

Evaluation of temporal variation of the discharge and physico-chemical parameters of Boltív Spring (Budapest, Hungary)

ISZA

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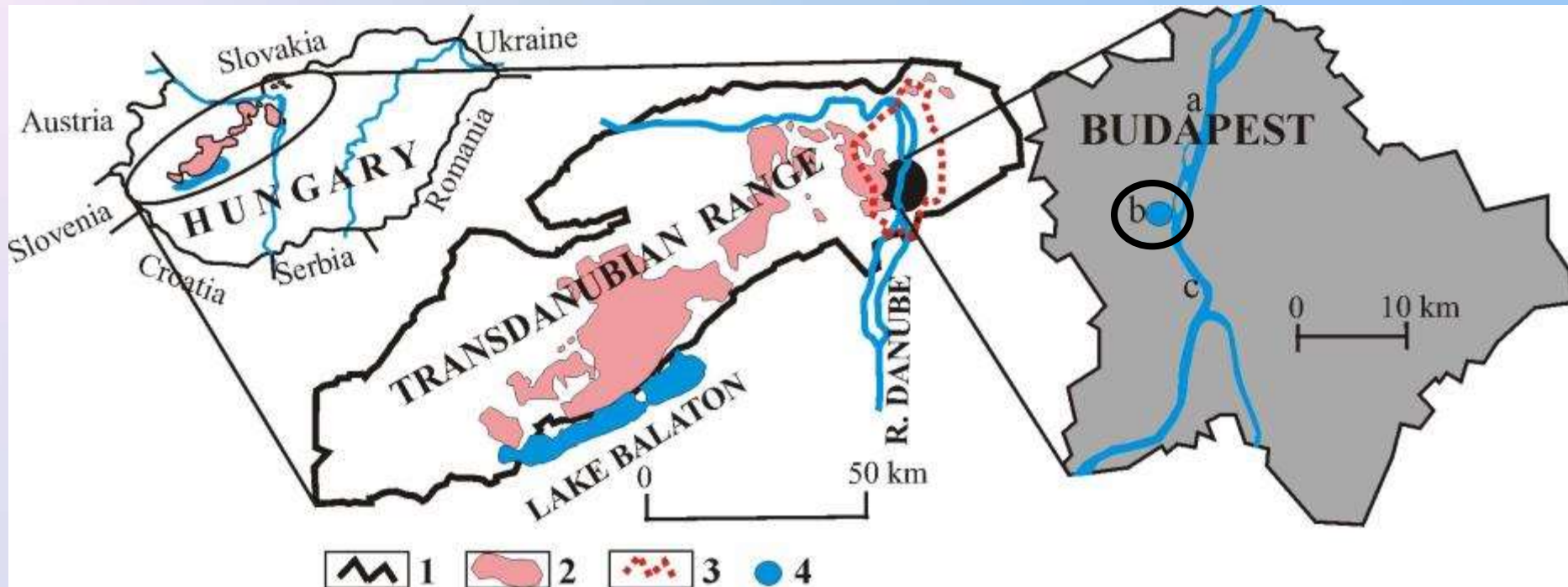
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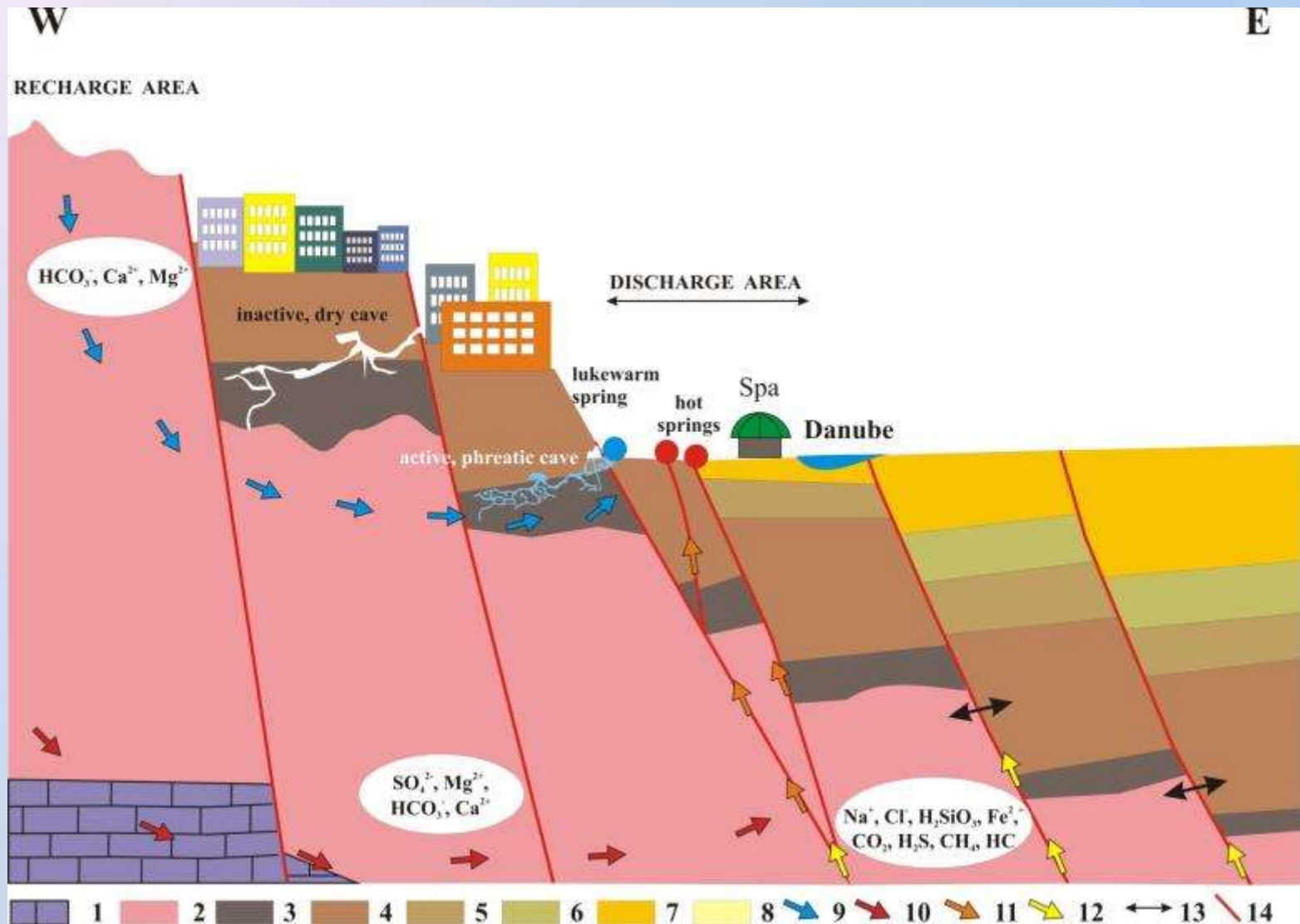
Location



Location of the Buda Thermal Karst System in the Transdanubian Range

1: Subsurface boundary of Mesozoic carbonates; 2: Uncovered Mesozoic carbonates; 3: Buda Thermal Karst System; 4: Boltív Spring

