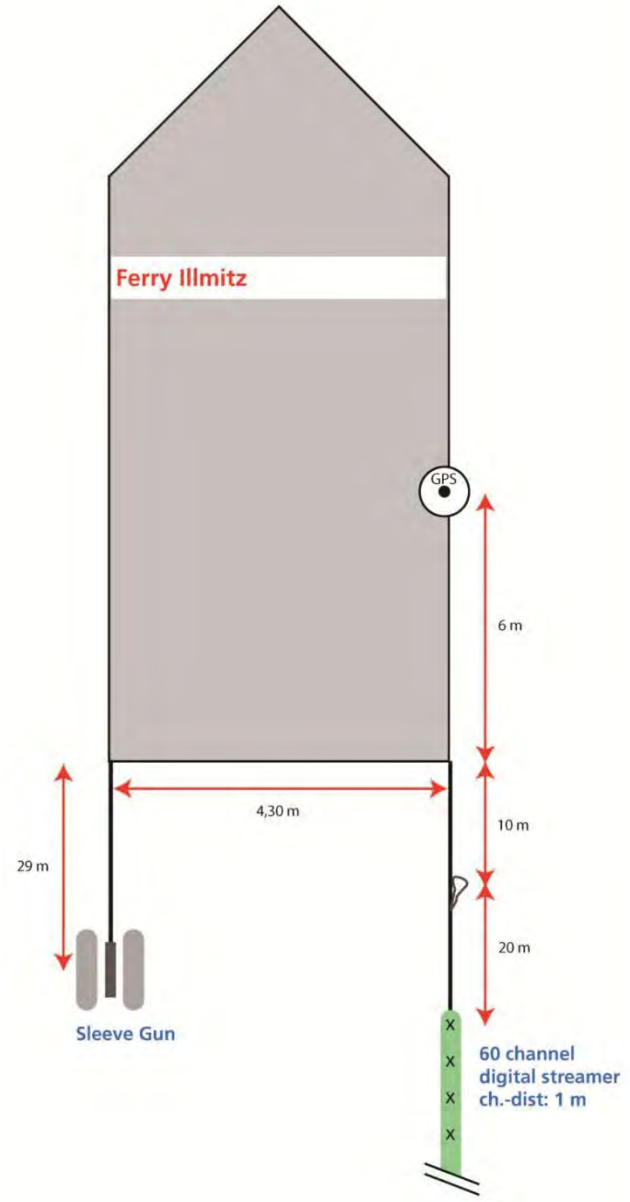
Entstehung und Entwicklungsgeschichte des Neusiedler Sees und der Lacken im Seewinkel

Erich Draganits, Michael Weißl & Bendeguz Tobias

universität wien

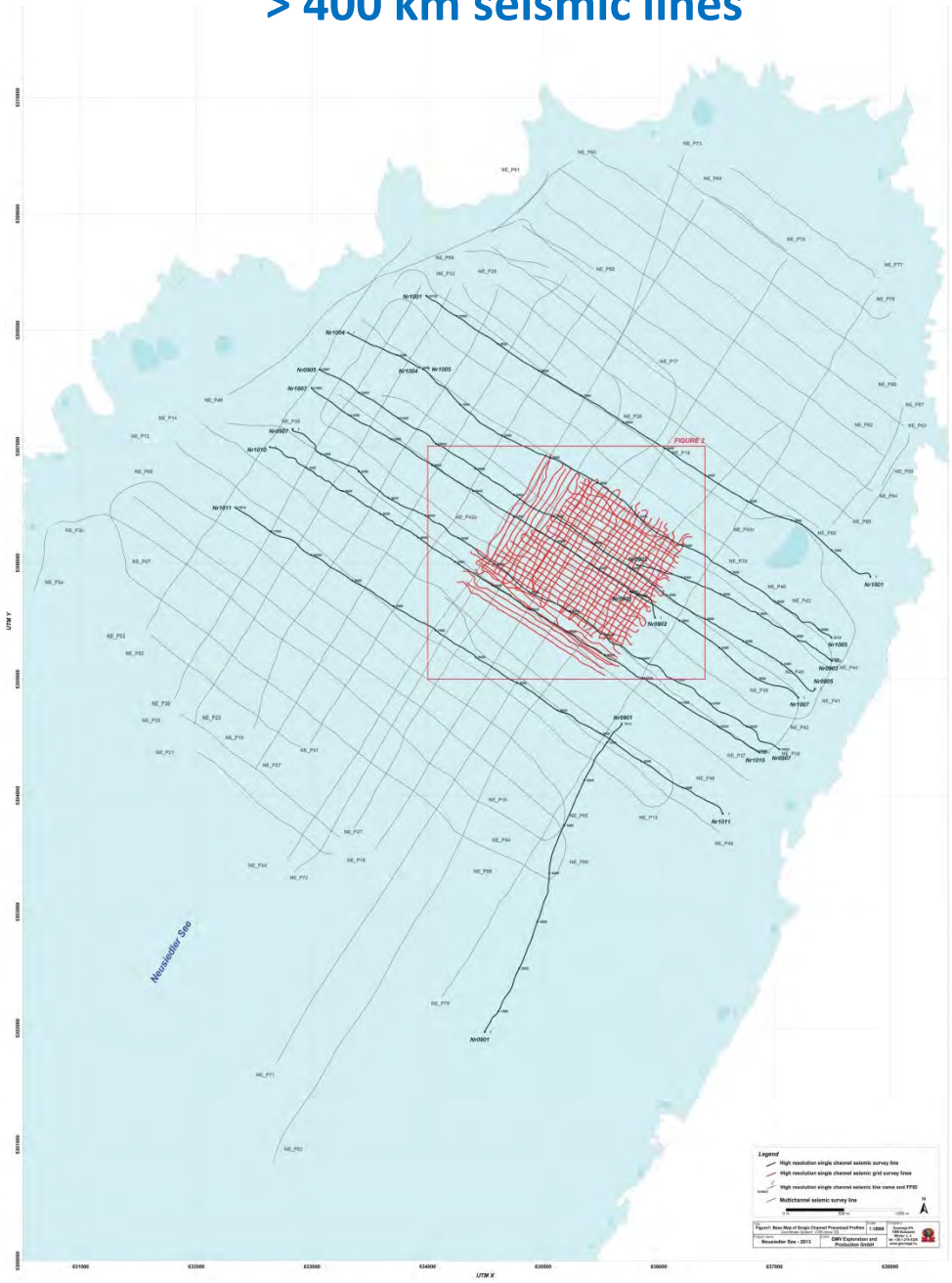
Lake formation

Lake seismic project OMV and University of Vienna, 2013



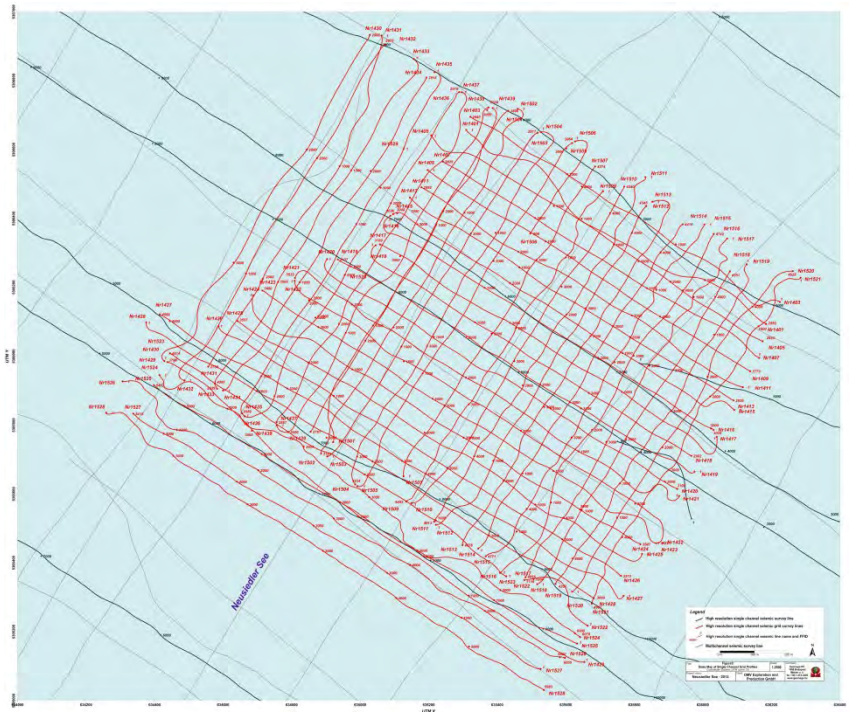
GEOMEGA
High Quality Geoservices
from ideas to implementation

