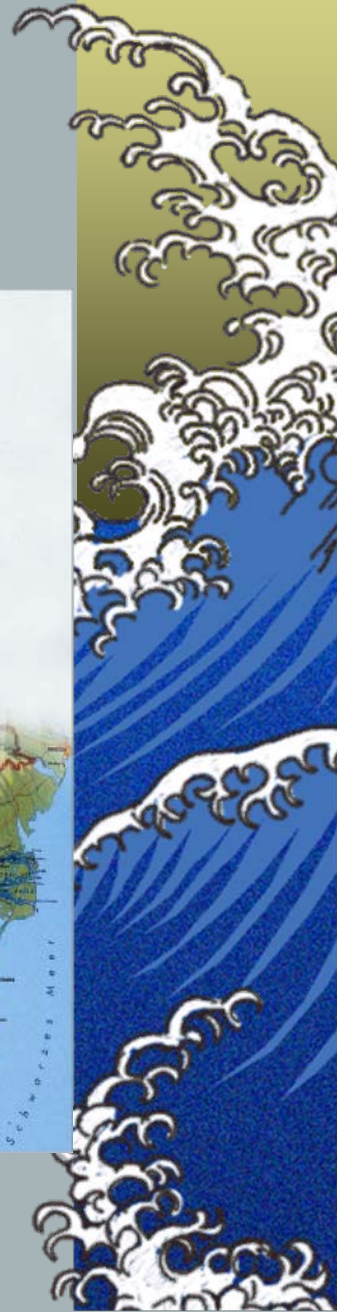
Dr. László Nagy
Technical University of Budapest,
Hungary



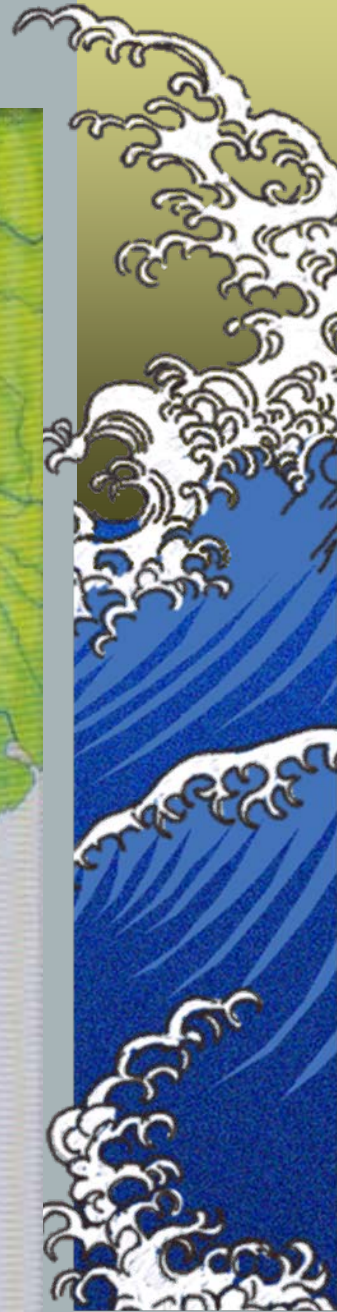
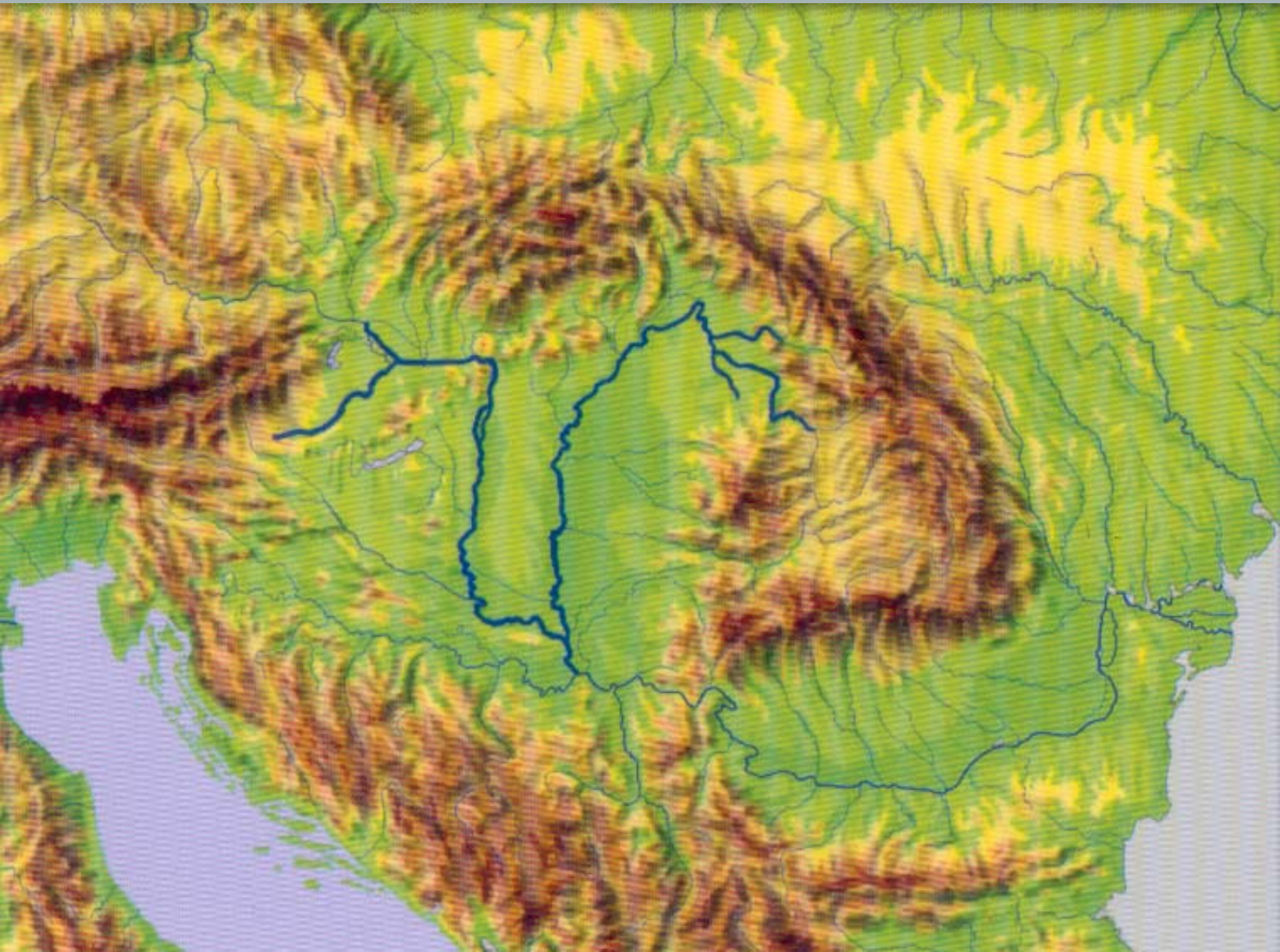
Where we are?