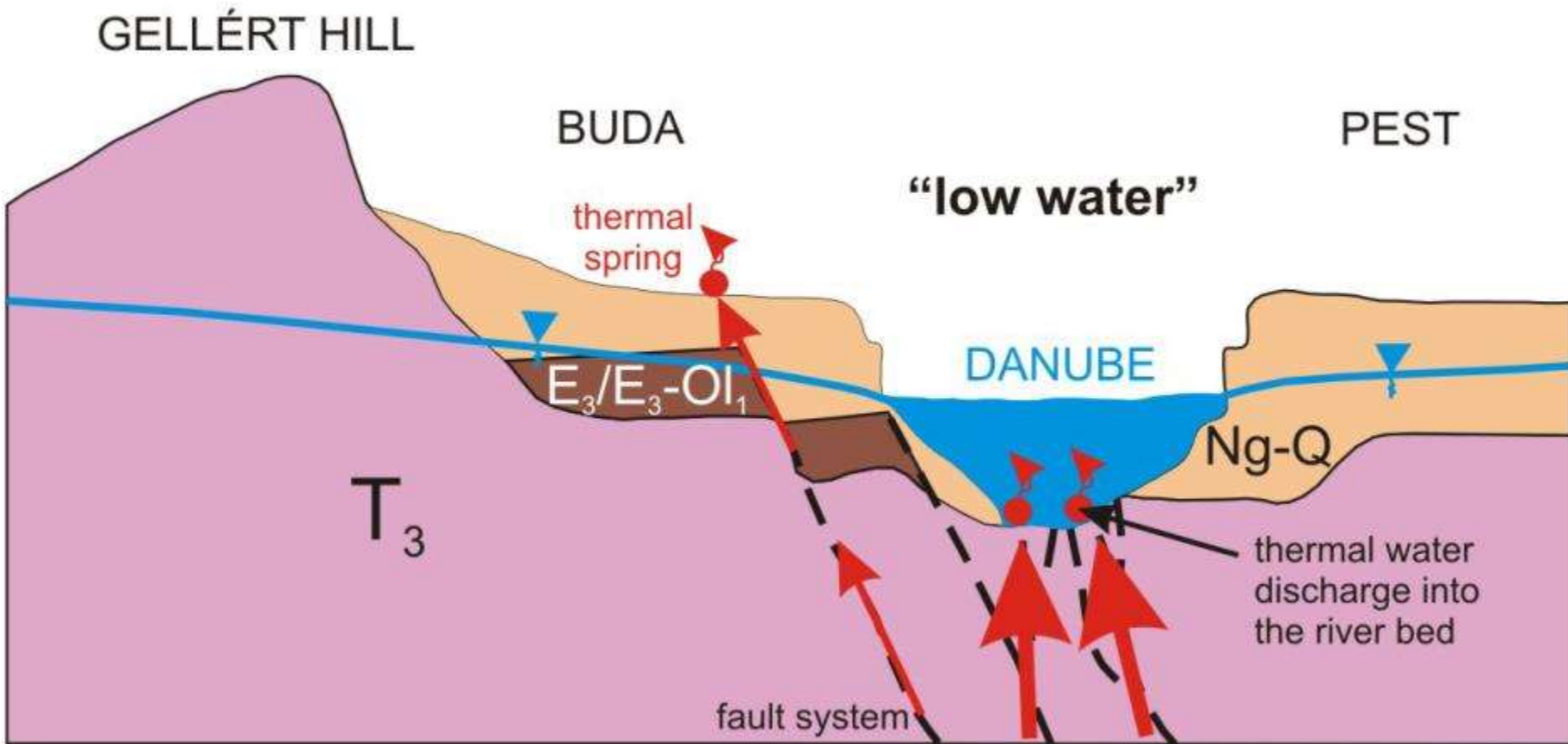
a: Northern discharge area; b: Central discharge area (Rózsadomb); c: Southern discharge area (Gellért Hill)



Conceptual flow model for the Rózsadomb discharge area (Erőss, 2010)

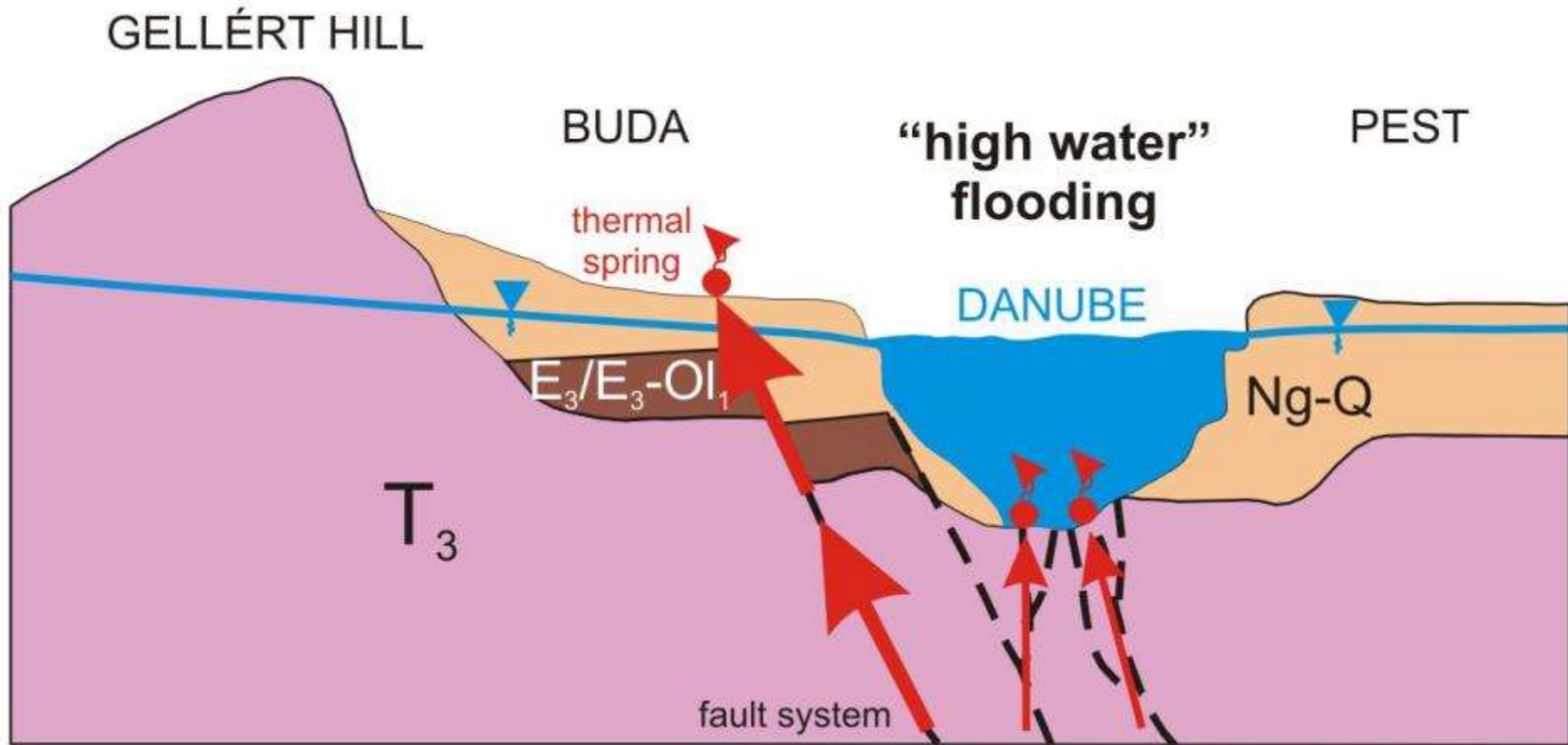
- 1: Permian-Lower Triassic evaporitic-carbonate strata; 2: Triassic carbonates; 3: Szépvölgy Limestone; 4: Buda Marl; 5: Tard Clay; 6: Kiscell Clay; 7: Miocene rocks; 8: Quaternary sediments; 9: local-intermediate flow system; 10: regional flow system; 11: regional and basinal fluids; 12: basinal fluids; 13: complex rock-water interaction; 14: structural elements