> 400 km seismic lines

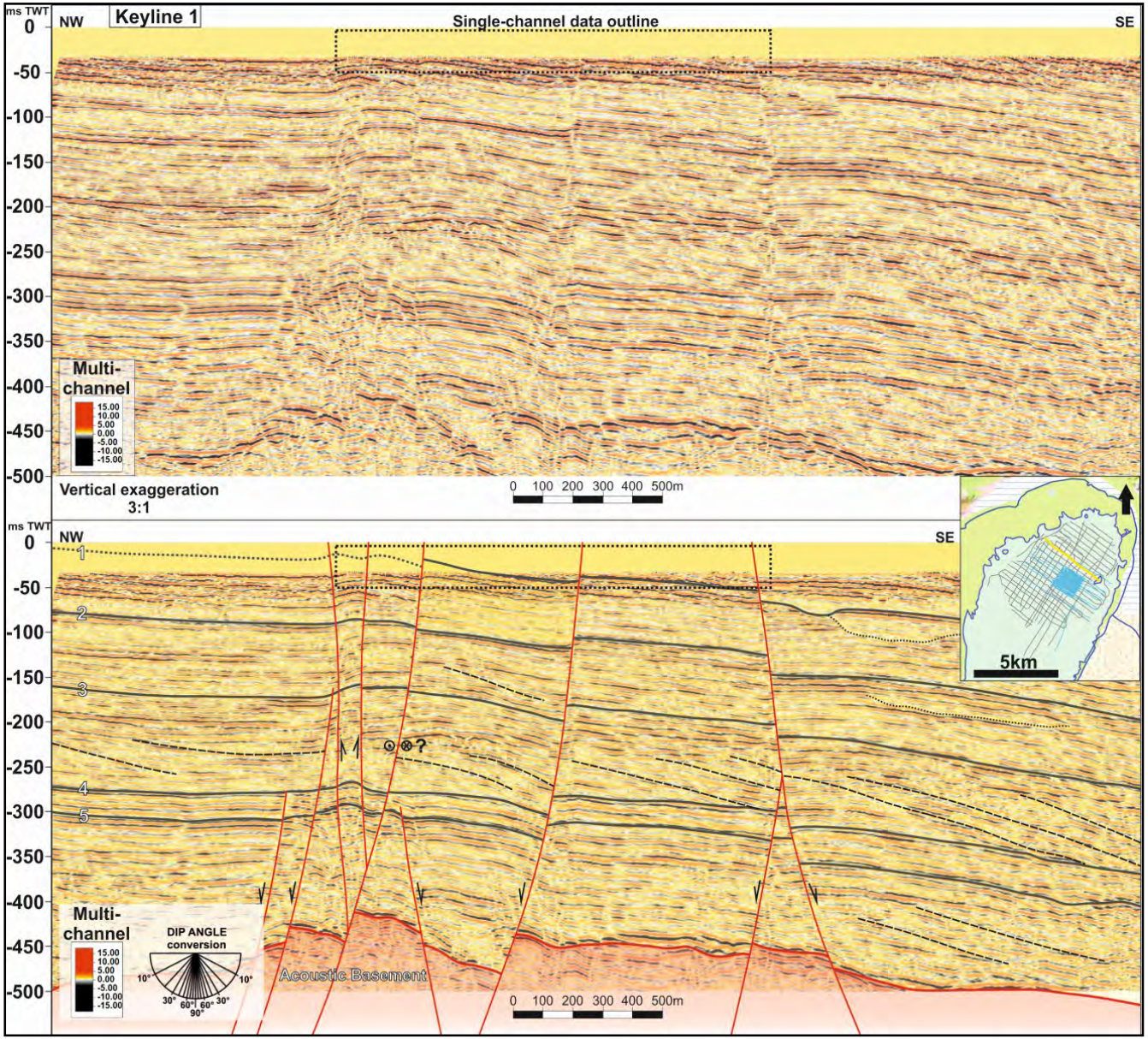


Multi-channel seismics, 500 m spacing

Single-channel seismics, 50 m spacing

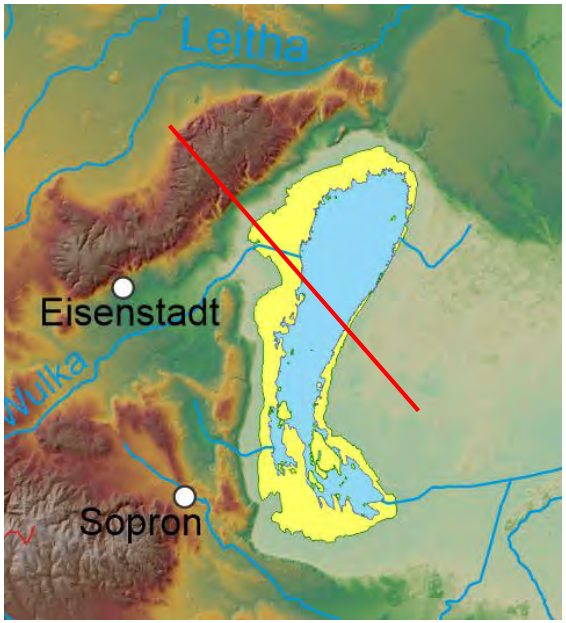


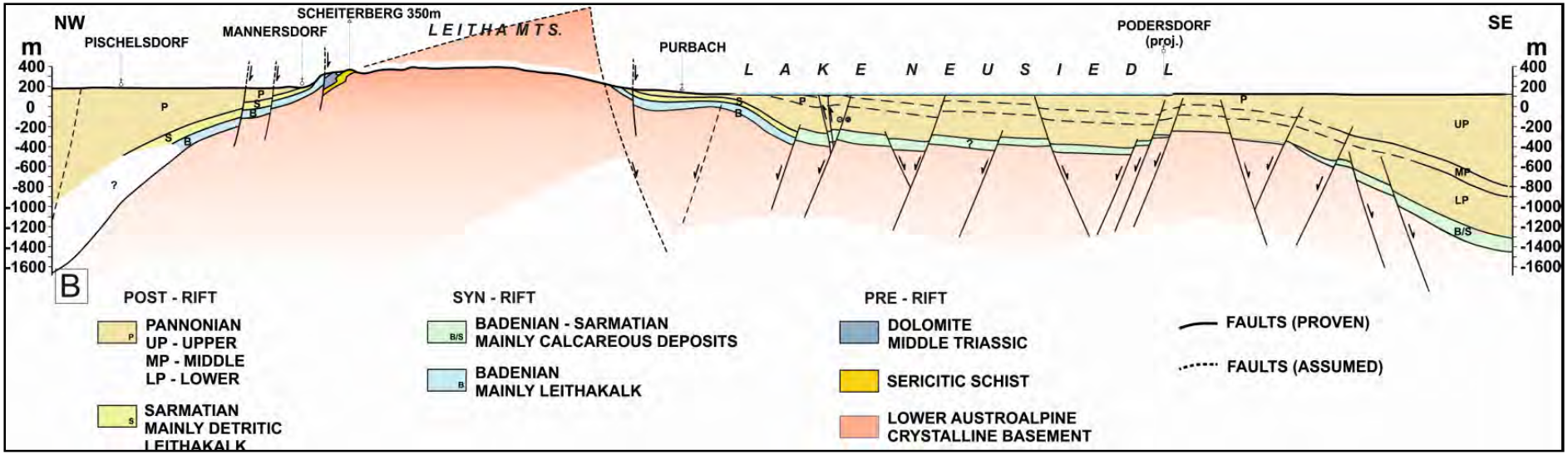
Multichannel lake seismic section (TWT)



Loisl et al. (2018)

NW-SE geological transect across Neusiedler See





Loisl et al. (2018)

Present- day Neusiedler See

Neusiedler See – present-day characterization

Catchment: 1120 km^2 (Wulka 384 km^2)