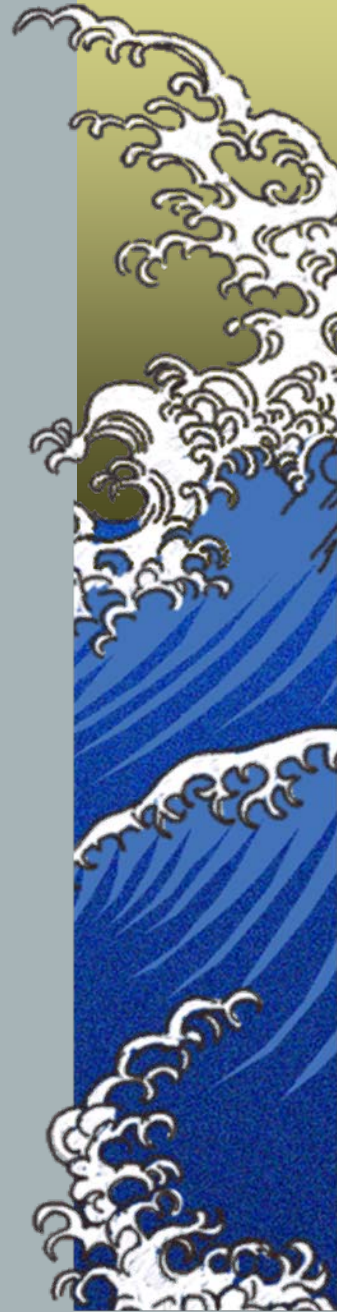
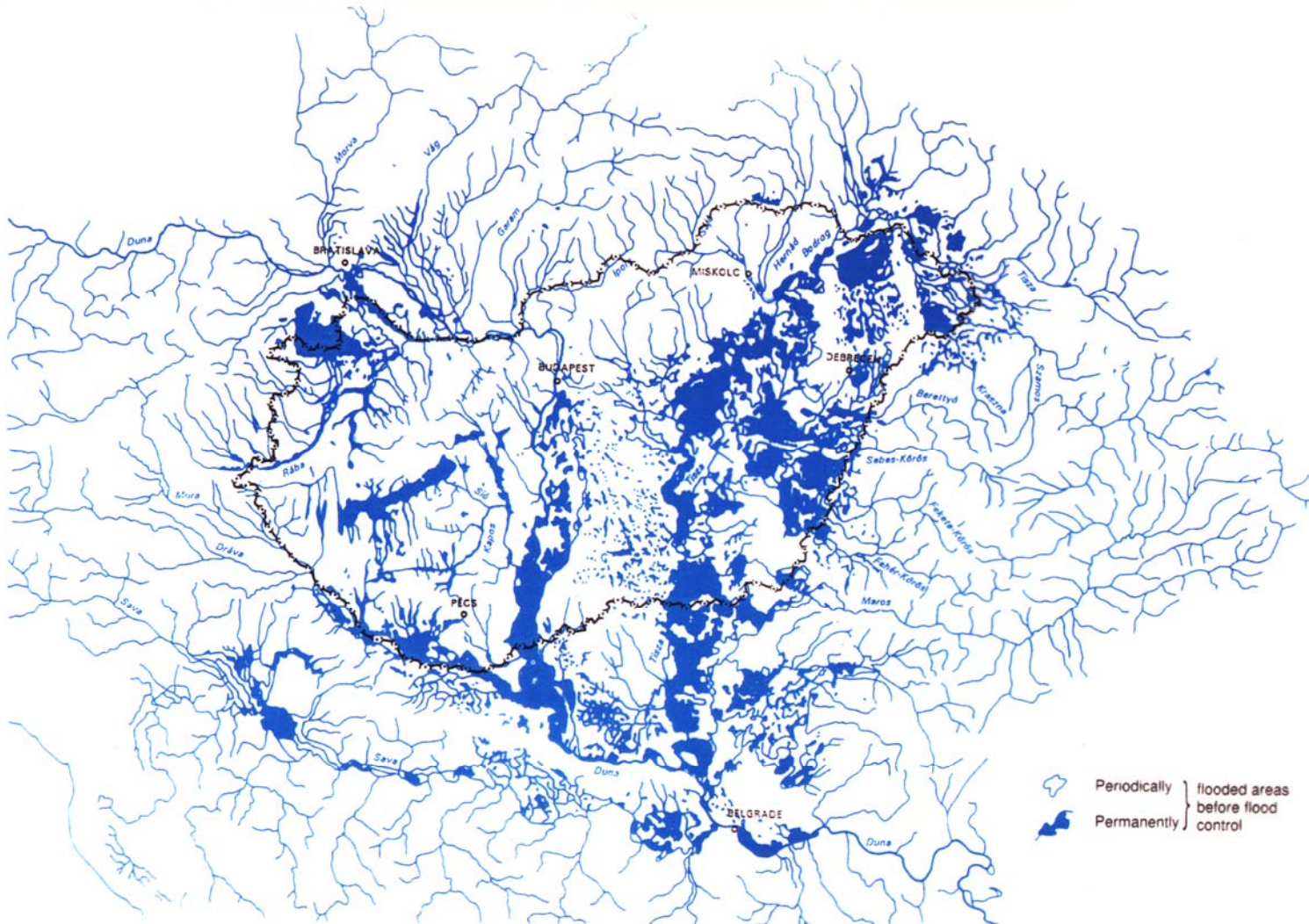
Danube catchment and the Carpathian basin



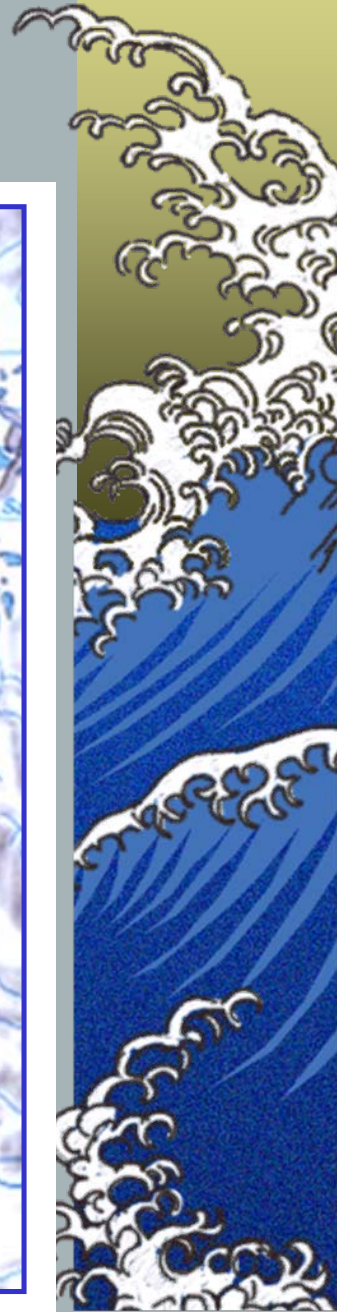
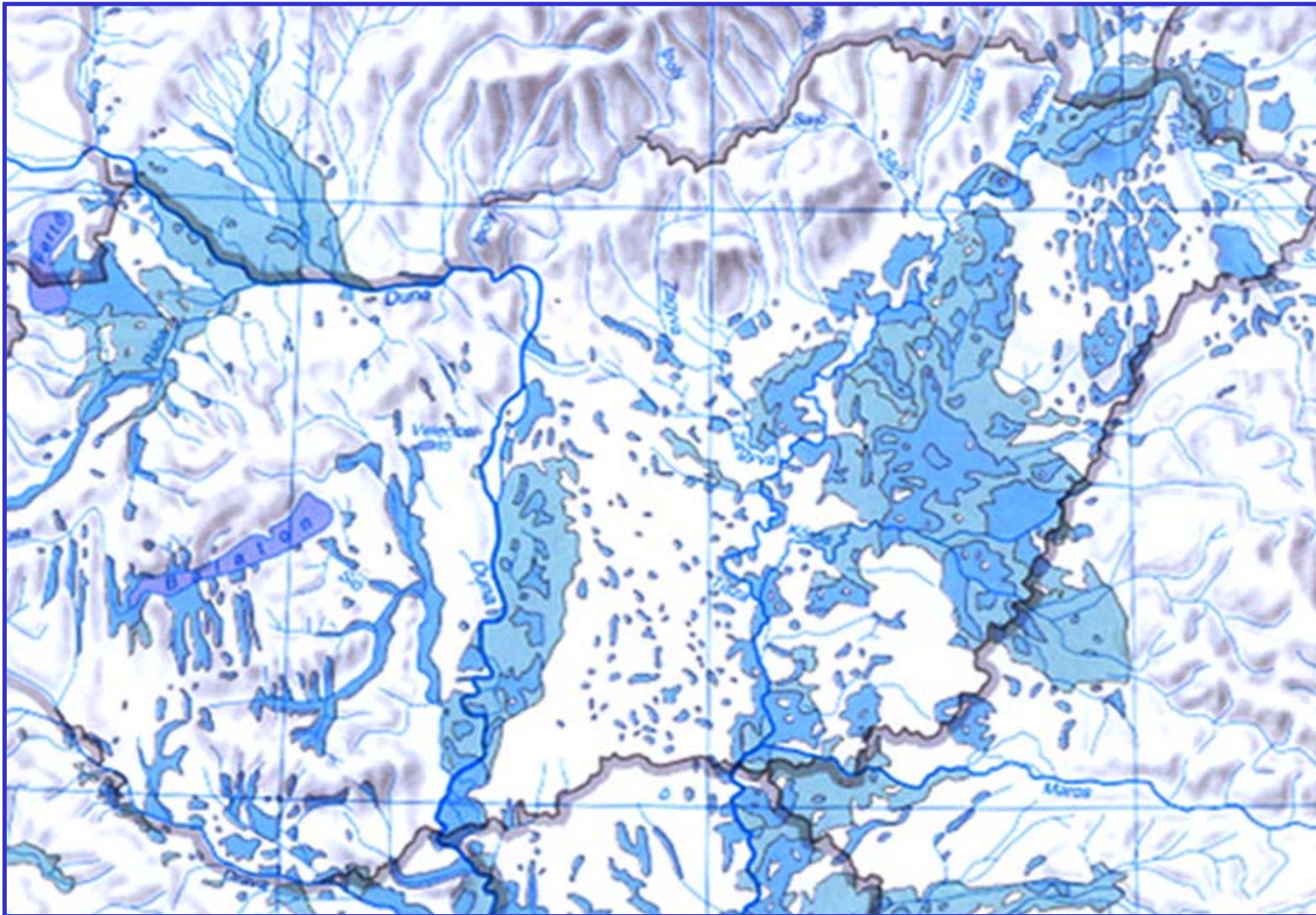
Carpathian Basin