Aims



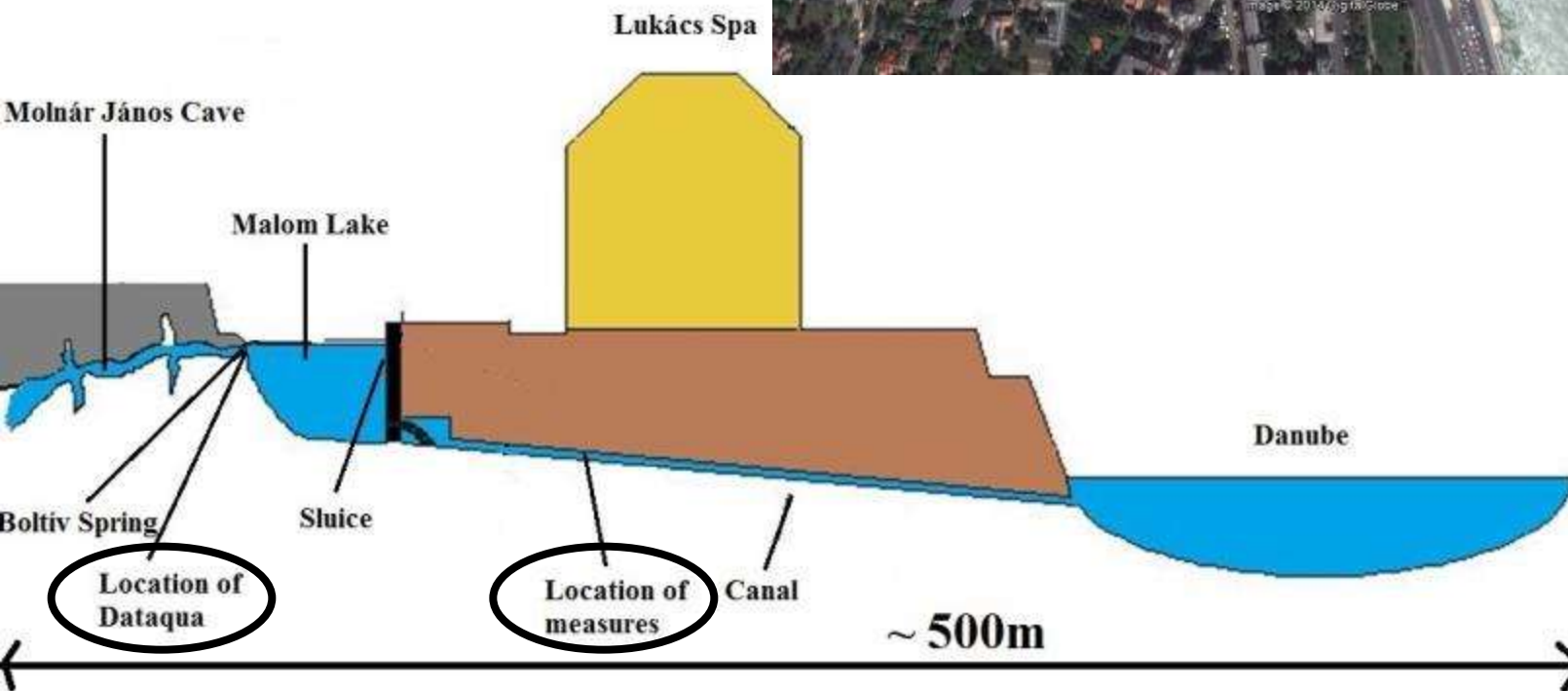
The hydraulic connection between the Danube and groundwater during „low water” conditions at the Gellért Hill (modified after Somogyi,2009)

Aims



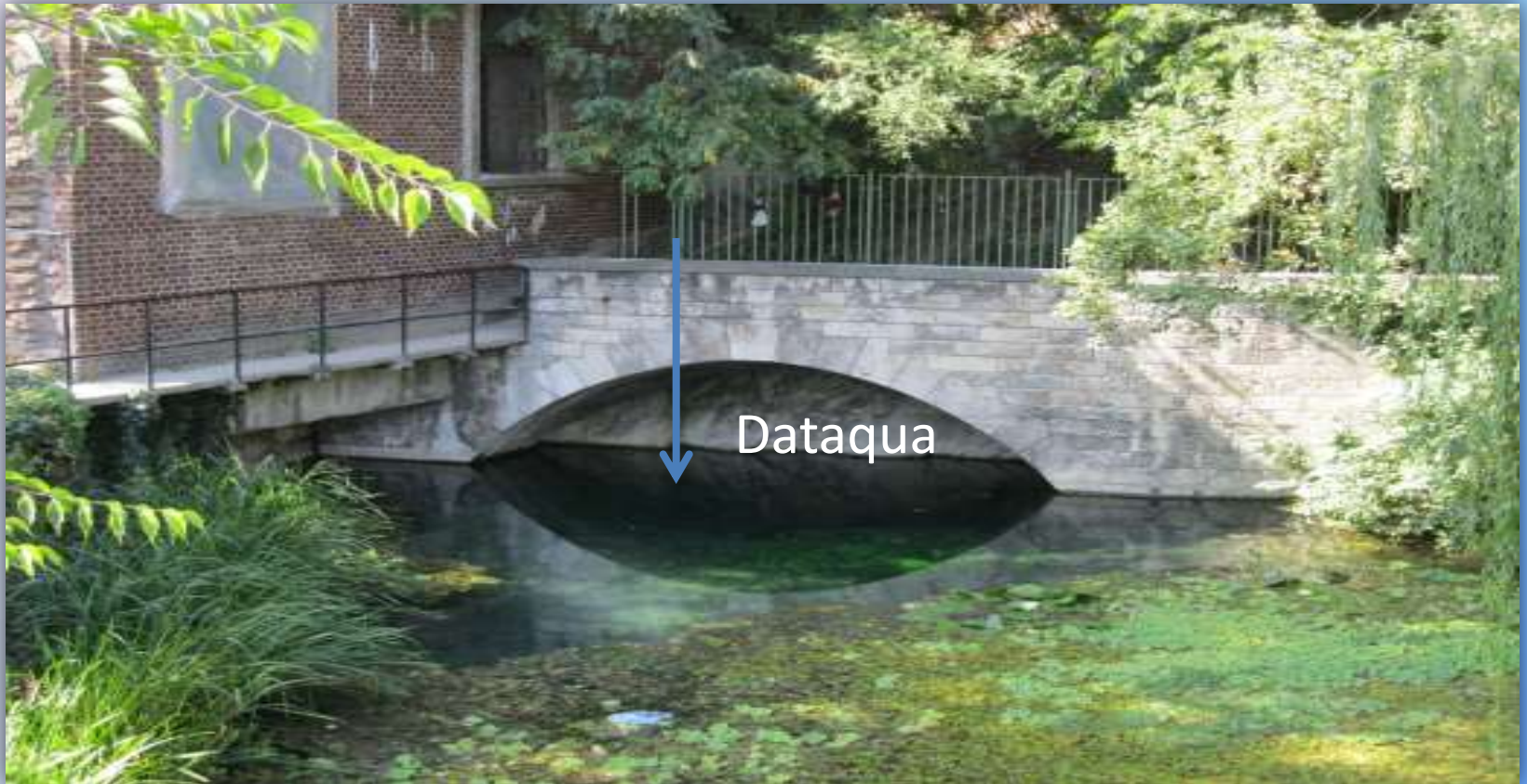
The hydraulic connection between the Danube and groundwater during „high water” conditions at the Gellért Hill (modified after Somogyi,2009)