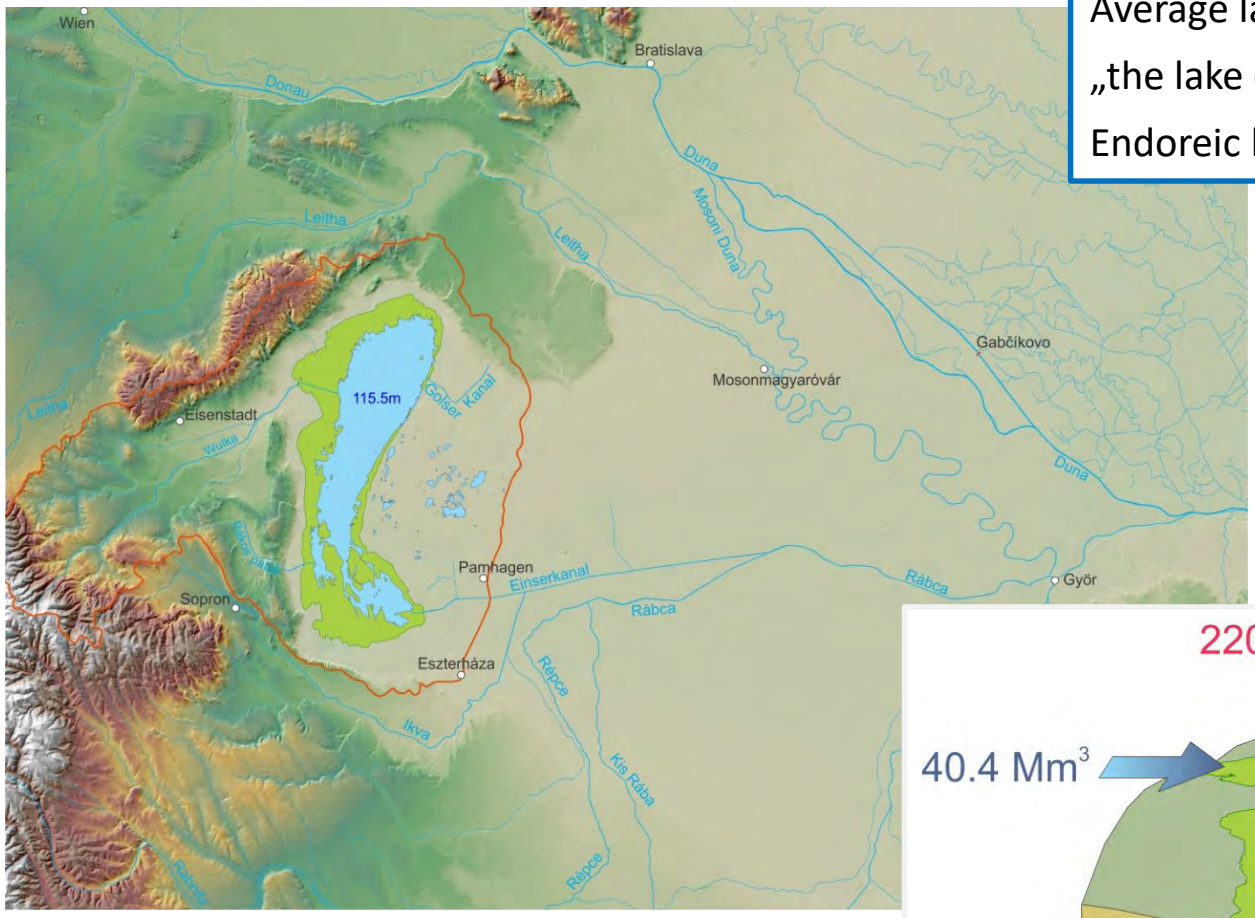
Area: 320 km^2 (incl. 178 km^2 reed)

Age: c. 15,000 years

Average lake level: 115.5 m asl

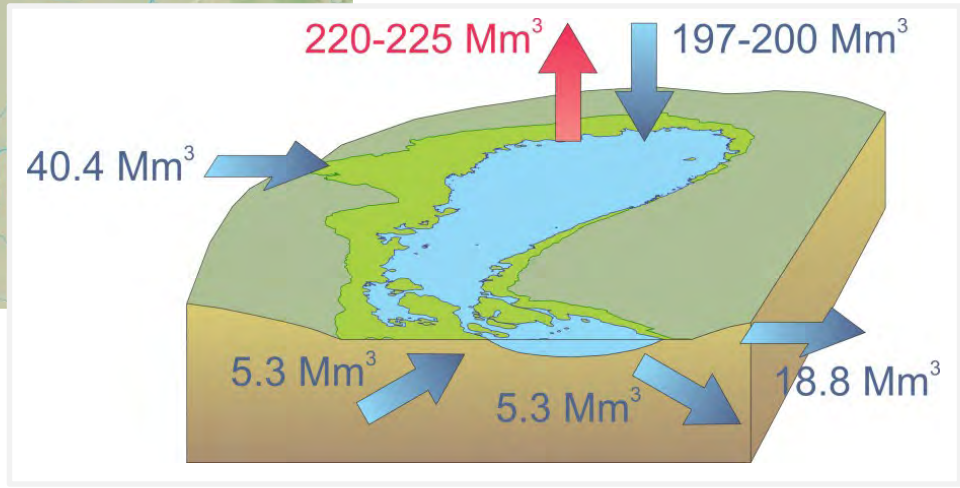
„the lake dried out about 100-times“

Endoreic lake, „steppe lake“

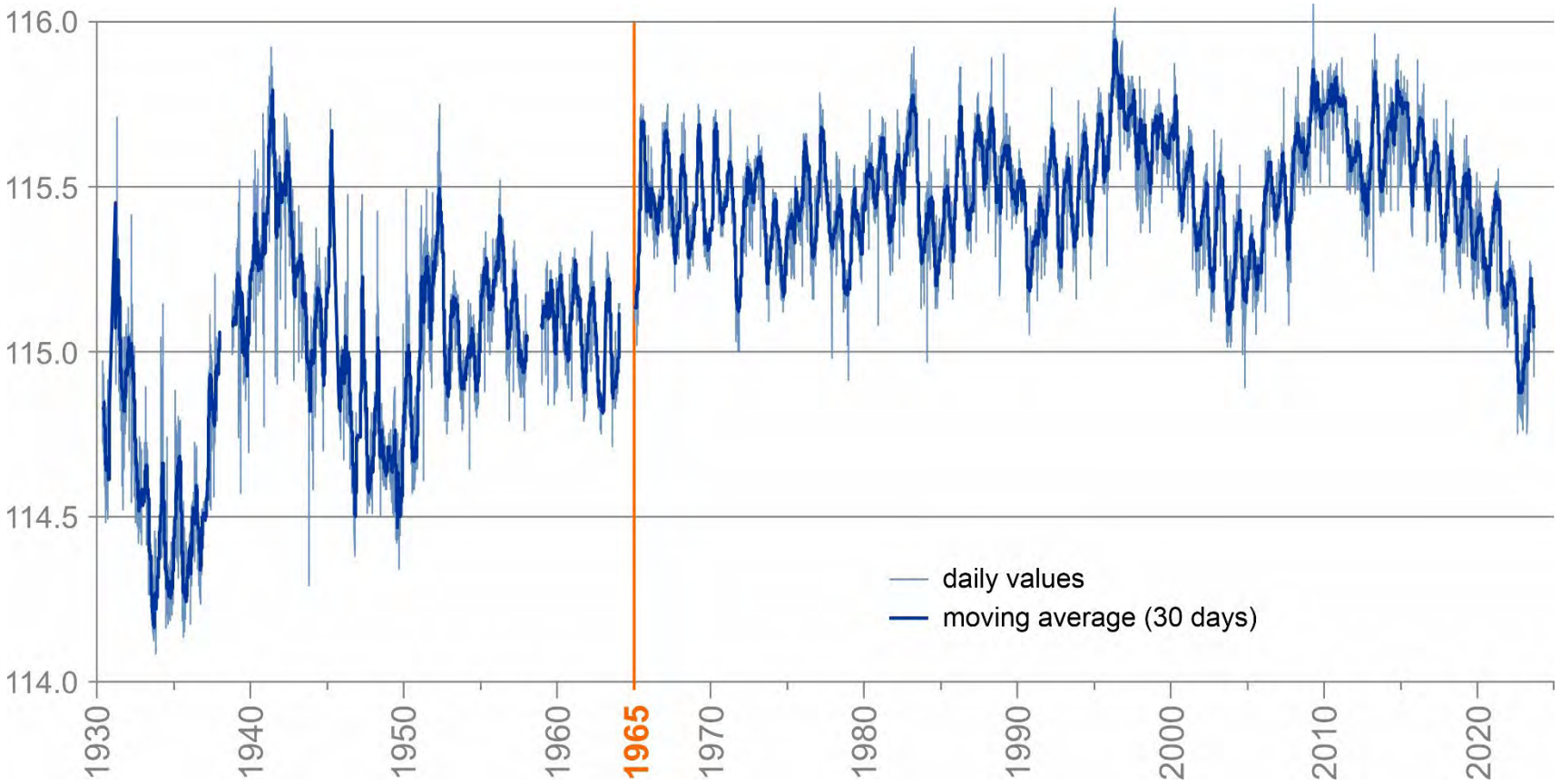


Nationalpark &
Burgenländische Landesregierung

Water balance



Water level (m above Adria) Neusiedl am See
16th May 1930 to 26th September 2023.