Inundations before the river regulation and dike constructions

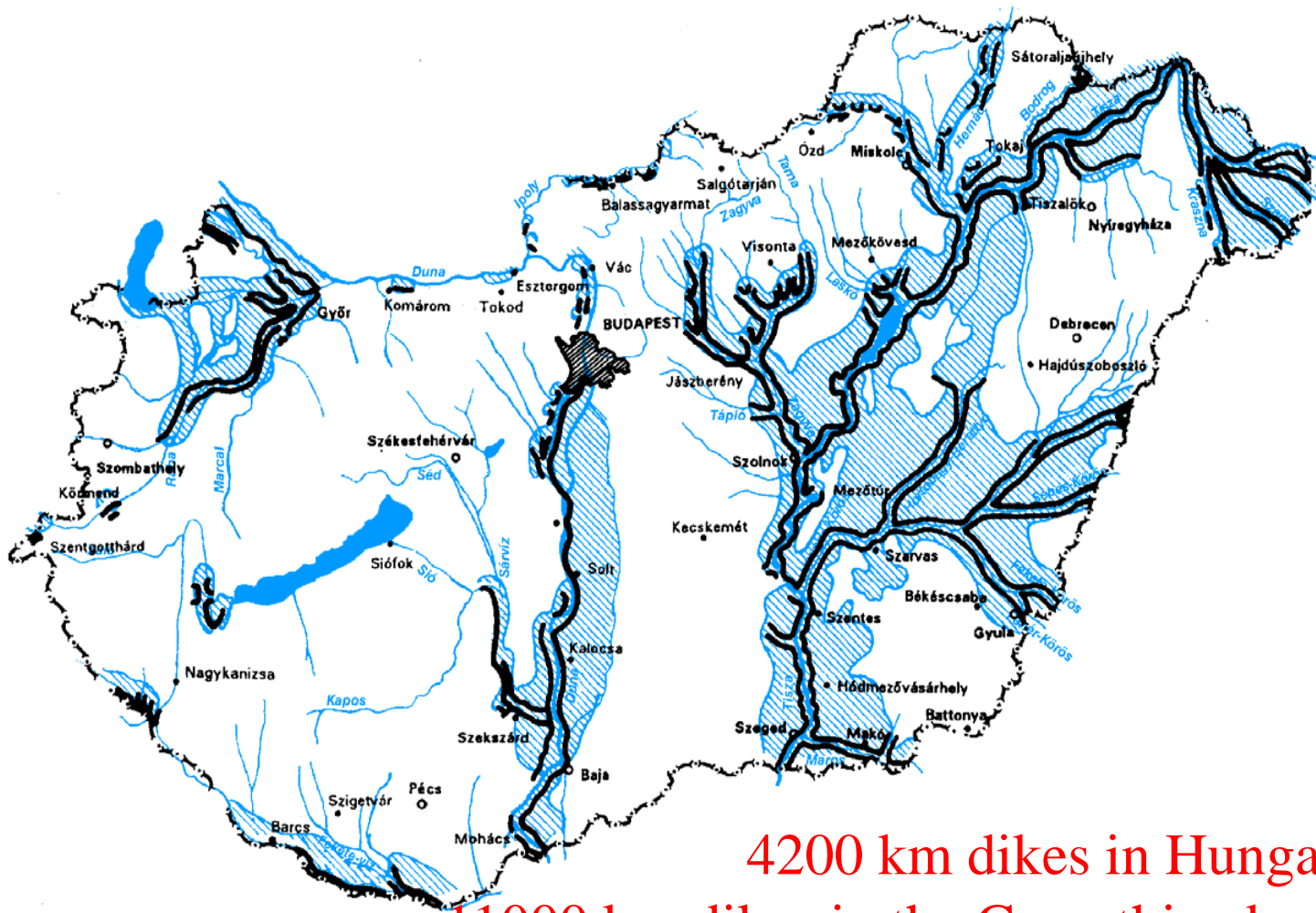


Inundation map from the XVII. century

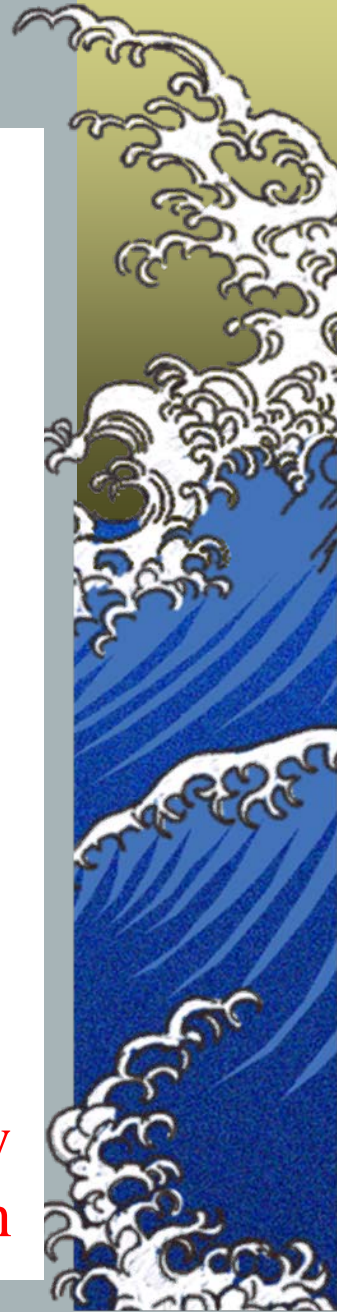


Hungarian answer

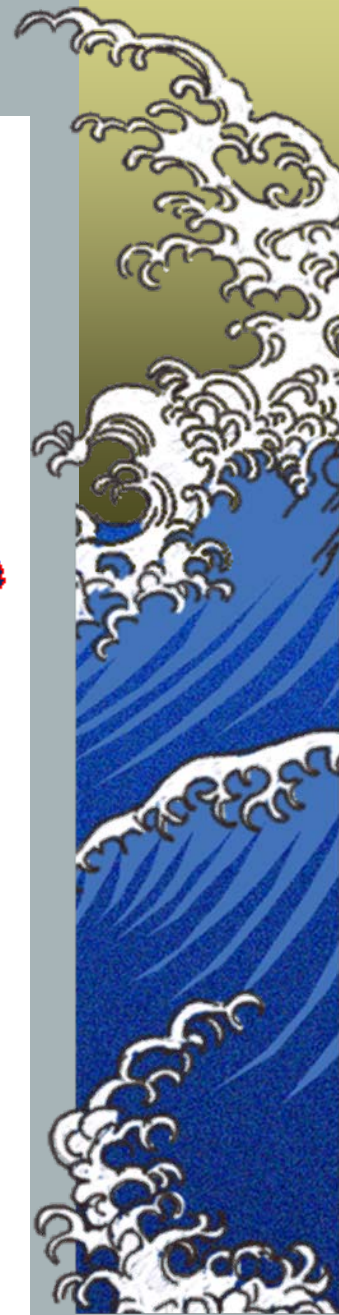
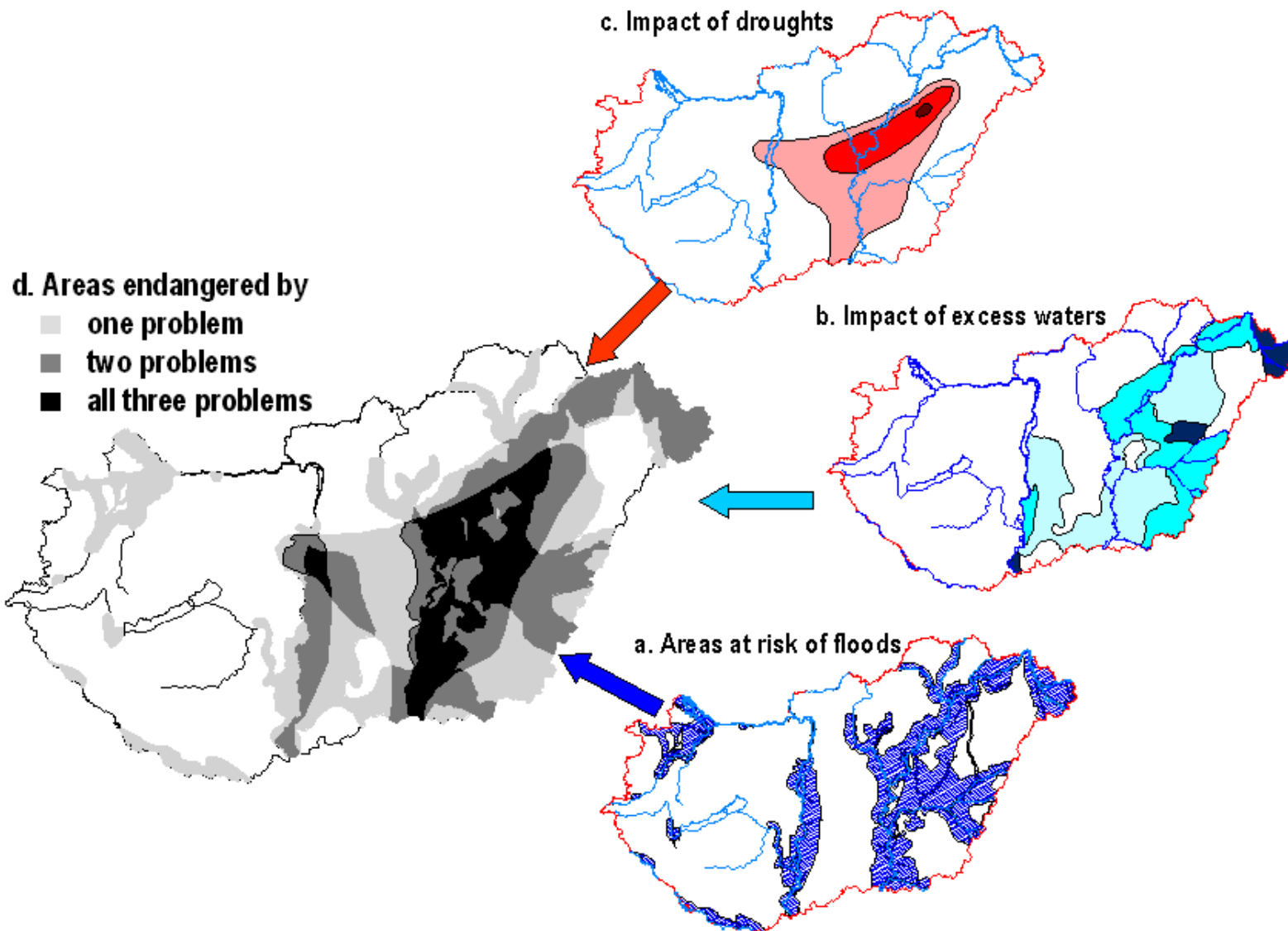
(before 1846 ~1000 km dike)