Study site



Schematic cross section of the study site (modified after Mádlné et al., 2001)

Study site



Place of the Dataqua in the Malom Lake (Source: Wikipedia)

(Dataqua: continuous measuring device – water level, temperature, electric conductivity)

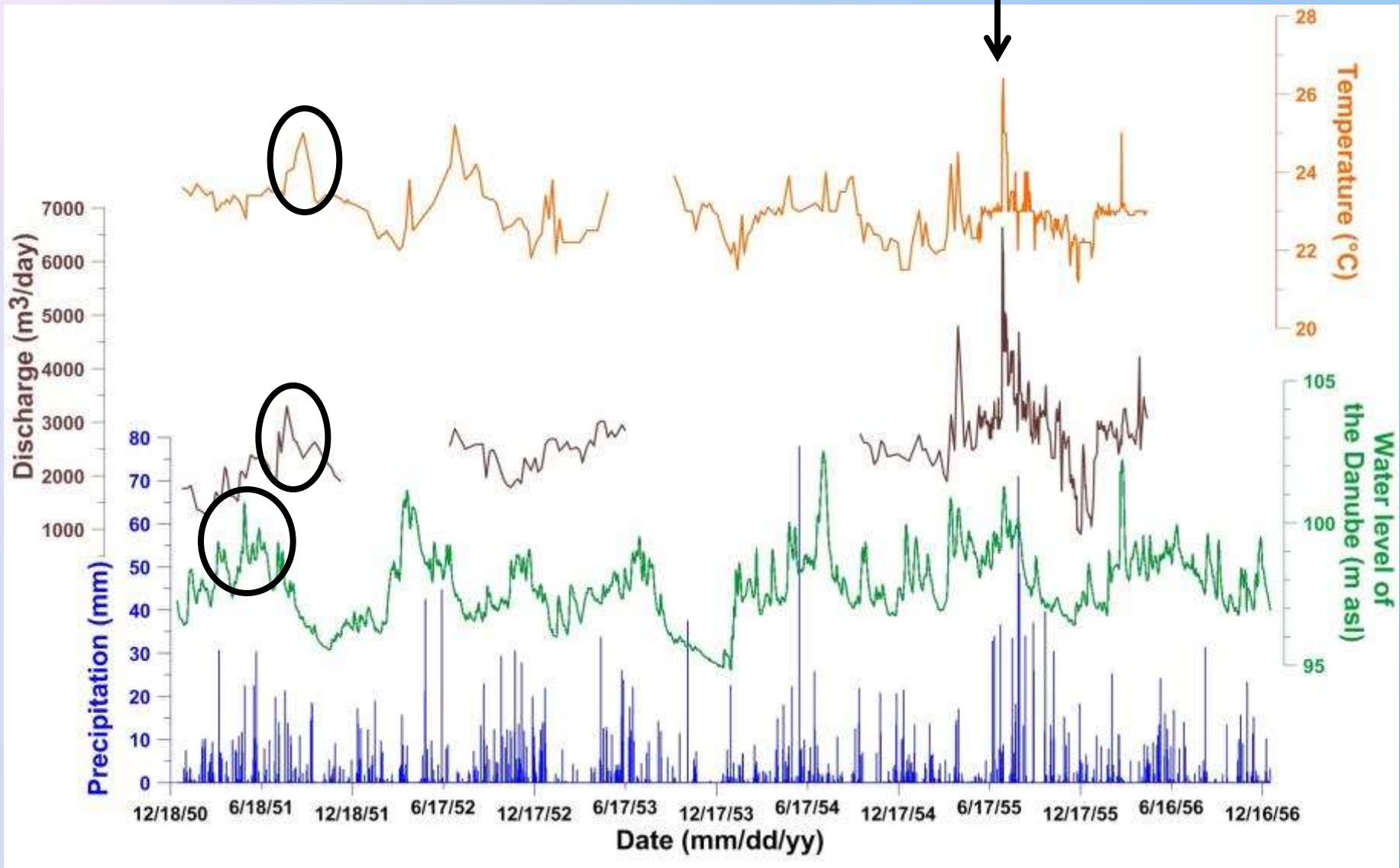
Used data

- 1951 – 1956 : discharge and temperature data
 - June 2001 – November 2001: discharge
 - October 2012 – June 2013: discharge, temperature, electric conductivity, pH (canal)
 - October 2012 – July 2013: water level of the Malom Lake, temperature, electric conductivity (Dataqua)
- + daily precipitation, water level of the Danube