Hydrography, Burgenland

Evolution of Neusiedler See

Historical maps

1561 Wolfgang Lazius (ÖNB, 393221-E.K KAR MAG)

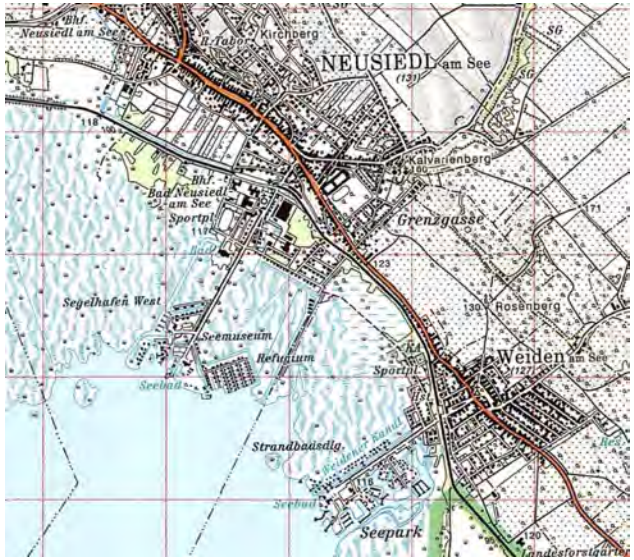
1. Military Survey
1784, 1:28.800

Example at Neusiedl „am See“ und Weiden „am See“

1756

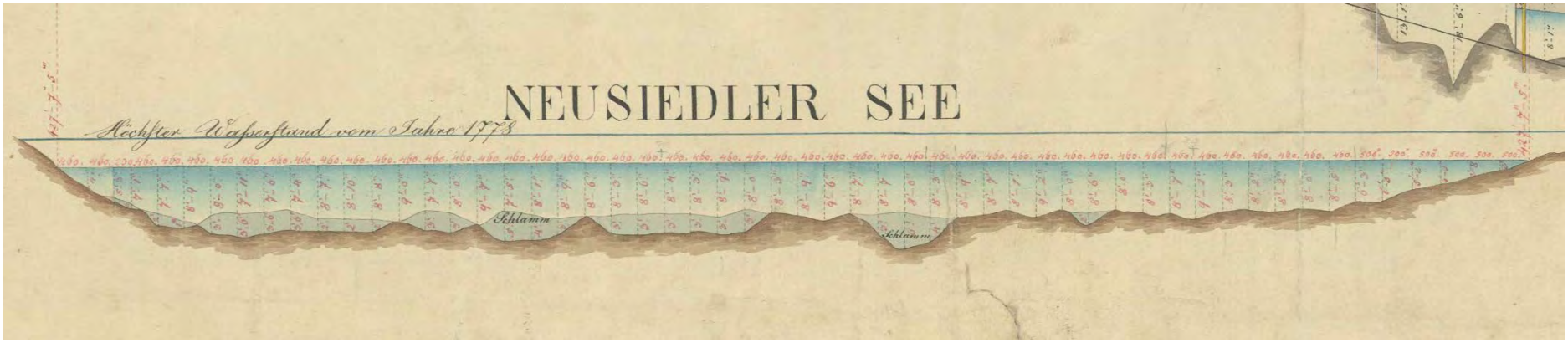
1784

2000

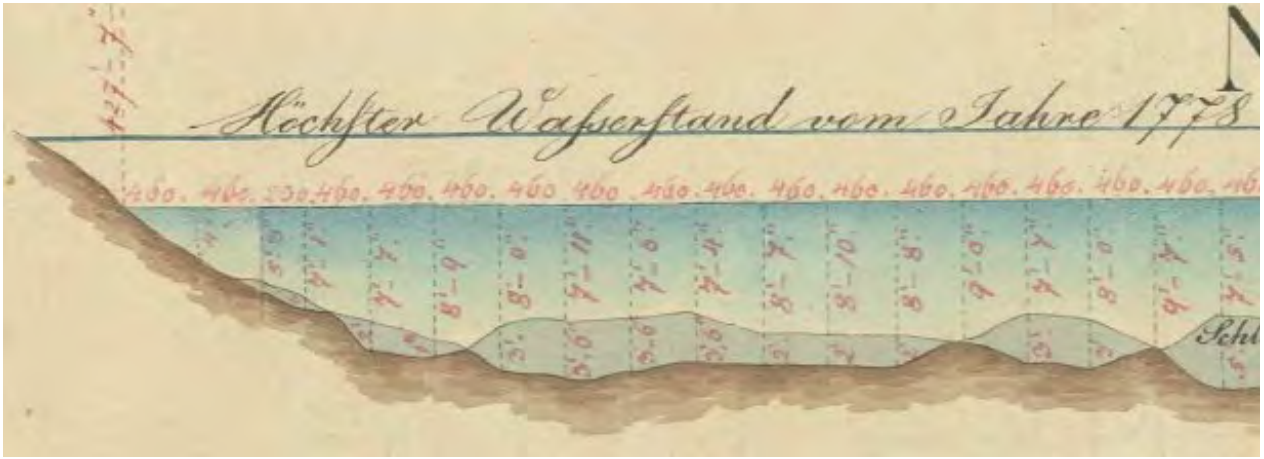


1km

Übersichts Längen Profil der Flüsse Raab und Rabnitz, wie auch der Hanság und des Neusiedler Sees …



Keczkés (1833), National Archives of Hungary (S 80 – Rába - No. 22)