4200 km dikes in Hungary
11000 km dikes in the Carpathian basin



Dangers in Hungary according to water

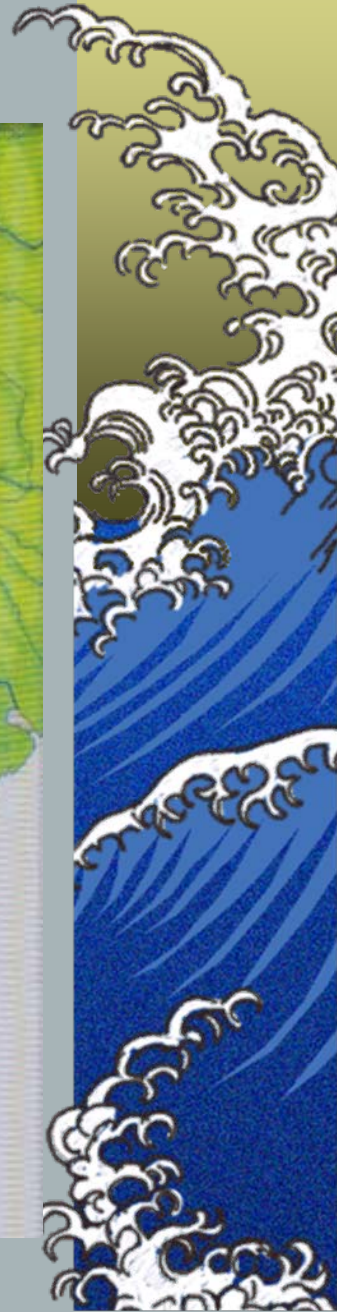
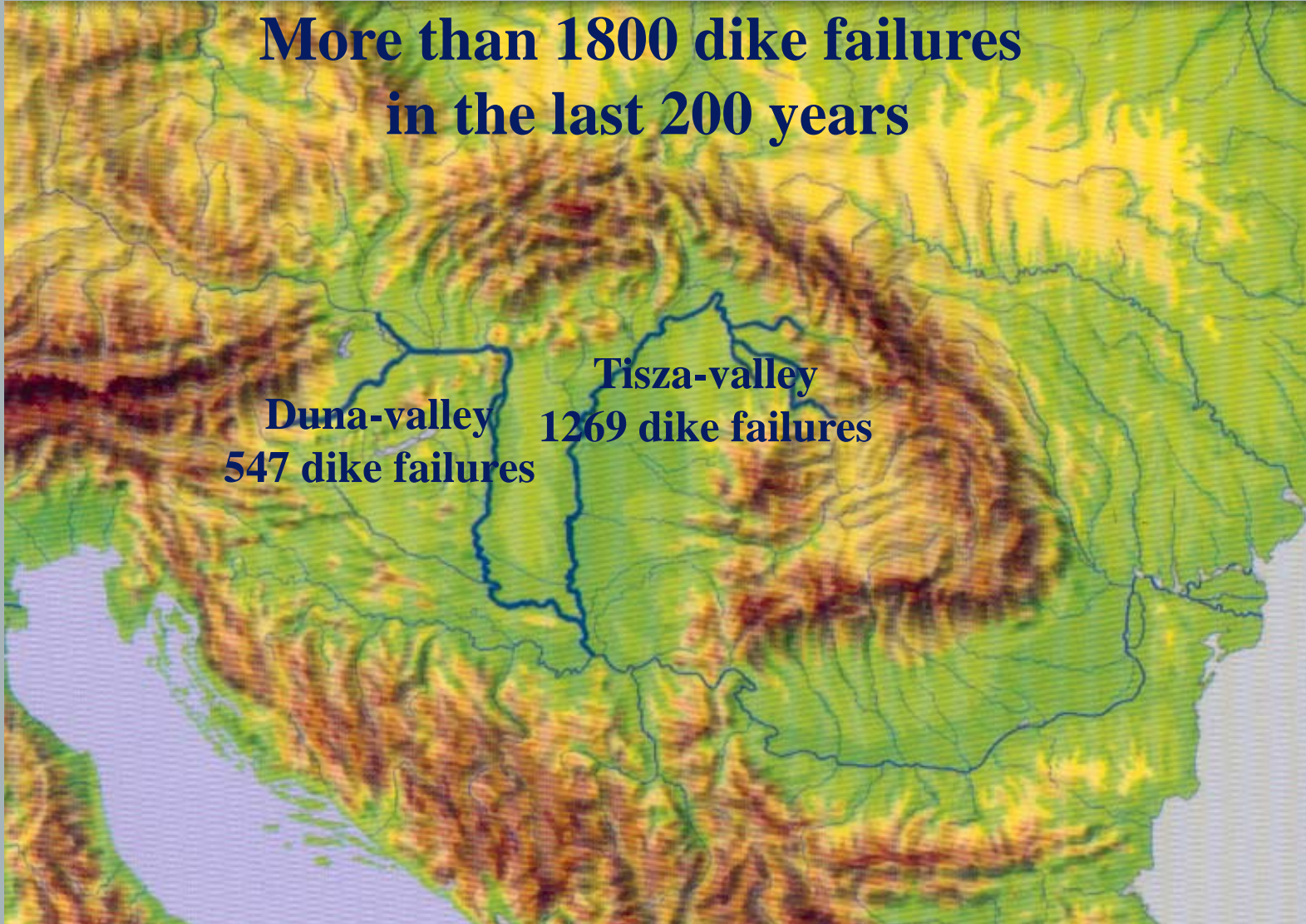


Carpathian Basin

**More than 1800 dike failures
in the last 200 years**

Duna-valley
547 dike failures

Tisza-valley
1269 dike failures

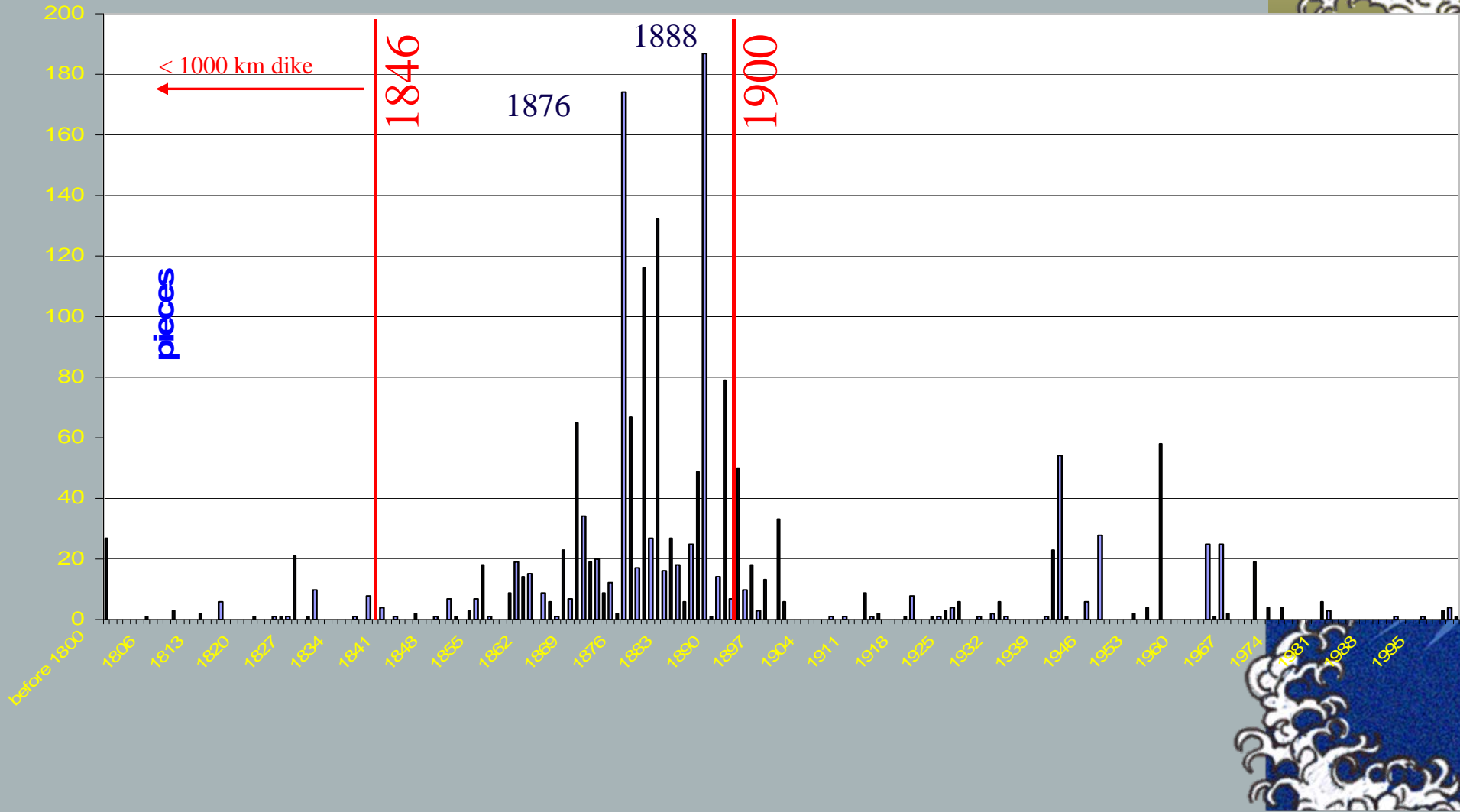


Collected data:

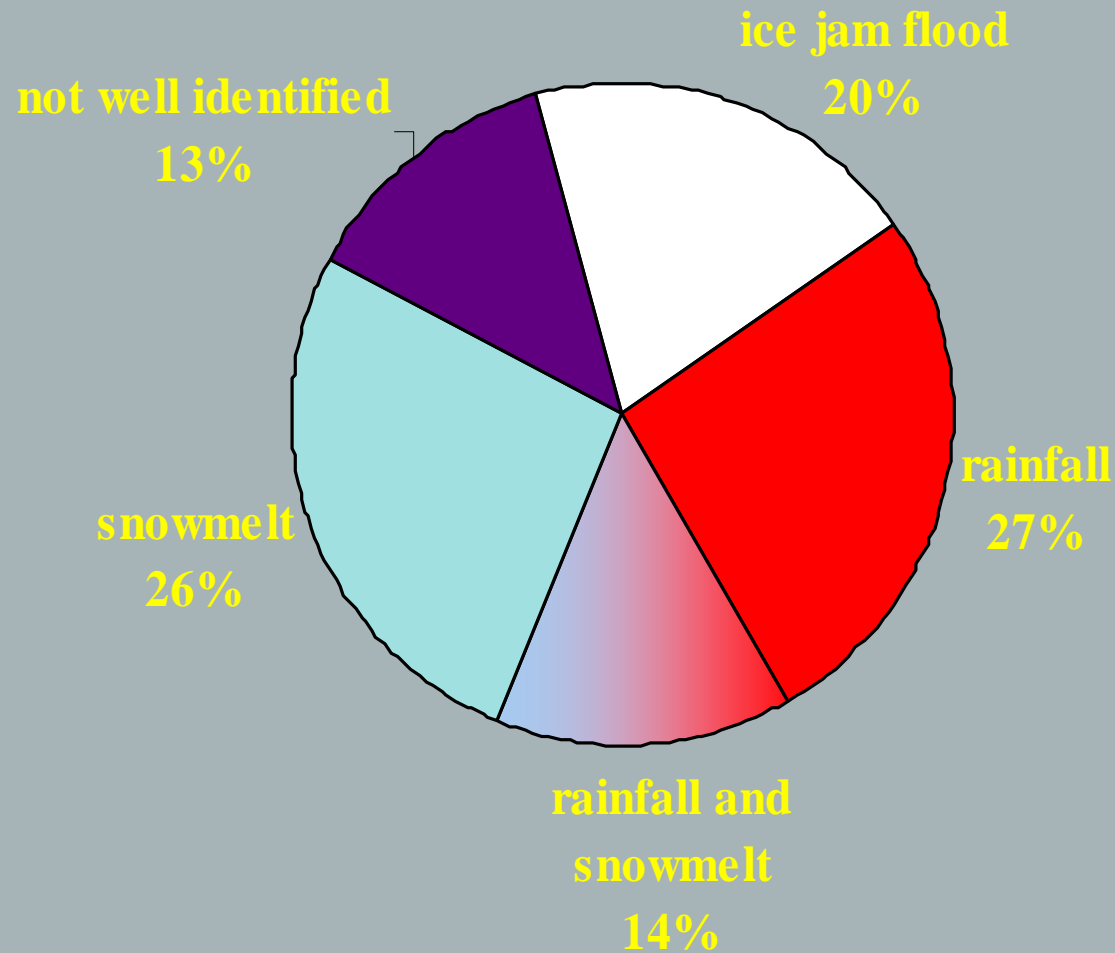
- 1. *Exact data and time of failure,*
- 2. *Location (river, bank, stationing),*
- 3. *Failure mechanism,*
- 4. *Origin of the flood causing failure,*
- 5. *Length of breach,*
- 6. *Possible geotechnical data,*
- 7. *Overtopping without failure,*
- 8. *Territory of inundated area,*
- 9. *Losses and number of casualties,*
- 10. *Existence of a scour pit,*
- 11. *The affected floodplain section,*
- 12. *Other circumstances, notes,*
- 13. *Literature.*