Applied methods

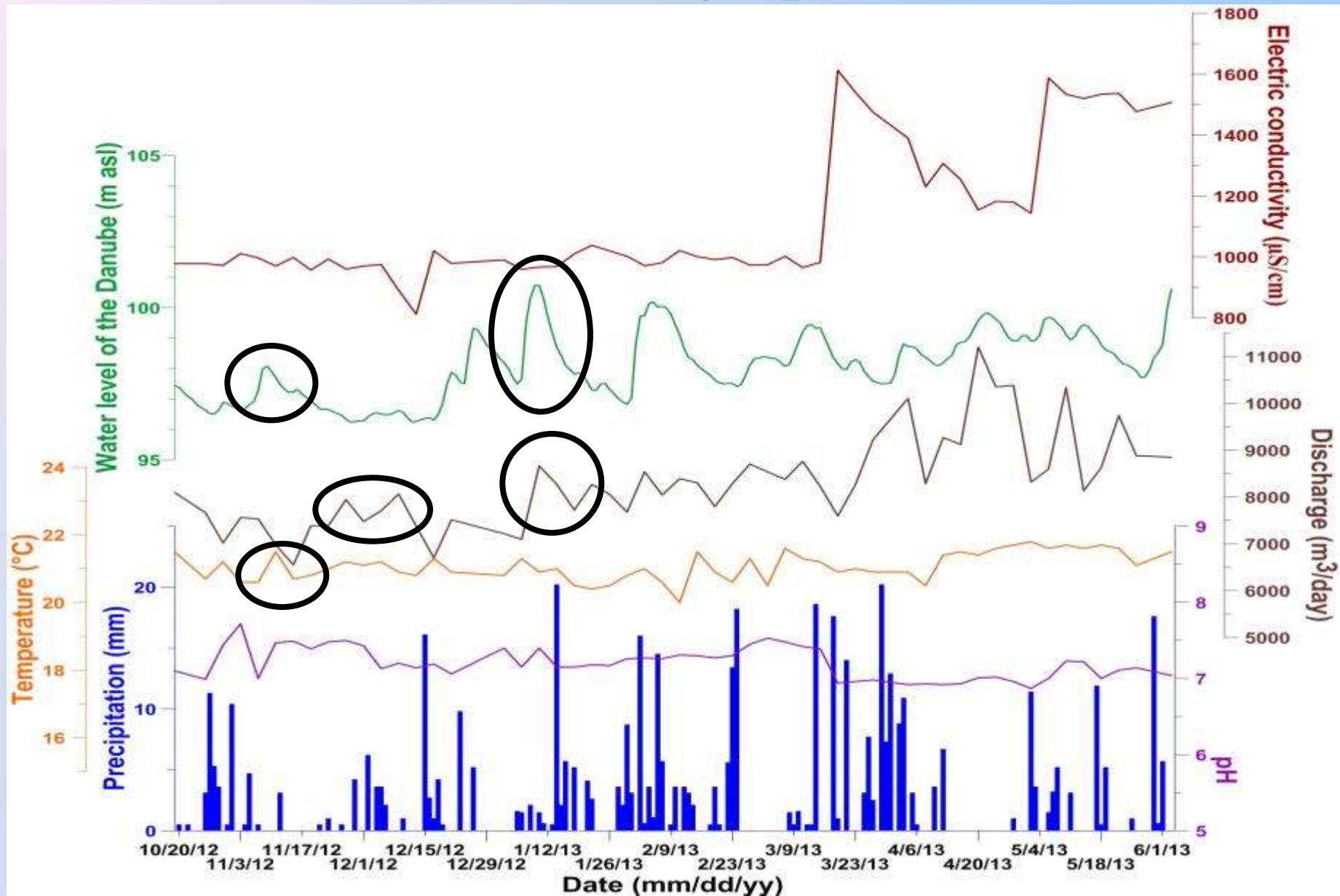
- Graphs
- Descriptive statistics
- Correlation
- Cross correlation

Results: graphs



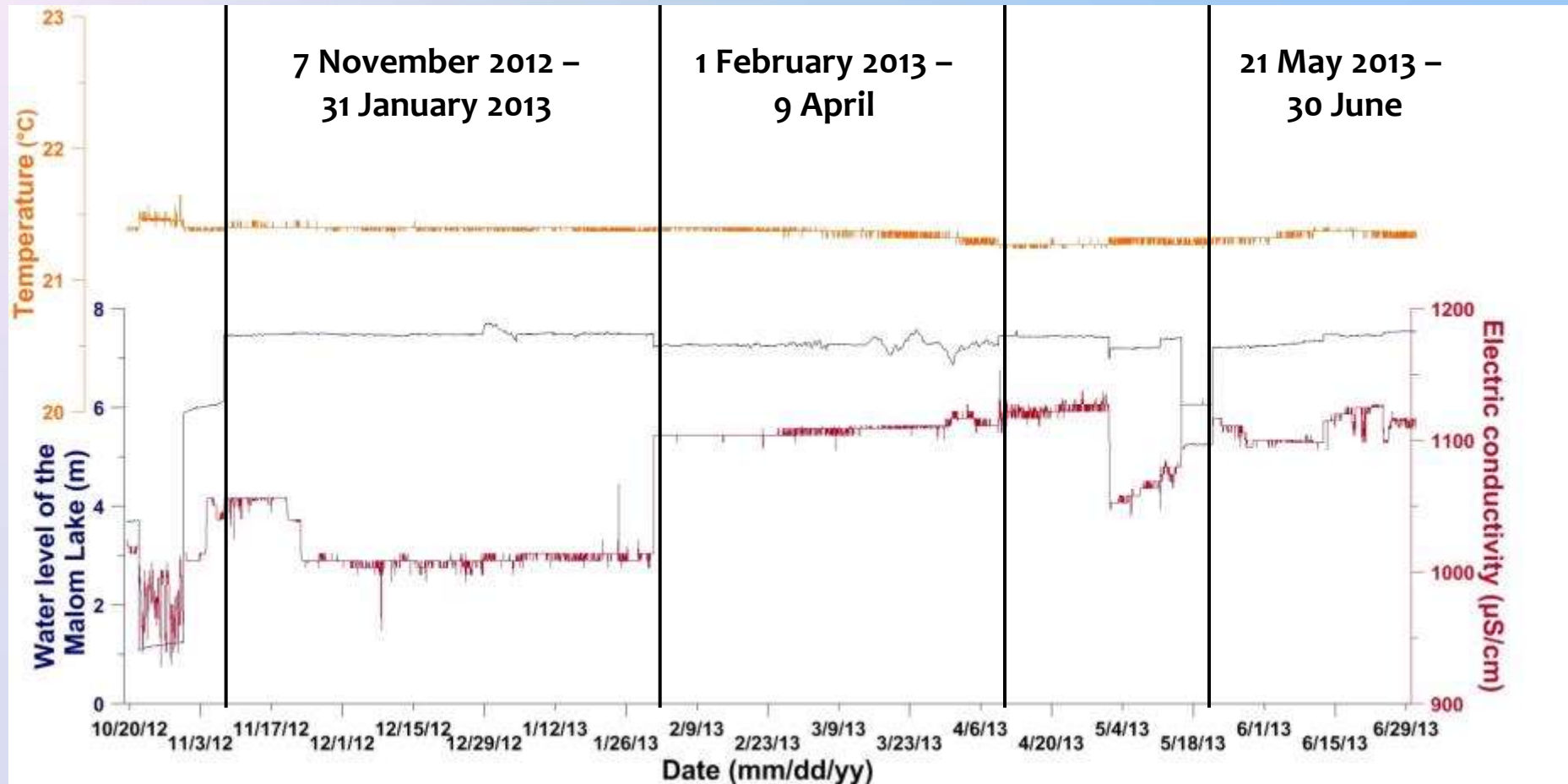
Graph from the archive data (source of data: Alföldi et al., 1968)