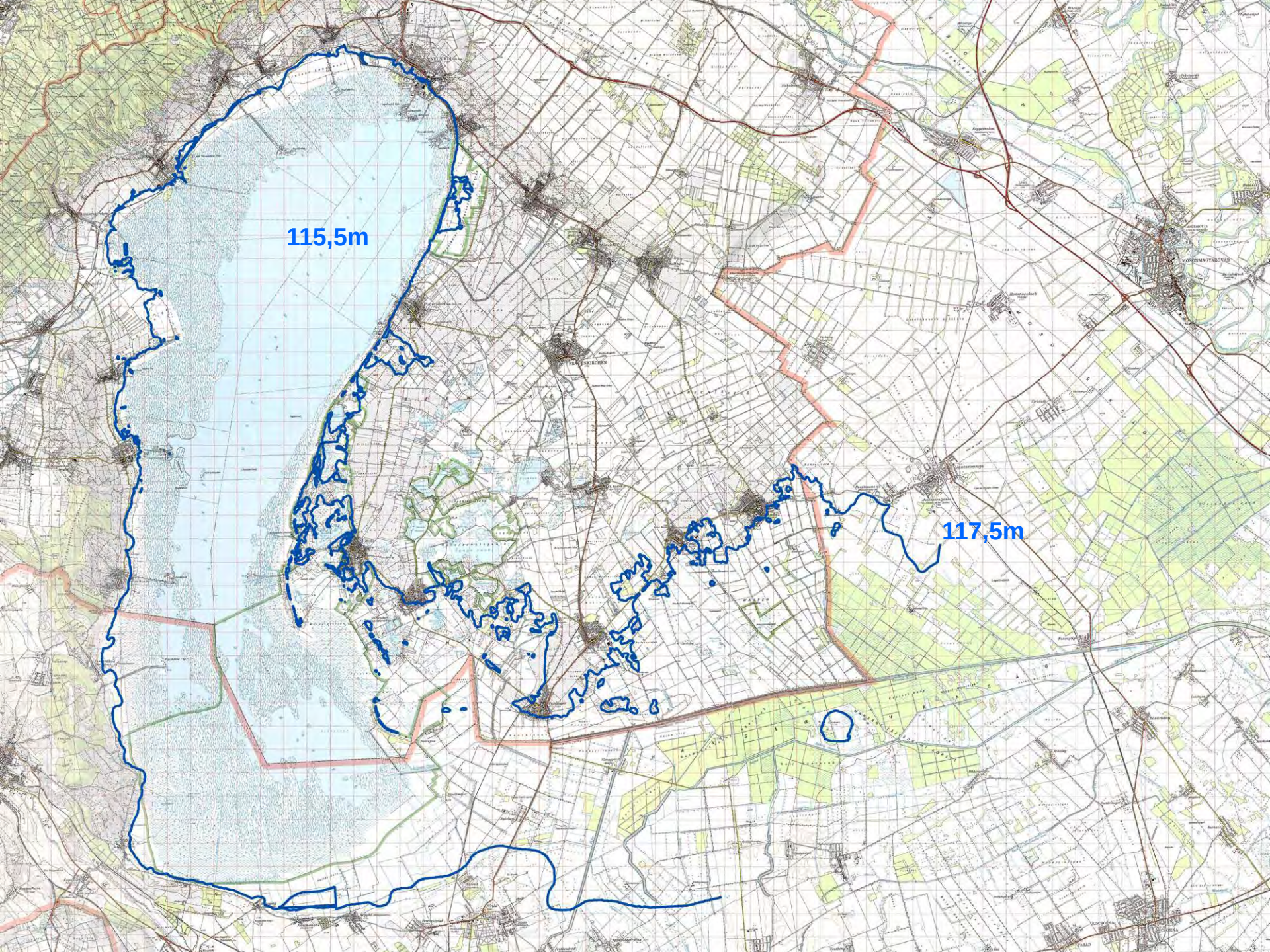
1778: 12 Fuss, 7 Zoll = **3.98 m**

1833: 9 Fuss, 7 Zoll = **3.03 m**

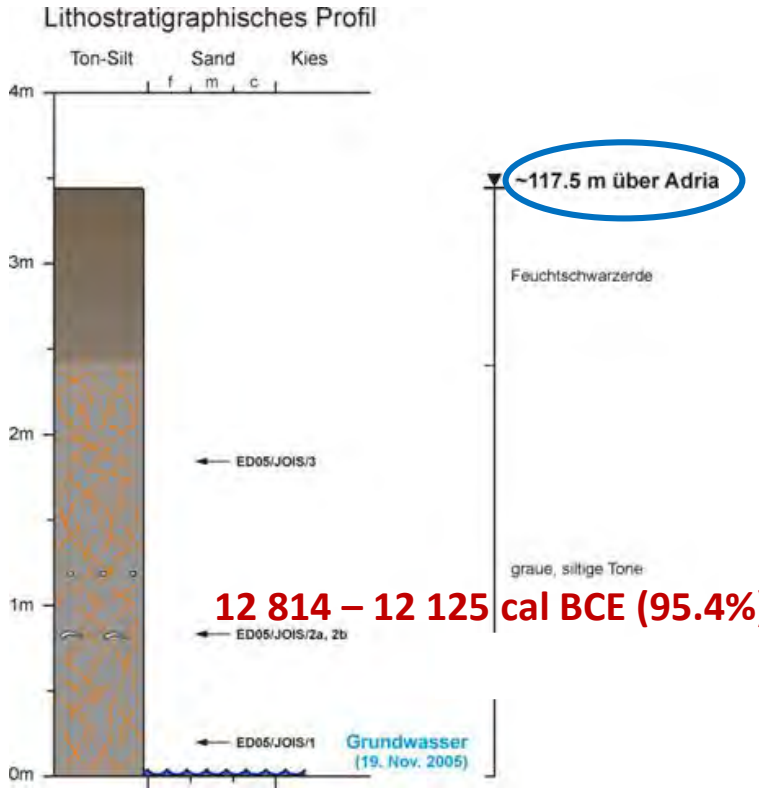
1 Fuss = 12 Zoll = 31.608 cm

1 Zoll = 2.634 cm

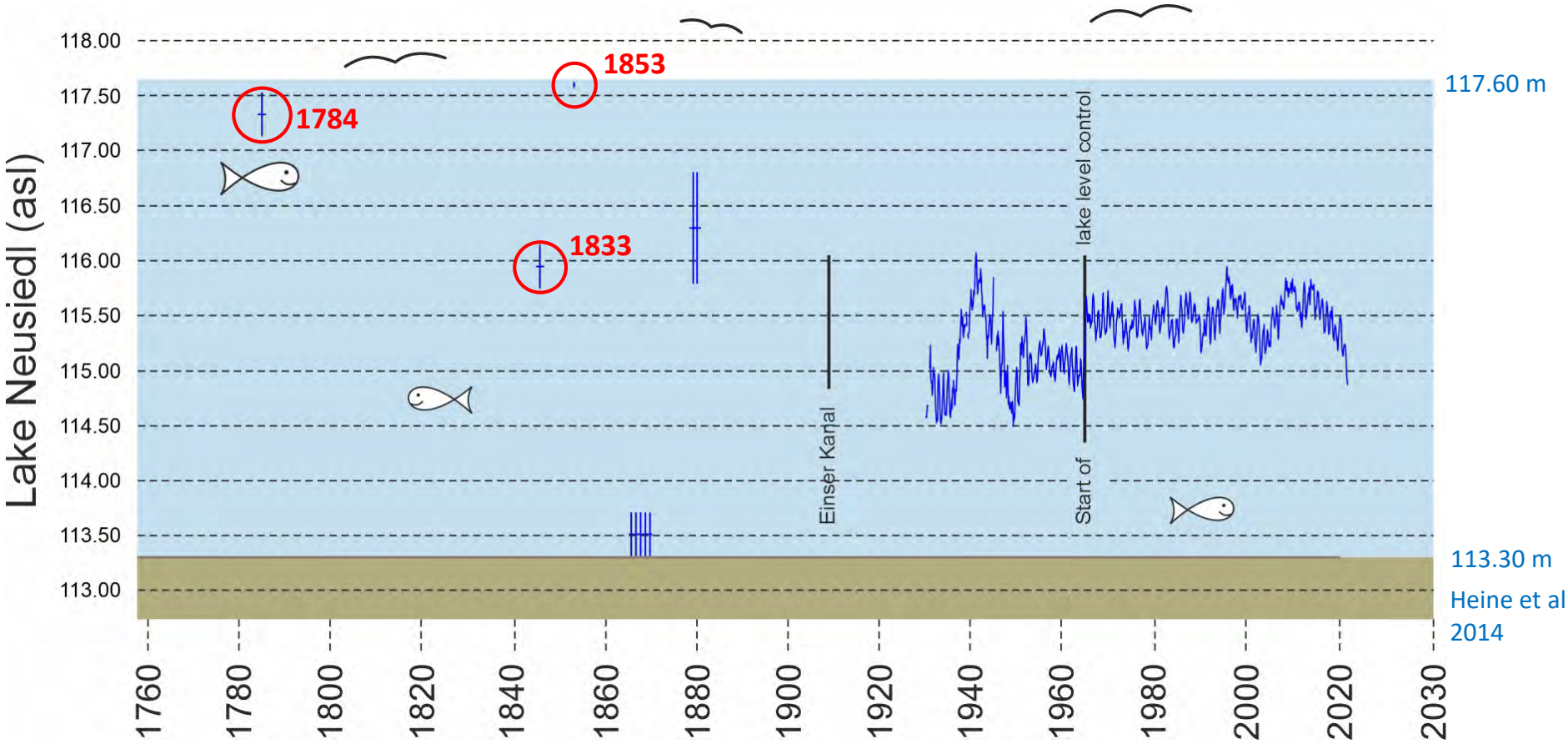

1. Military Survey
1784, 1:28.800
117,50 m
Neusidler See
Neusidler See
Neusidler See
Neusidler See
Hanság
Hanság


115,5m
117,5m


W
E


Lithostratigraphisches Profil
Ton-Silt
Sand
Kies
f
m
c
4m
3m
2m
1m
0m
~117.5 m über Adria
Feuchtschwarzerde
graue, siltige Tone
ED05/JOIS/3
ED05/JOIS/2a, 2b
ED05/JOIS/1
Grundwasser
(19. Nov. 2005)
12 814 – 12 125 cal BCE (95.4%)