Dike failures in the Carpathian basin in the last 200 years



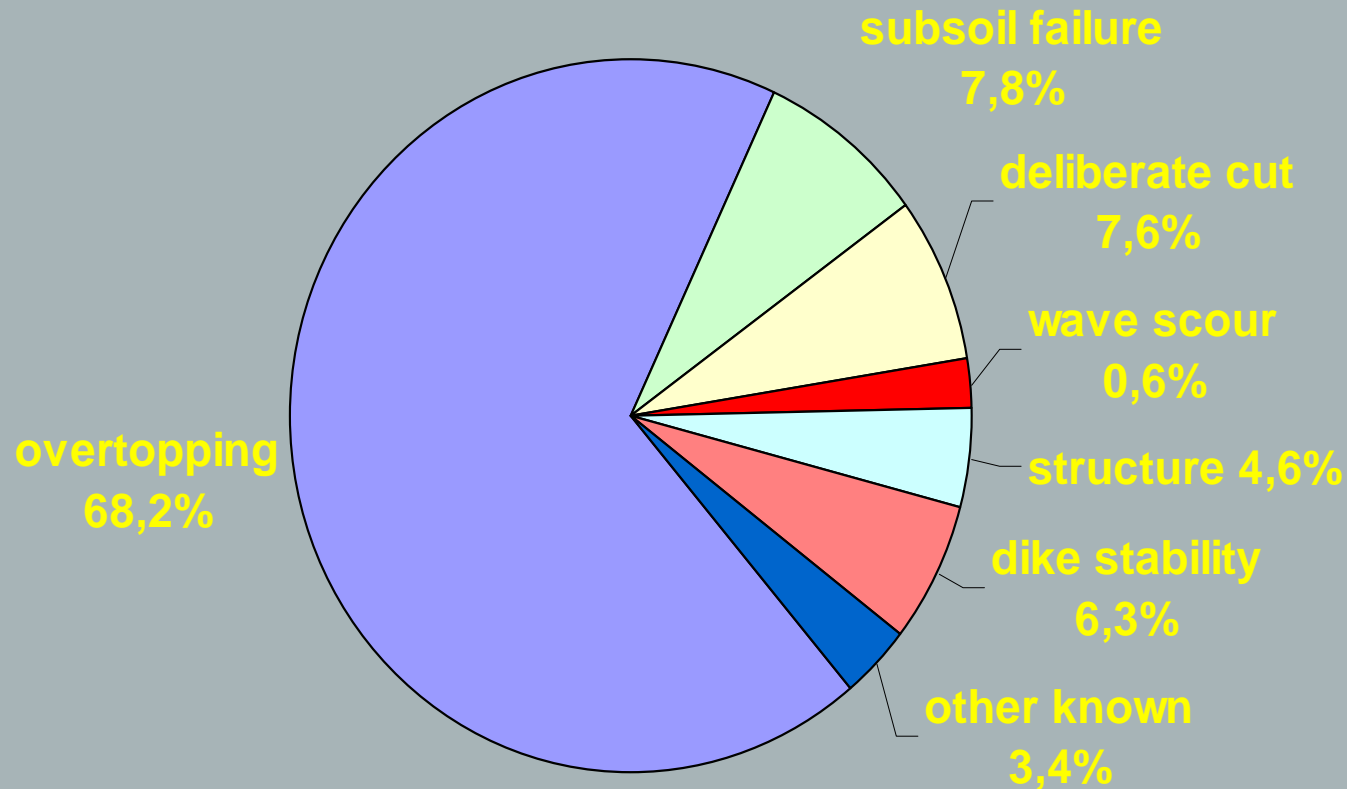
Origin of the flood causing failure



From 1816 data

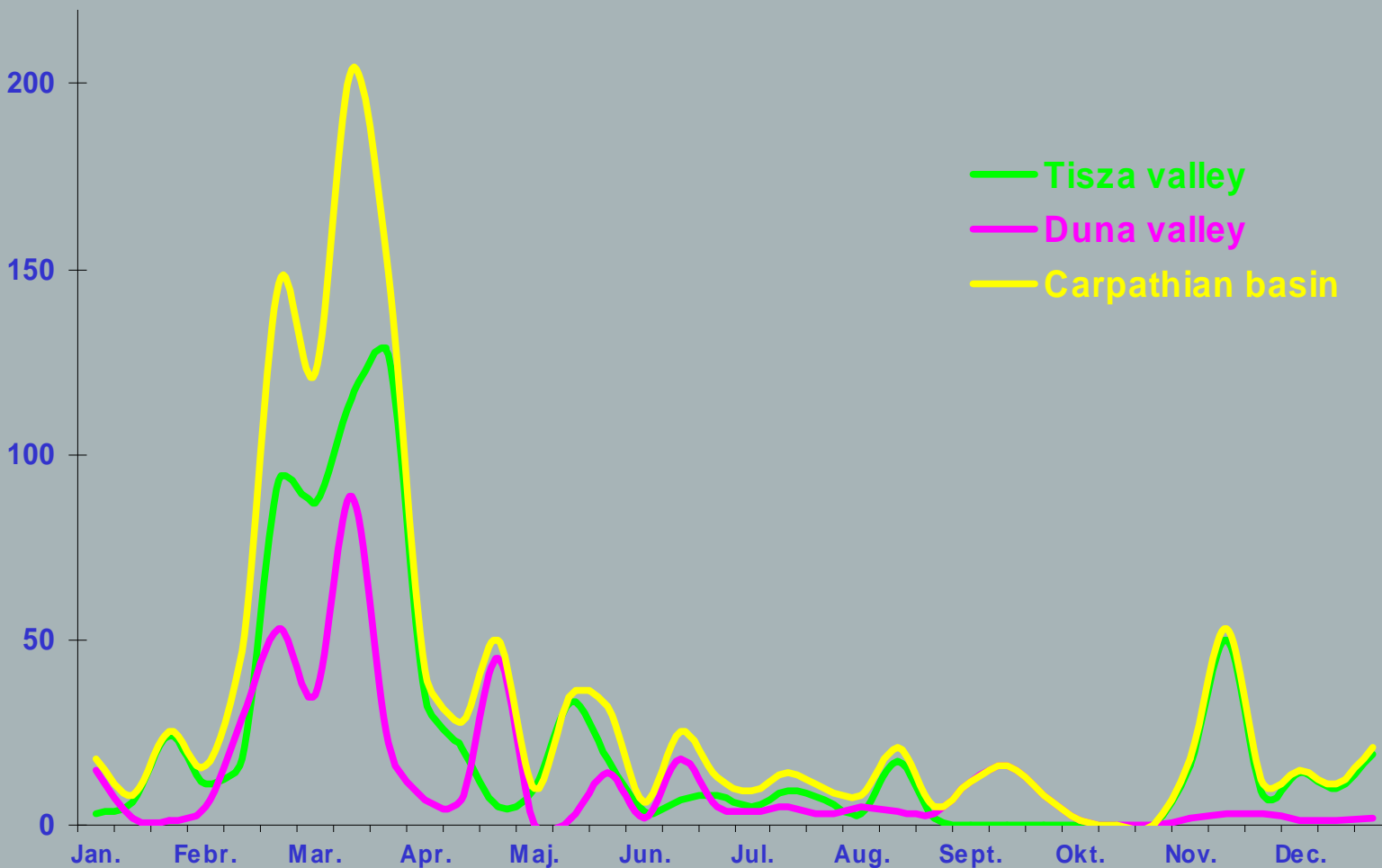


Distribution of dike failure mechanism

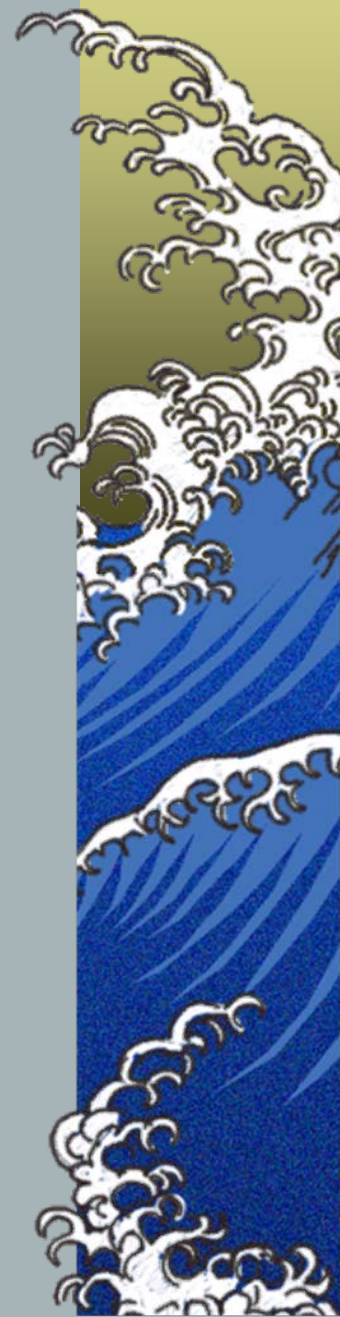


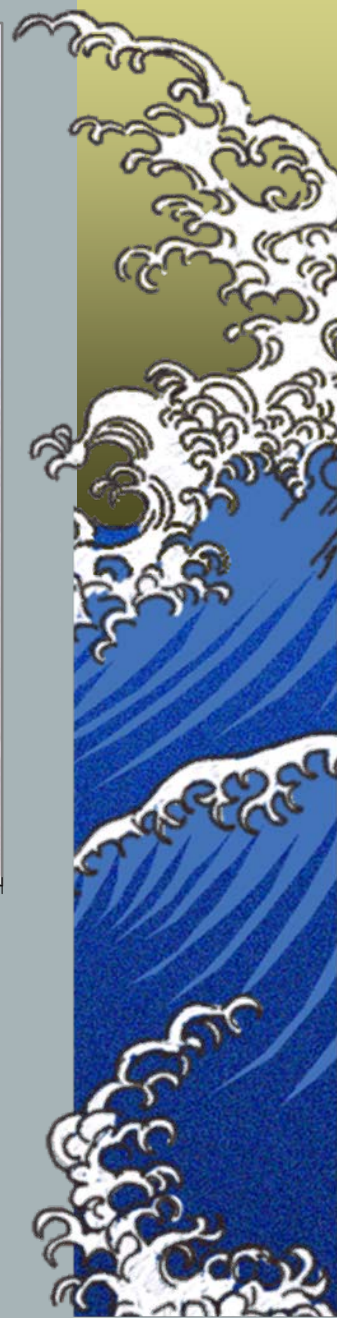
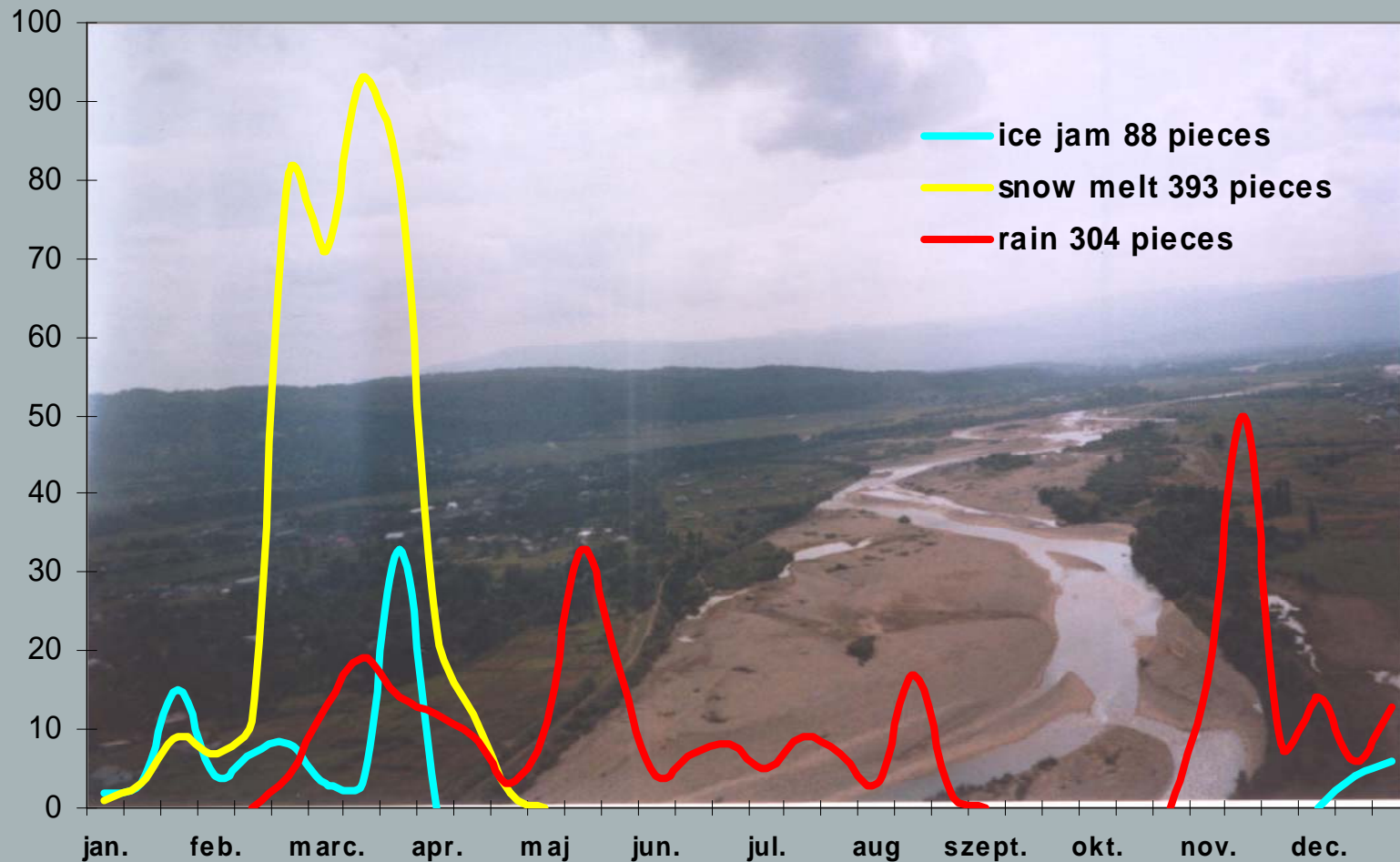
From 1168 data