Results: graphs



Graph from the recent data

Results: graphs



Results: correlation

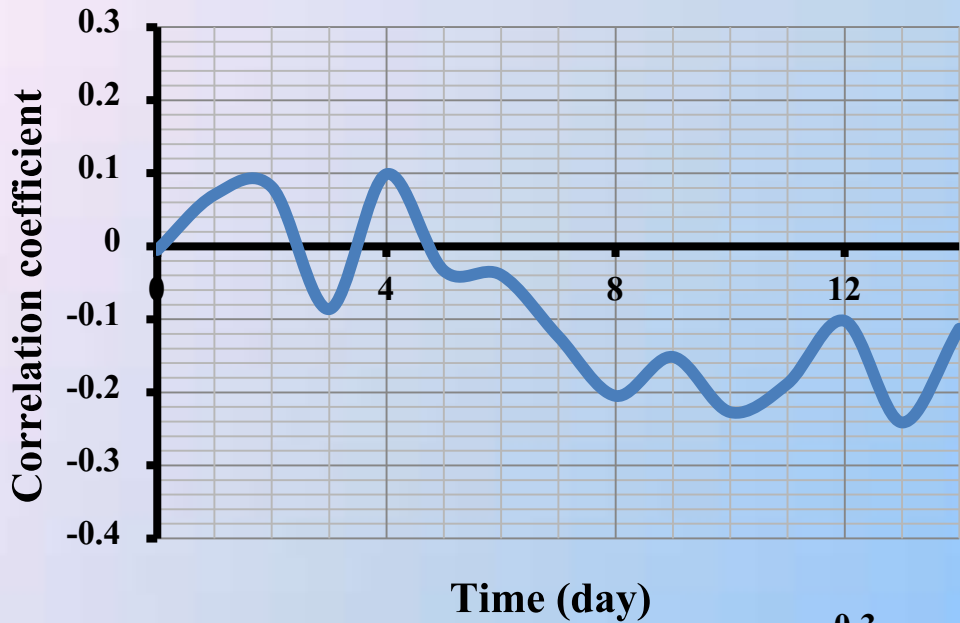
	Temperature (°C)	Discharge (m ³ /day)	Precipitation (mm)	Water level of the Danube (m asl)
Temperature (°C)	1			
Discharge (m ³ /day)	0,804	1		
Precipitation (mm)	0,012	0,110	1	
Water level of the Danube (m asl)	0,597	0,567	0,086	1

Correlation matrix of the archive data from May 1955 – August 1955

	Temperature (°C)	Discharge (m³/day)	pH	Electric conductivity (µS/cm)	Precipitation (mm)	Water level of the Danube (m asl)
Temperature (°C)	1					
Discharge (m³/day)	0,380	1				
pH	-0,220	-0,416	1			
Electric conductivity (µS/cm)	0,388	0,487	-0,544	1		
Precipitation (mm)	-0,099	-0,051	-0,155	-0,317	1	
Water level of the Danube (m asl)	0,290	0,589	-0,249	0,418	-0,009	1