Lake level variations Neusiedler See

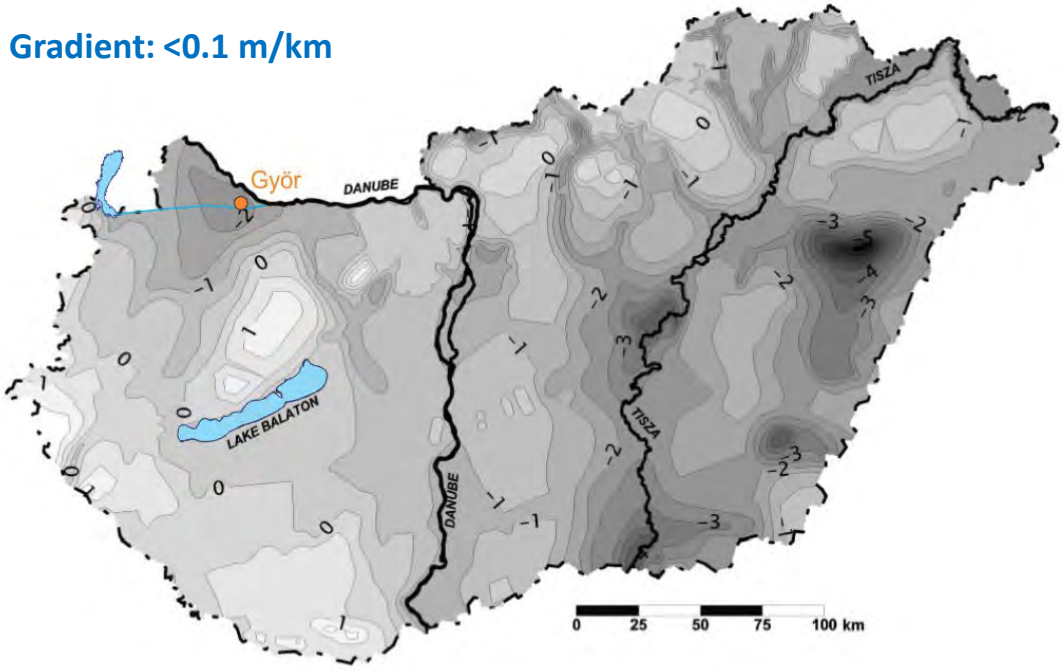


1865-1870 drying

3. Landesaufnahme 1872

Geological factors: Active vertical crustal movements

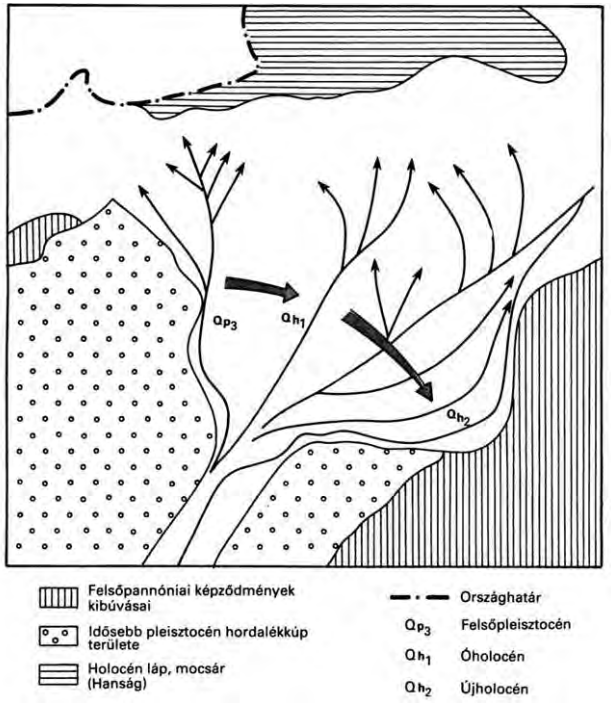
Gradient: <0.1 m/km



1mm/yr = 1m/1000 yr

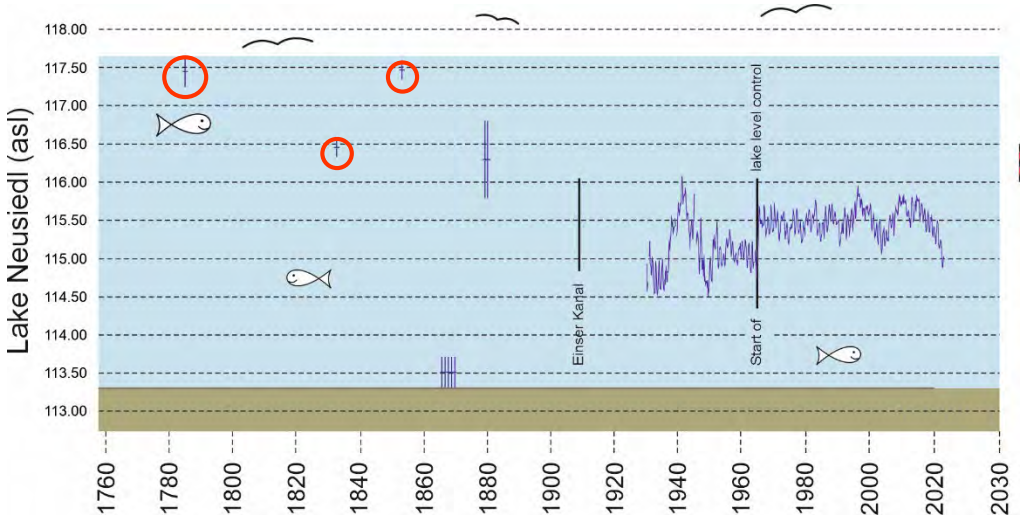
Timar & Racz (2002)

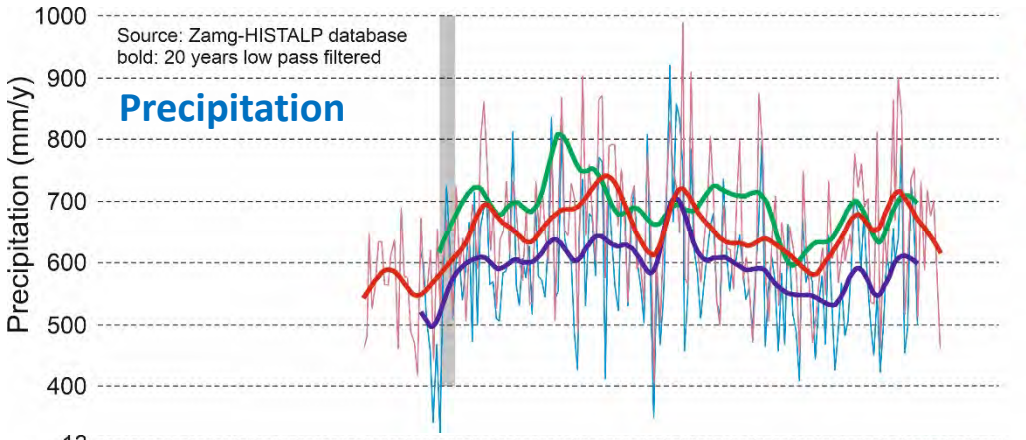
Shift of Rába from Late Würmian to present



Scharek (1993)

Climate versus anthropogenic influences

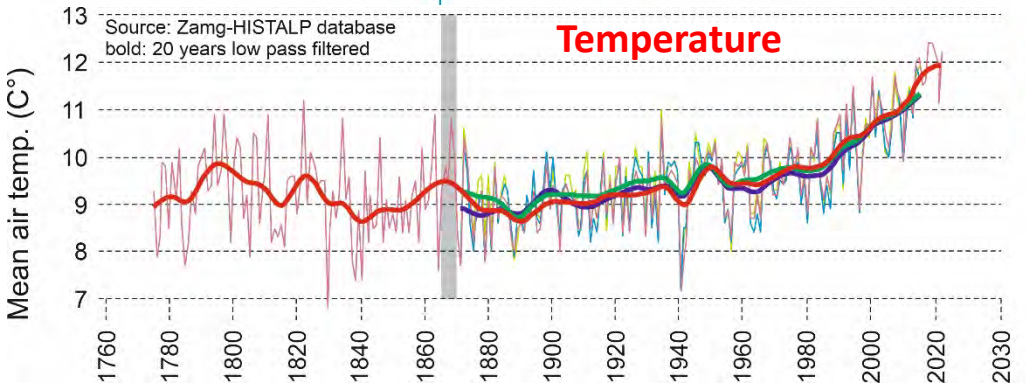




Hohe Warte 1841-2022 (209 m asl)

Mosonmagyarovar 1859-2015 (121 m asl)

Sopron 1865-2015 (234 m asl)



Hohe Warte 1775-2022 (209 m asl)

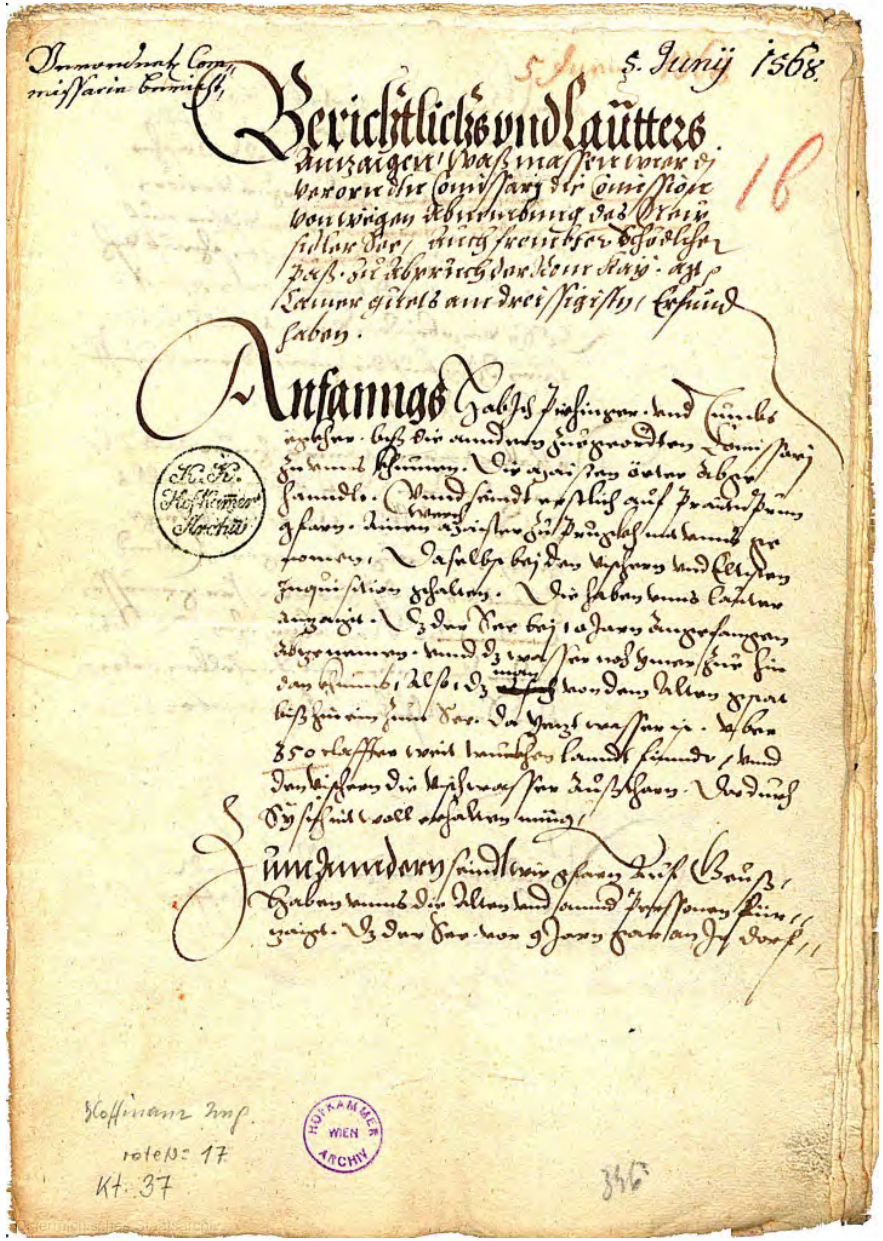
Mosonmagyarovar 1871-2015 (121 m asl)

Sopron 1865-2015 (234 m asl)

https://www.zamg.ac.at/histalp

Hydrological interventions

5. Juni 1568 Rabnitz Ableitung



Finanz- und Hofkammerarchiv,
Hoffinanz Ungarn rote Nr. 17, fol. 346-352

Neusiedler Jahrbuch, **2023**

Erich Draganits – Sepp Gmasz

„… das sich das Wasser umb 100 Claffter lanng unnd 1 ½ man dieff verlorn."