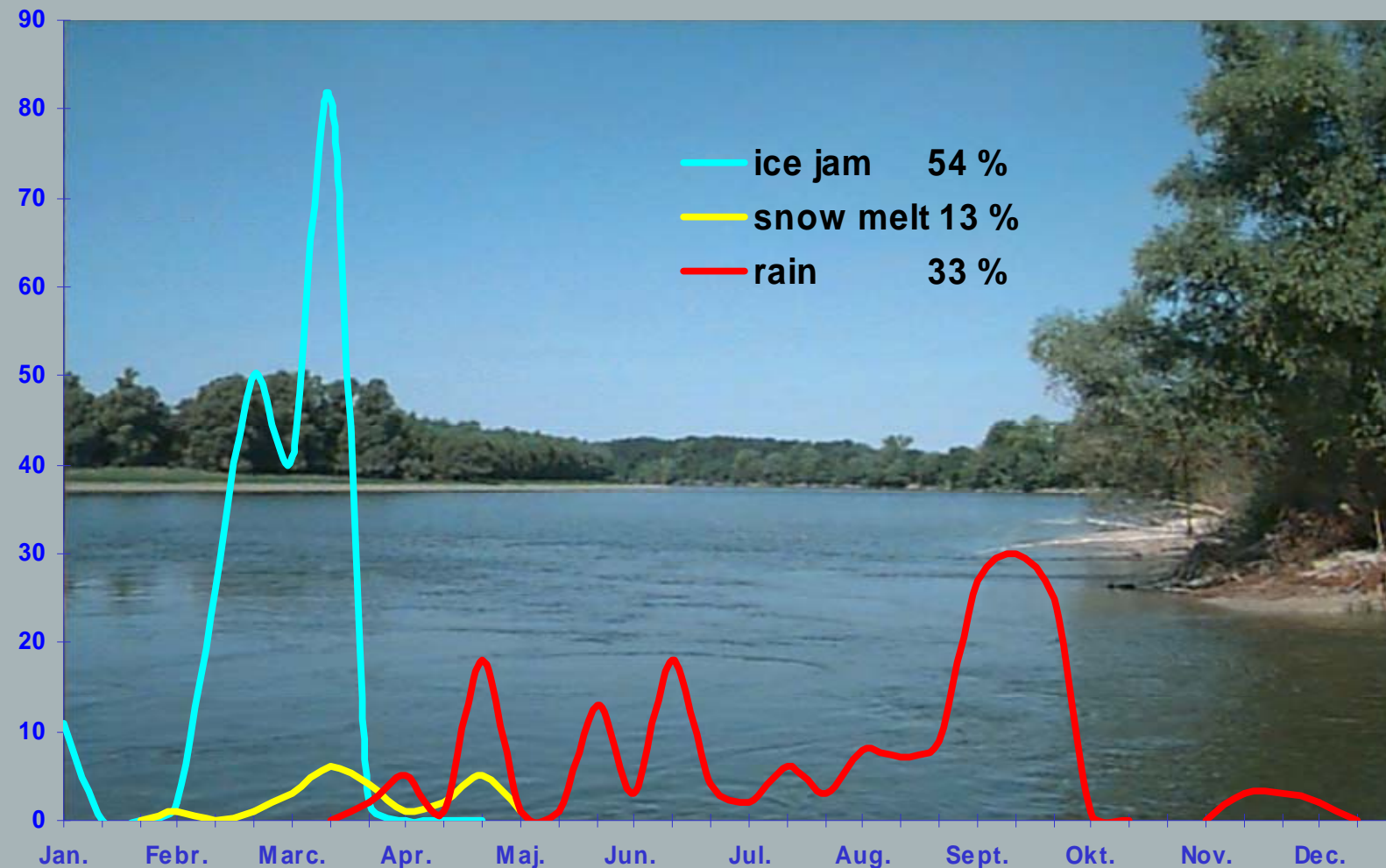


Carpathian basin dike breaches by ten days period

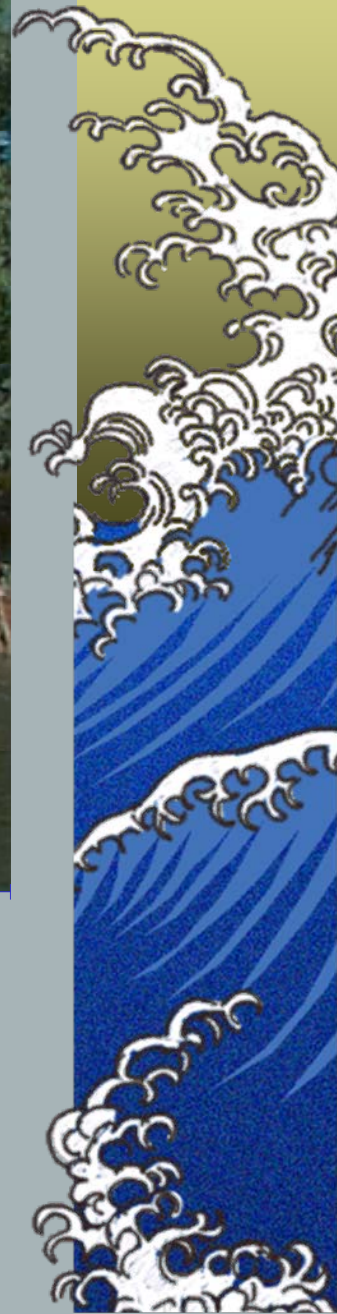




**Tisza-valley dike failures distribution
by ten days period**



**Duna-valley dike breaches
distribution by ten days period**



Dike breaches average length

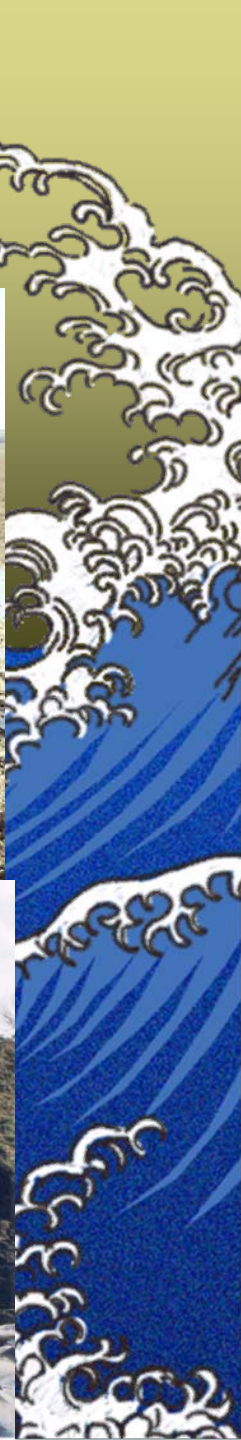
River	Q_{\max} (m ³ /s)	Length (m)
Danube	~10 000	110-130
Tisza	4000	100-115
Tributaries	600-3000	50-70
Small rivers	<600	35



Slope slides along Tisza right bank, Tarpa-Tivadar section in 2001



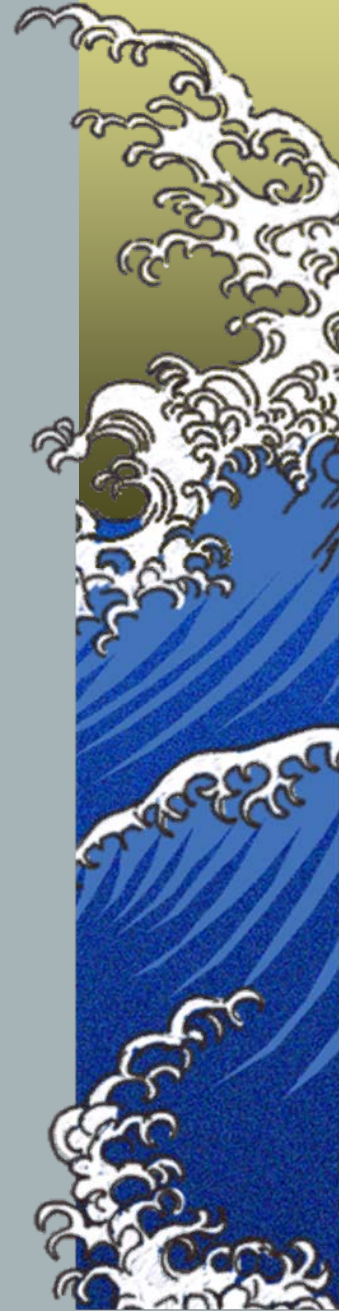
16 Slope slides
occured in a 2,700 m section
in 3,5 hrs!