Correlation matrix of the recent data

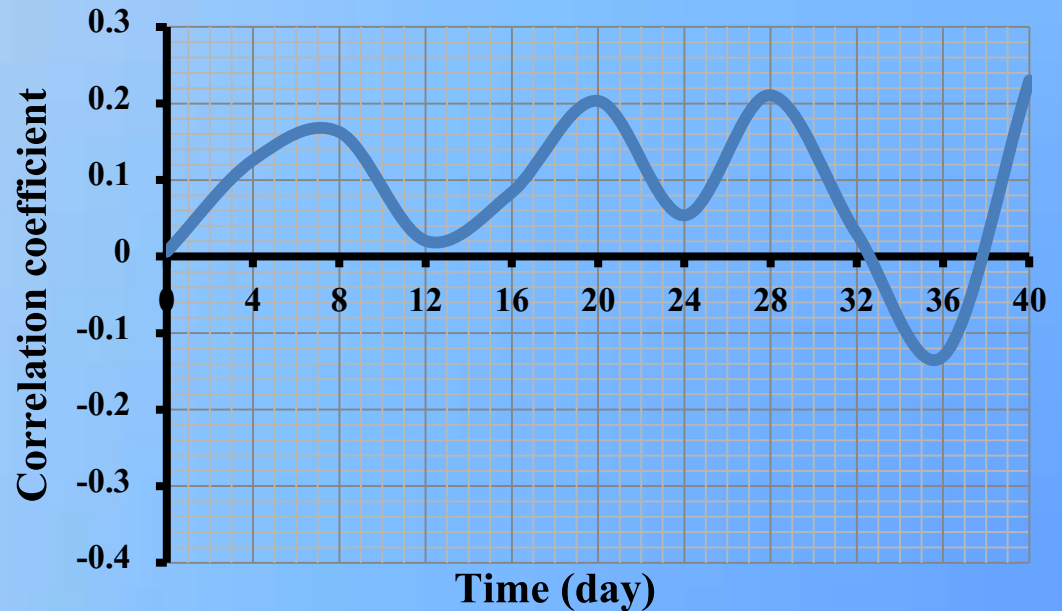
Results: cross correlation



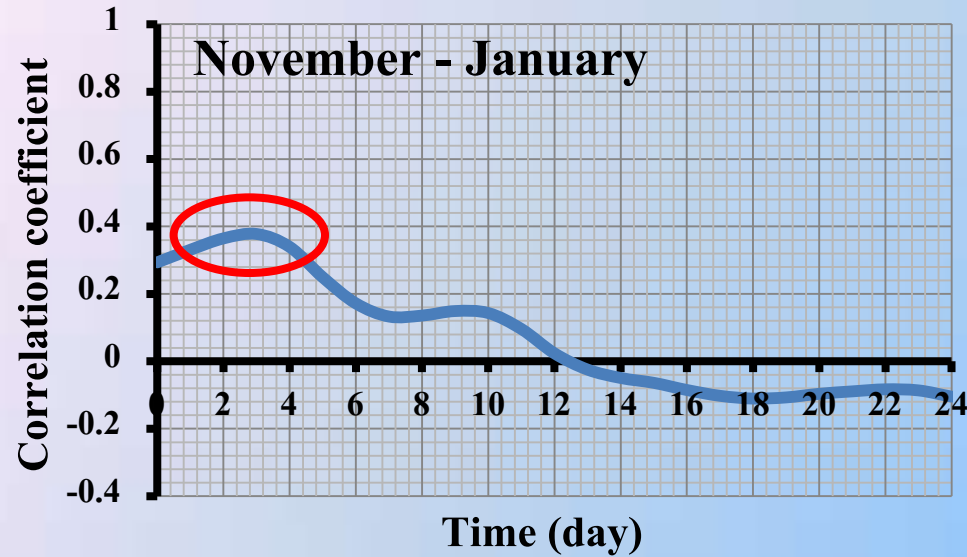
Precipitation & discharge

Archive data

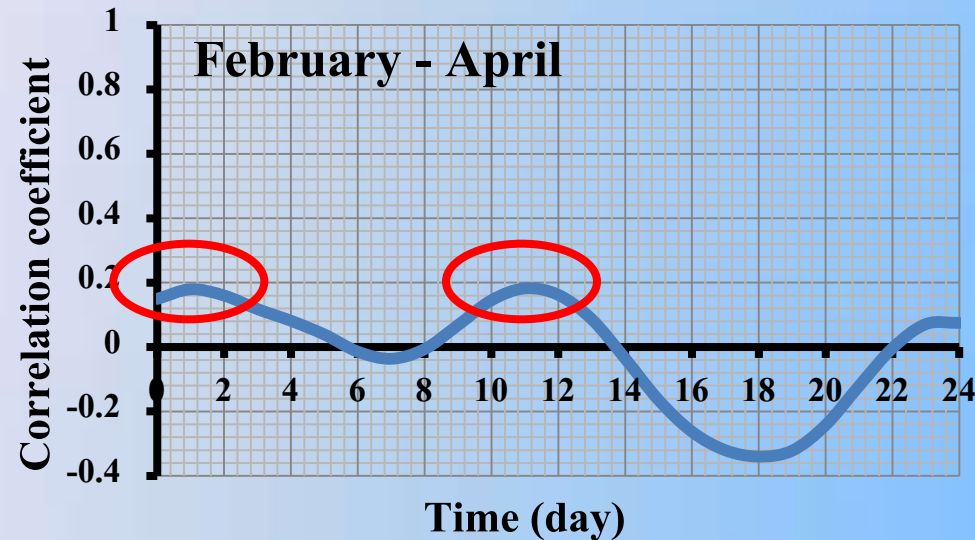
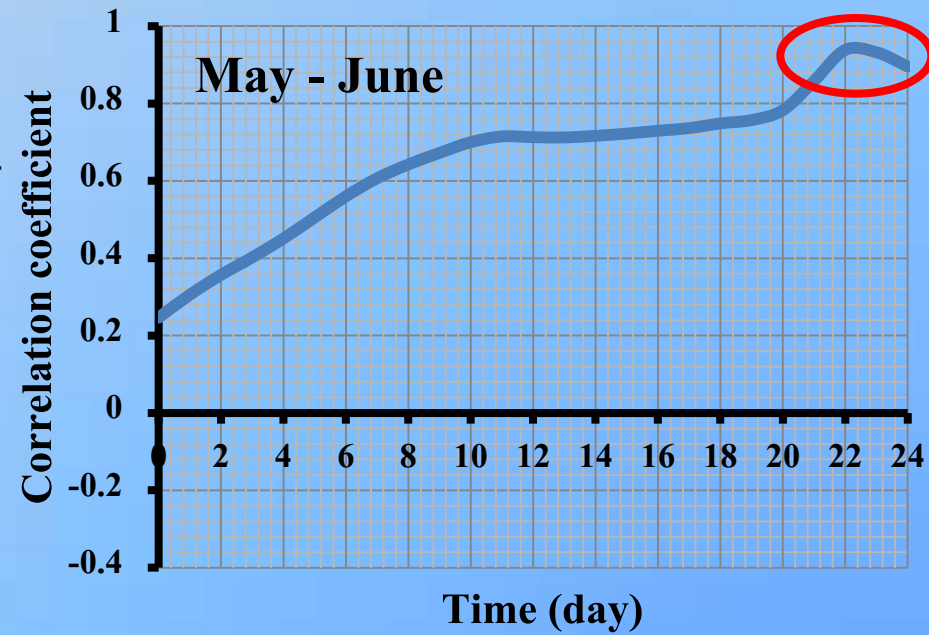
Recent data



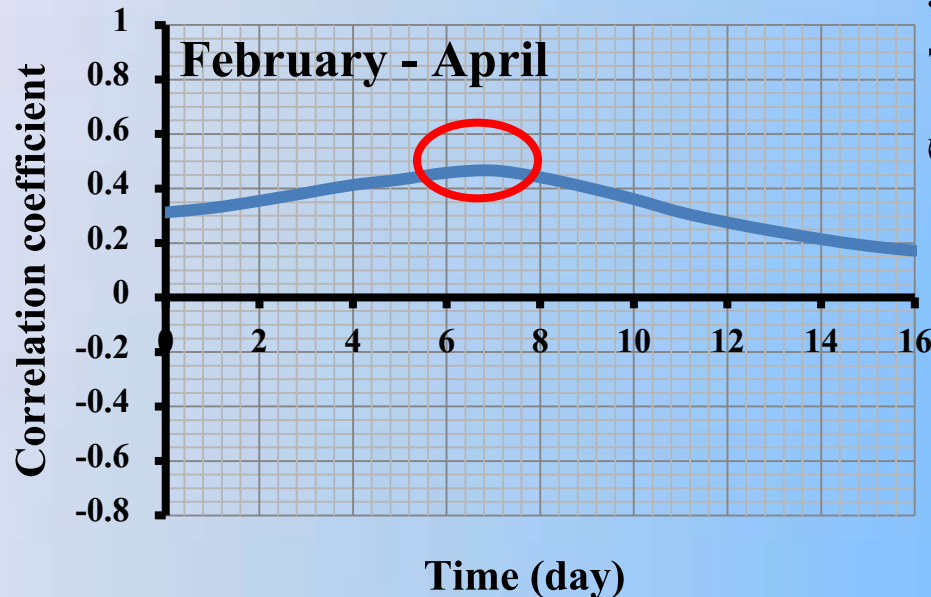
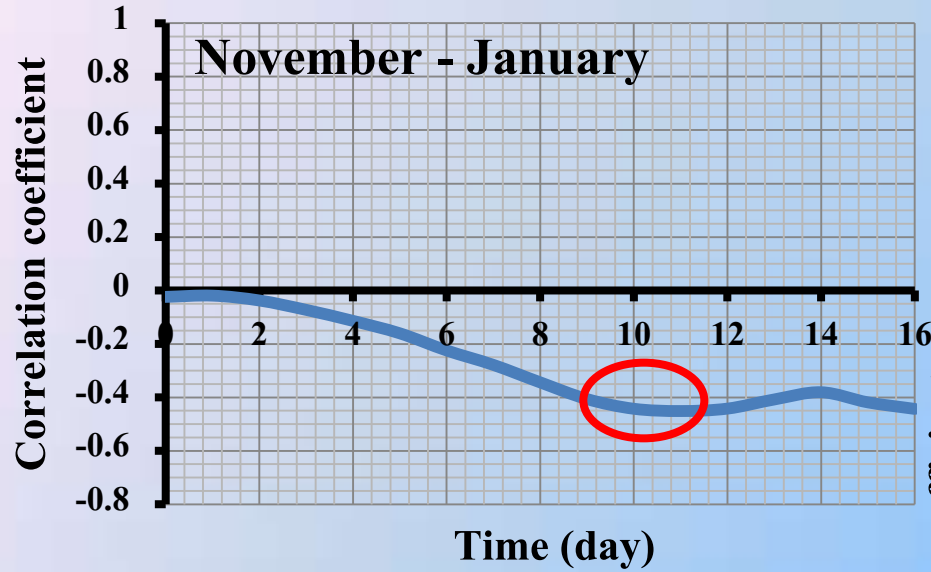
Results: cross correlation