Ein zeitgenössischer Inspektionsbericht über den Wasserrückgang des Neusiedler Sees im Jahre 1568

Einleitung

Der besonders niedrige Wasserstand des Neusiedler Sees im Jahr 2022 wird nicht nur von Anwohnern, Wassersportlern und Touristen mit Sorge verfolgt, sondern zieht weite Kreise bis in den Naturschutz, Klimaschutz, in die Medien[1] und die Politik. Inwieweit der menschengemachte Klimawandel[2], wasserbauliche Maßnahmen der Vergangenheit oder eine Kombination von beiden Faktoren dafür verantwortlich sind, wird in den Medien, Internetforen und Stammtischen lebhaft diskutiert und resultierte im Mai 2022 in der Gründung der „Taskforce für den Gesamtraum Neusiedler See / Seewinkel"[3].

Der mittlere Wasserstand des Neusiedler Sees wird als arithmetisches Mittel aus den Pegelmessungen in Apetlon, Breitenbrunn, Illmitz, Mörbisch, Neusiedl am See, Podersdorf und Rust berechnet.[4] Durch eine von Wind ausgelöste Wasserverfrachtung können sich die Pegelmessungen von Neusiedl am See und Apetlon um mehr als 1,16 m unterscheiden (z.B. 5. Februar 2020).[5] Am Tag der Abfassung dieses Beitrages (6. Dezember 2022) beträgt der Wert 114,93 m über Adria (üA), das ist der niedrigste Wert seit der bilateralen Wasserstandsregelung zwischen Österreich und

1 Aktuell beispielsweise Gluschitsch, G. 6. Dezember 2022. Schlammassel am Neusiedler See. Der Standard, https://www.derstandard.at/story/2000141528363/schlammassel-am-neusiedler-see-es-gibt-kein-zurueck-zum-ursprung

2 Z. B. Eitzinger, J., Kubu, G., Formayer, H., Haas, P., Gerersdorfer, T., Kromp-Kolb, H. (2009): Auswirkungen einer Klimaänderung auf den Wasserhaushalt des Neusiedler Sees. Endbericht im Auftrag der Burgenländischen Landesregierung vom 15. Juli 2005. BOKU-Met Report 1, 81 S.

3 https://www.burgenland.at/news-detail/dorner-setzt-task-force-fuer-den-naturraum-neusiedler-see-ein

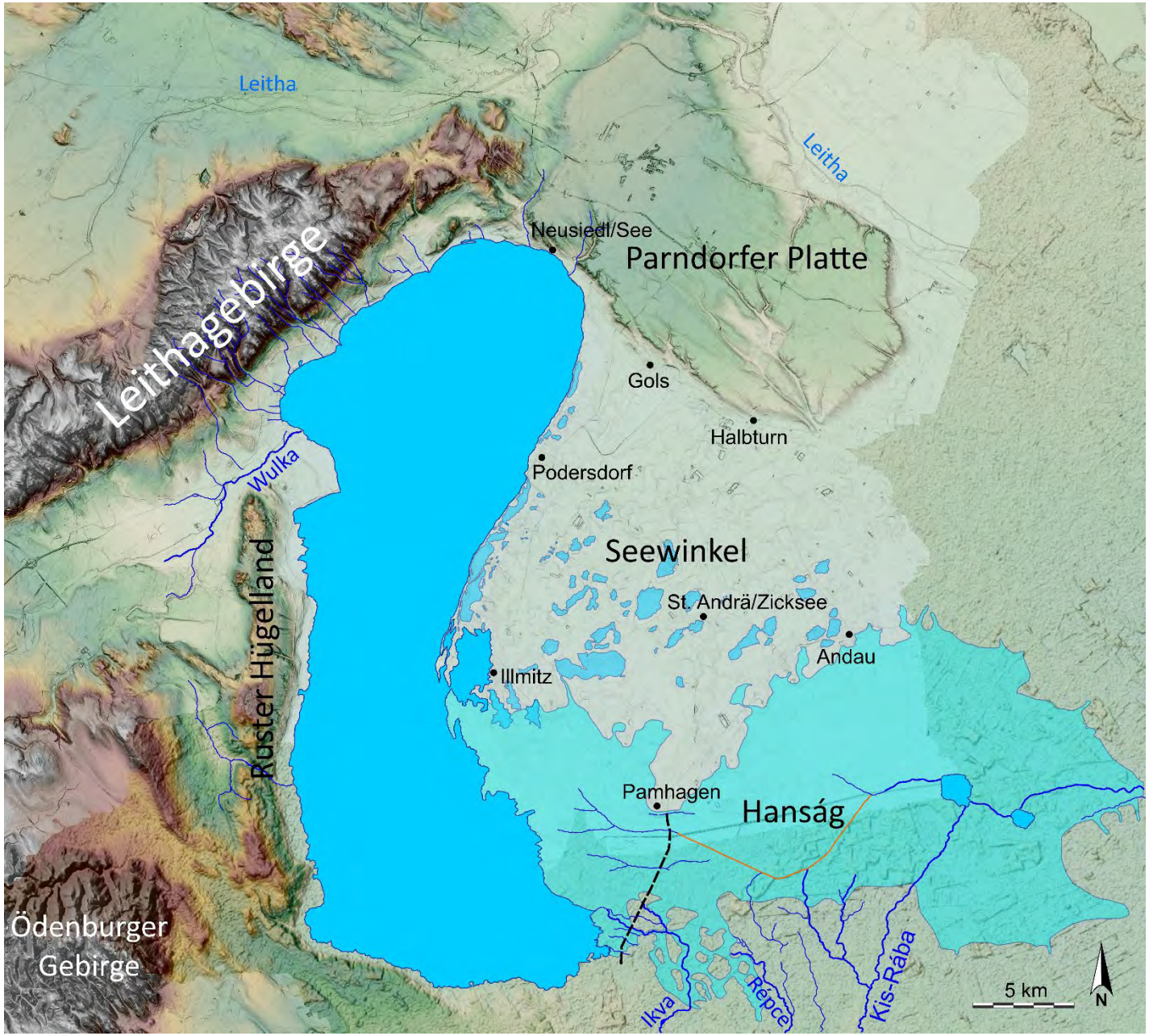
4 Kubu (2015): Methodik zur Ermittlung des mittleren Wasser-Spiegels des Neusiedler Sees. https://wasser.bgld.gv.at/fileadmin/user_upload/Methodik.pdf

5 https://info.bml.gv.at/themen/wasser/wasser-oesterreich/hydrographie/chronik-besonderer-ereignisse/wasserverlagerung-neusiedler-see.html