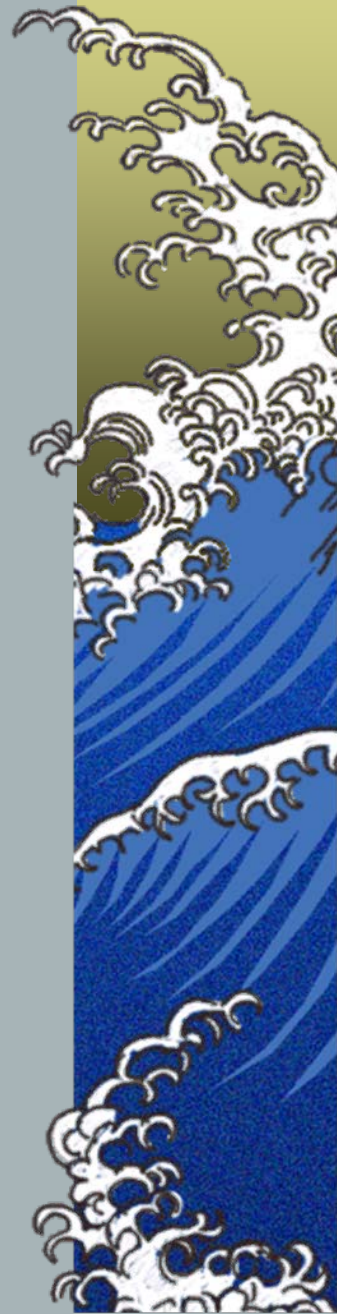
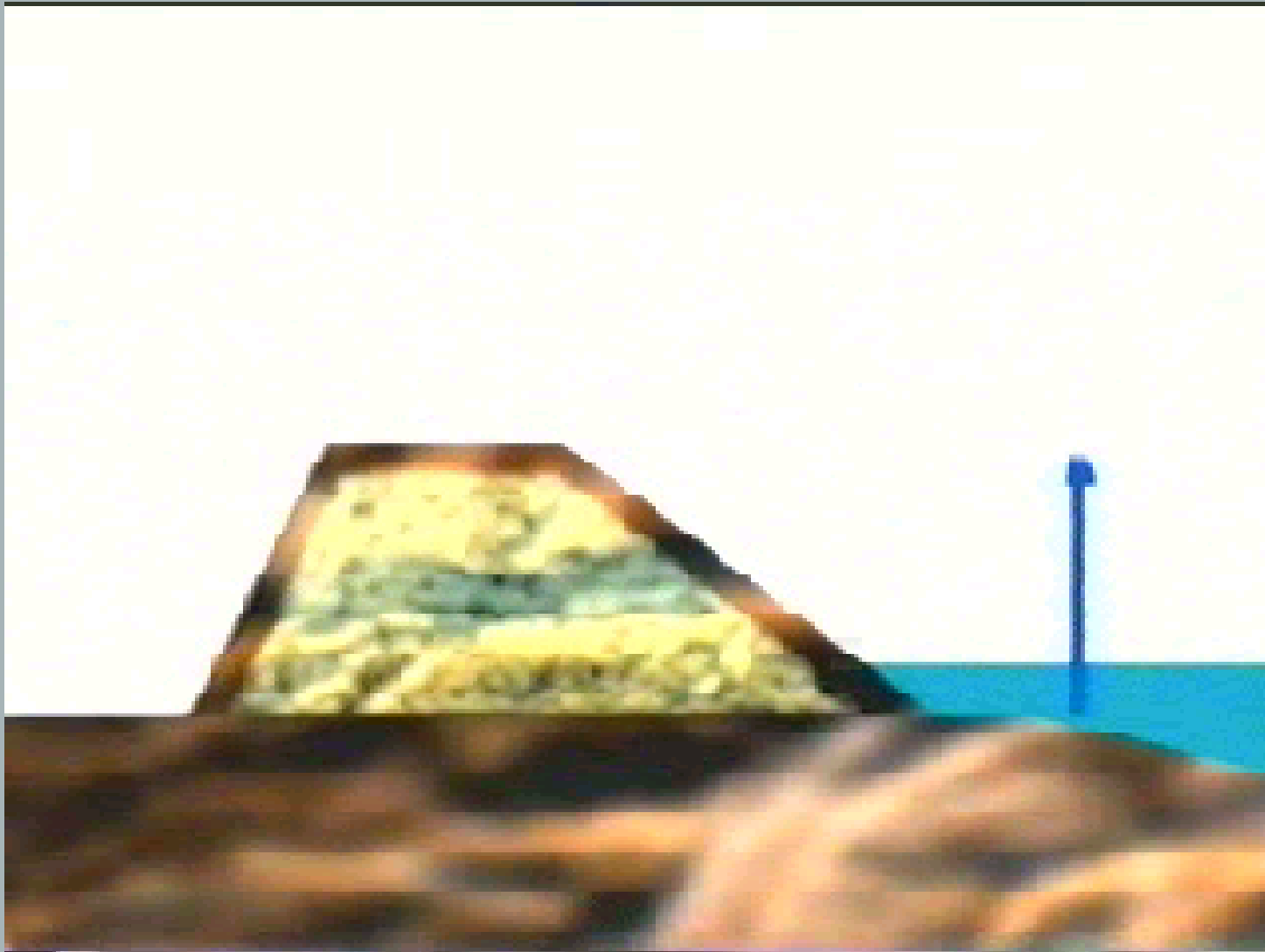
The largest piping in Middle-Europe Tiszasas



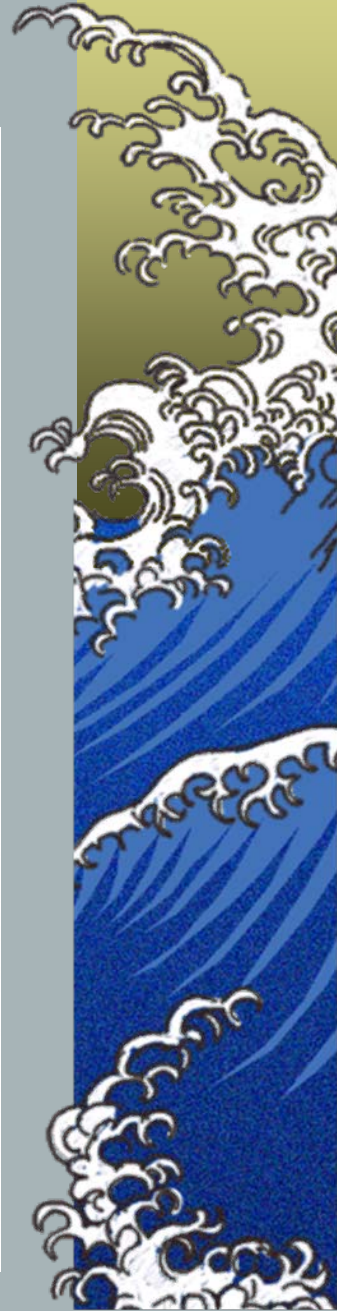
Piping in Nagyrév (at Tisza River)



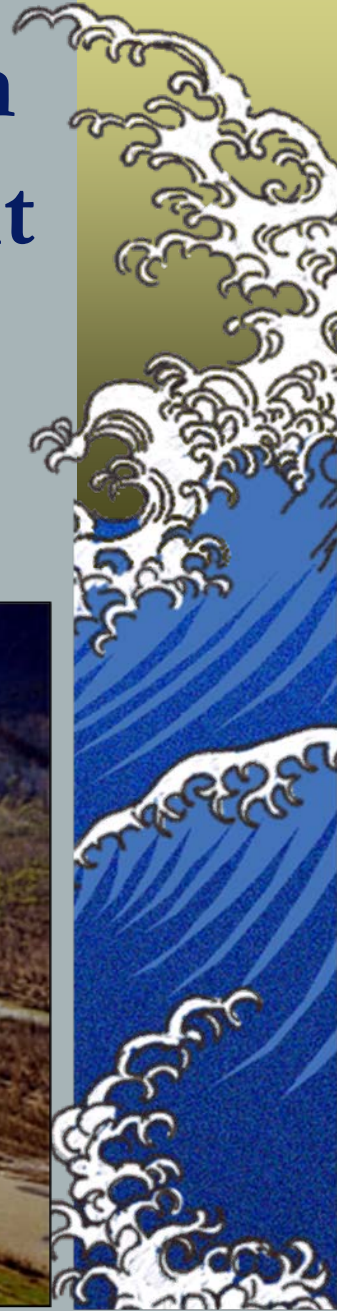
Levee breach, River Tisza right bank, Tarpa - Tivadar section



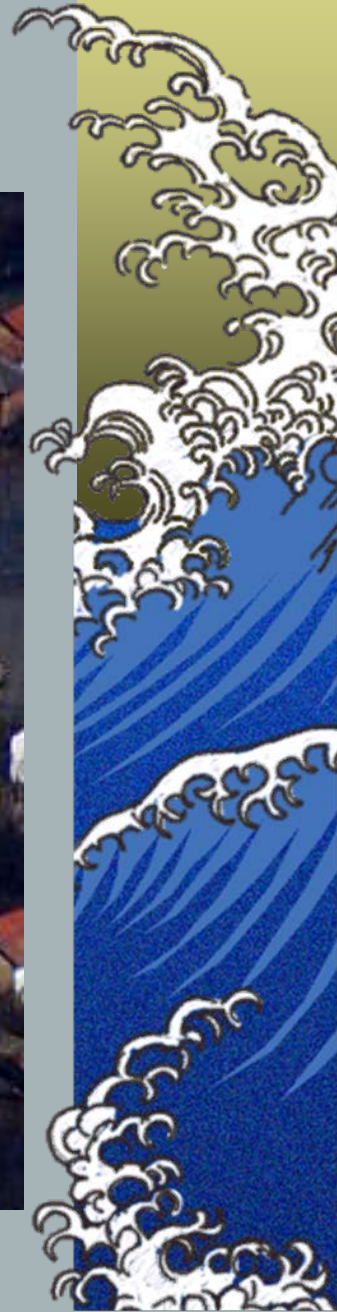
Dike breach management after failure in 2001



Dike breach management in Ukraine



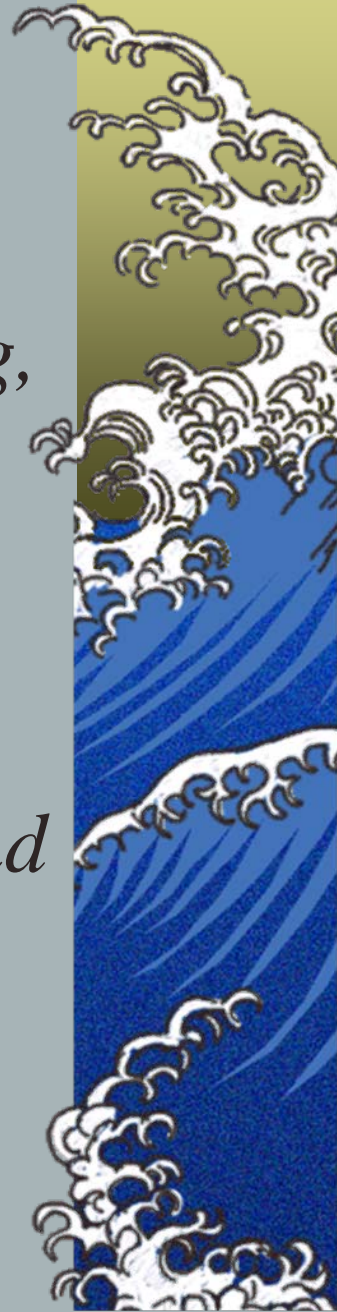
Inundation in Tákos (Hungary)



Conclusion:

Usable information for the flood risk mapping,

- ▶ *Length of the breach,*
- ▶ *The damages, Loss of life,*
- ▶ *Verifying the the inundation model,*
- ▶ *Correlation between the soil parameters and other breach parameters, etc.*



**Thank you, for your kind
attention!**