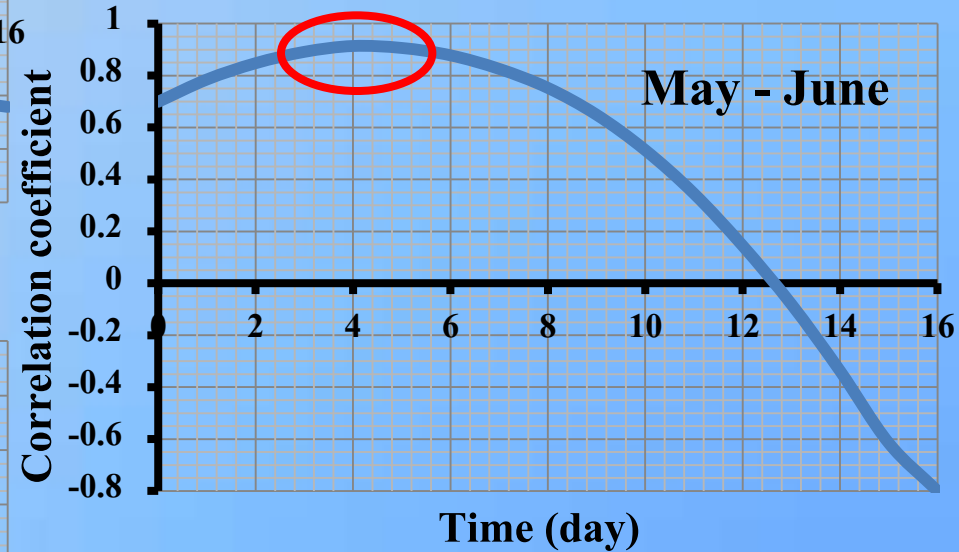
**Water level of the Danube &
water level of the Malom Lake**



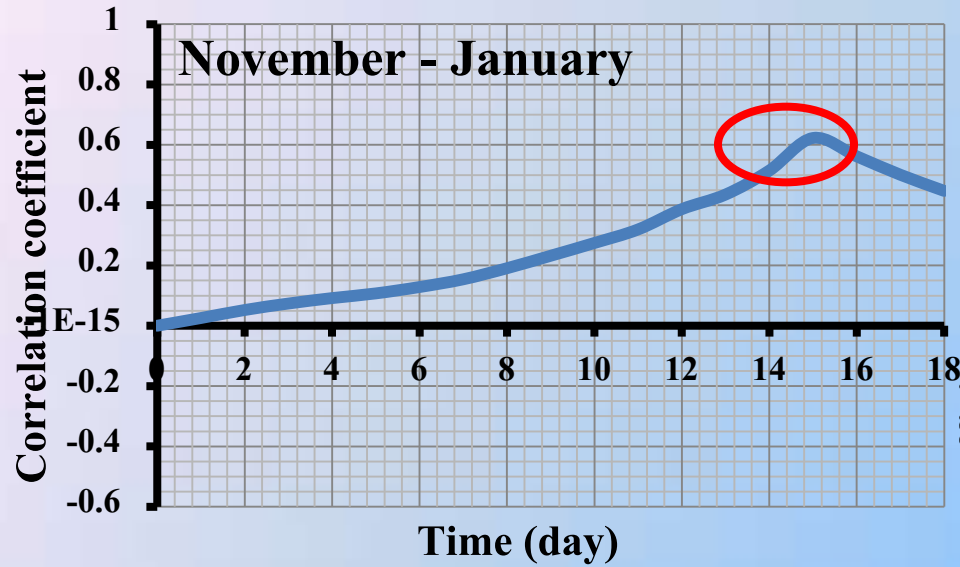
Results: cross correlation



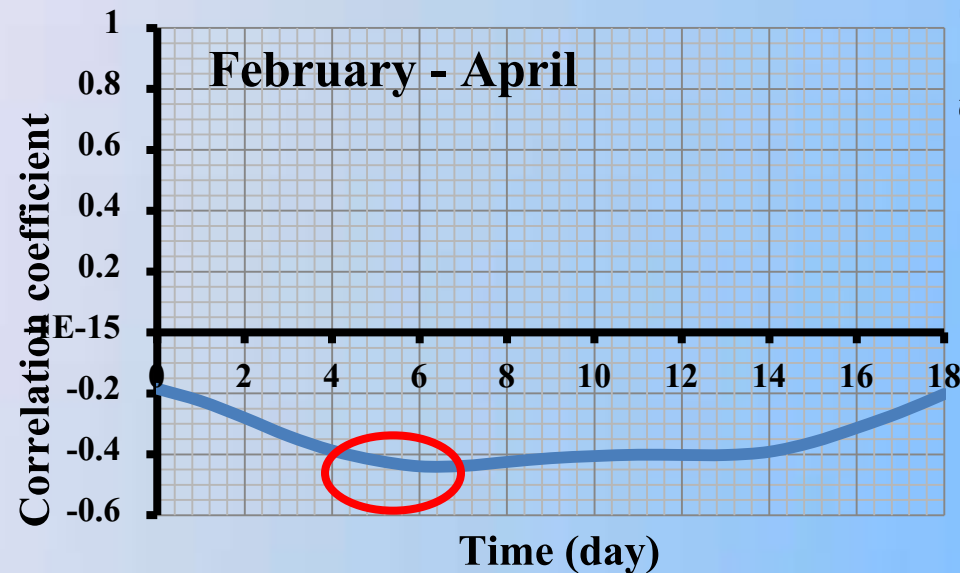
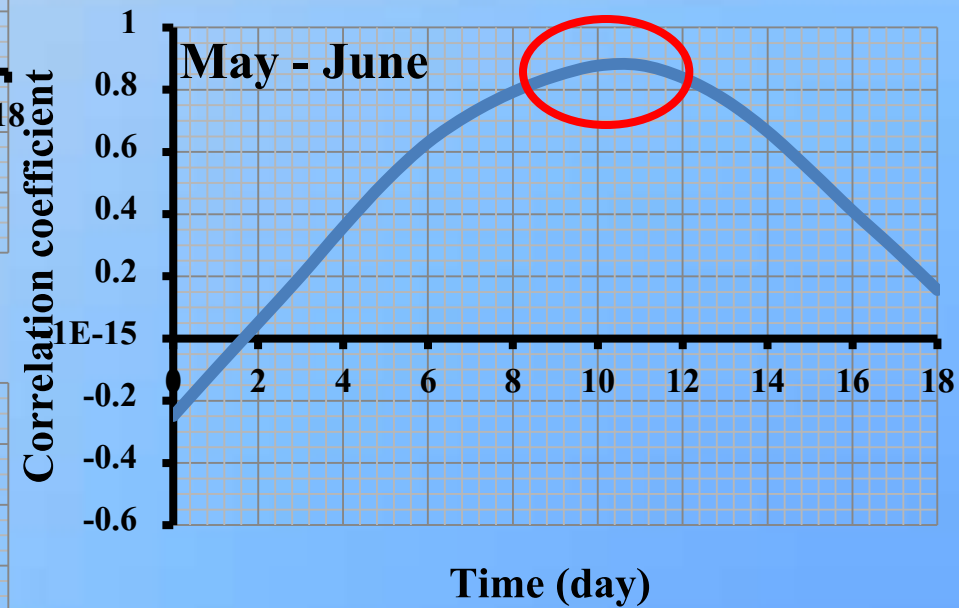
Water level of the Danube & water temperature



Results: cross correlation



**Water level of the Danube &
electric conductivity**



Conclusions

- Precipitation doesn't have a direct effect on the parameters
- The affect of the Danube changes during the year
- The Danube also has an affect further from the river
- The spring is economical and sustainable resource for geothermal usage

Acknowledgements

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Thank you for your attention!