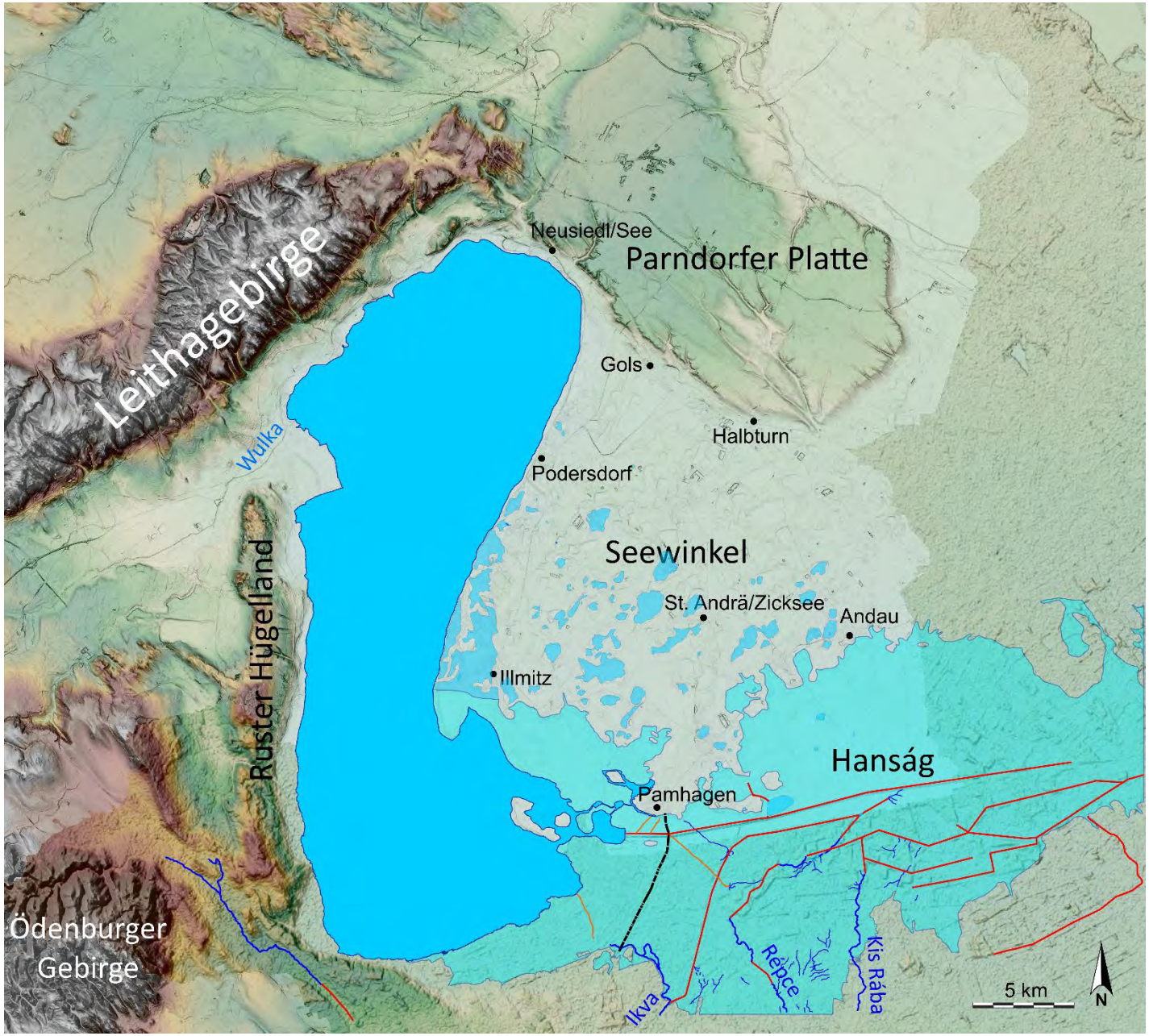
Palaeohydrology

1804 Johann M. Korabinszky

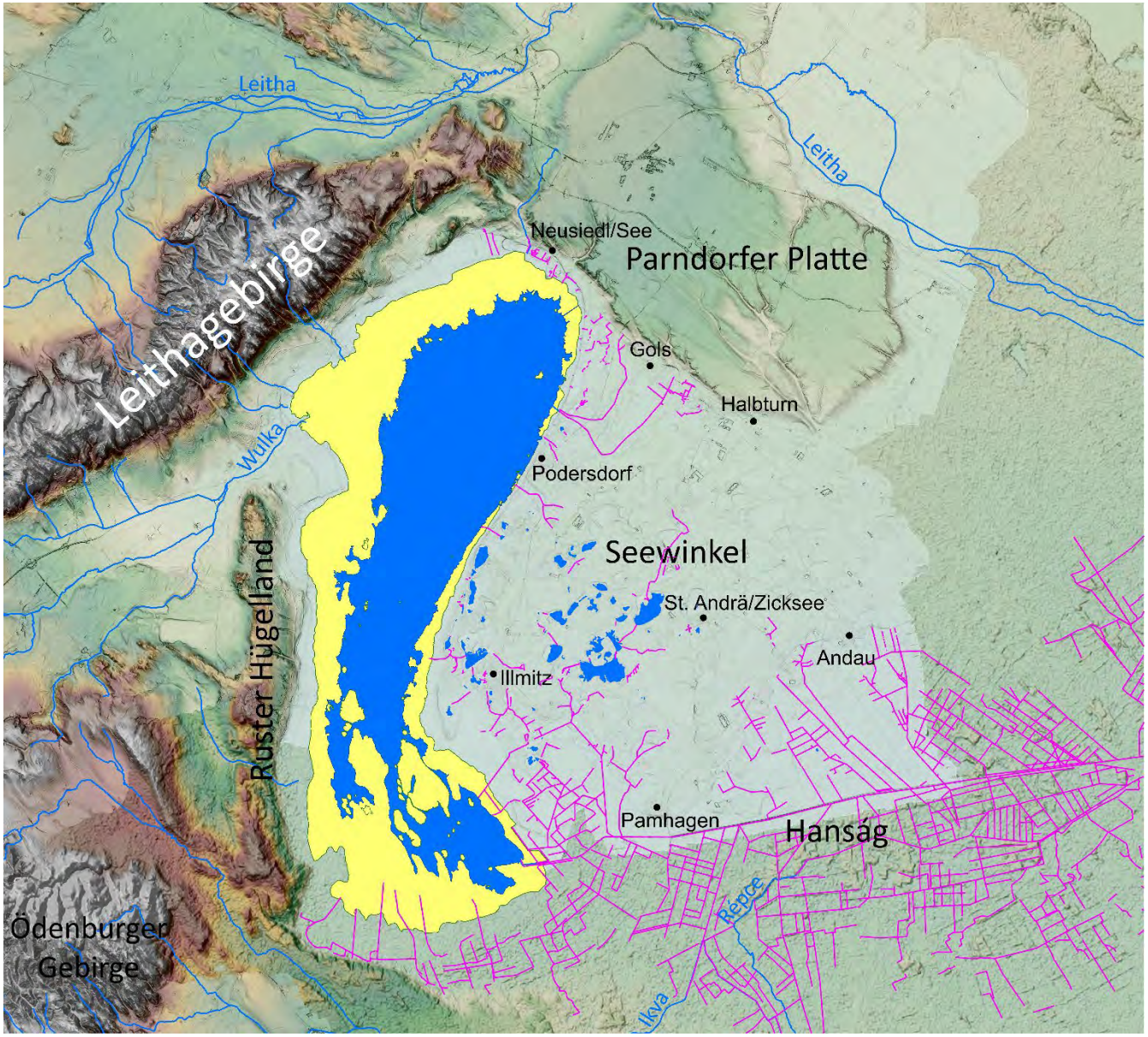
1. Landesaufnahme, **1784**, 1:28800



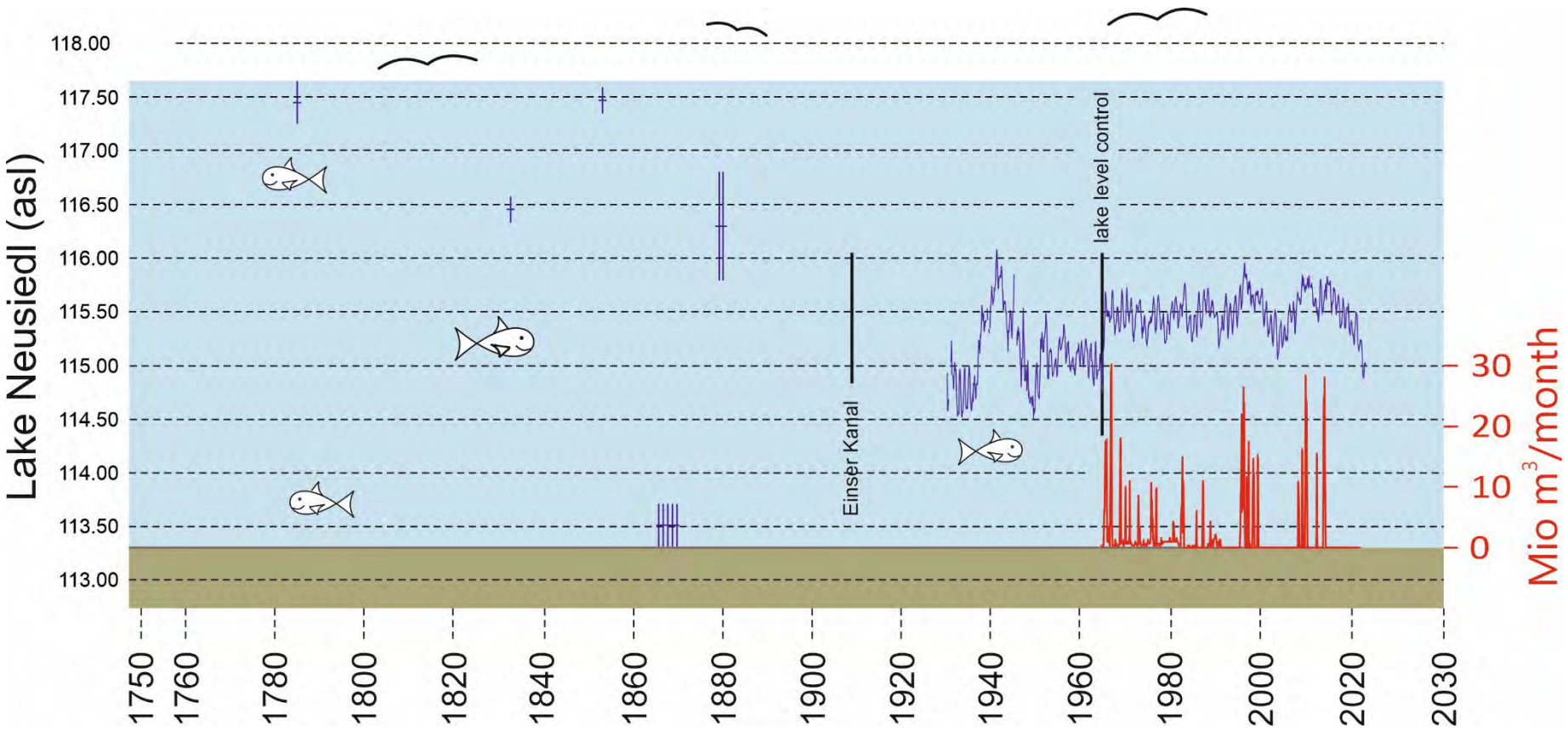
2. Landesaufnahme, **1845-1846**, 1:28800



Neusiedler See: modern – Hanság modern – Lacken: modern



Lake level and drainage Einserkanal

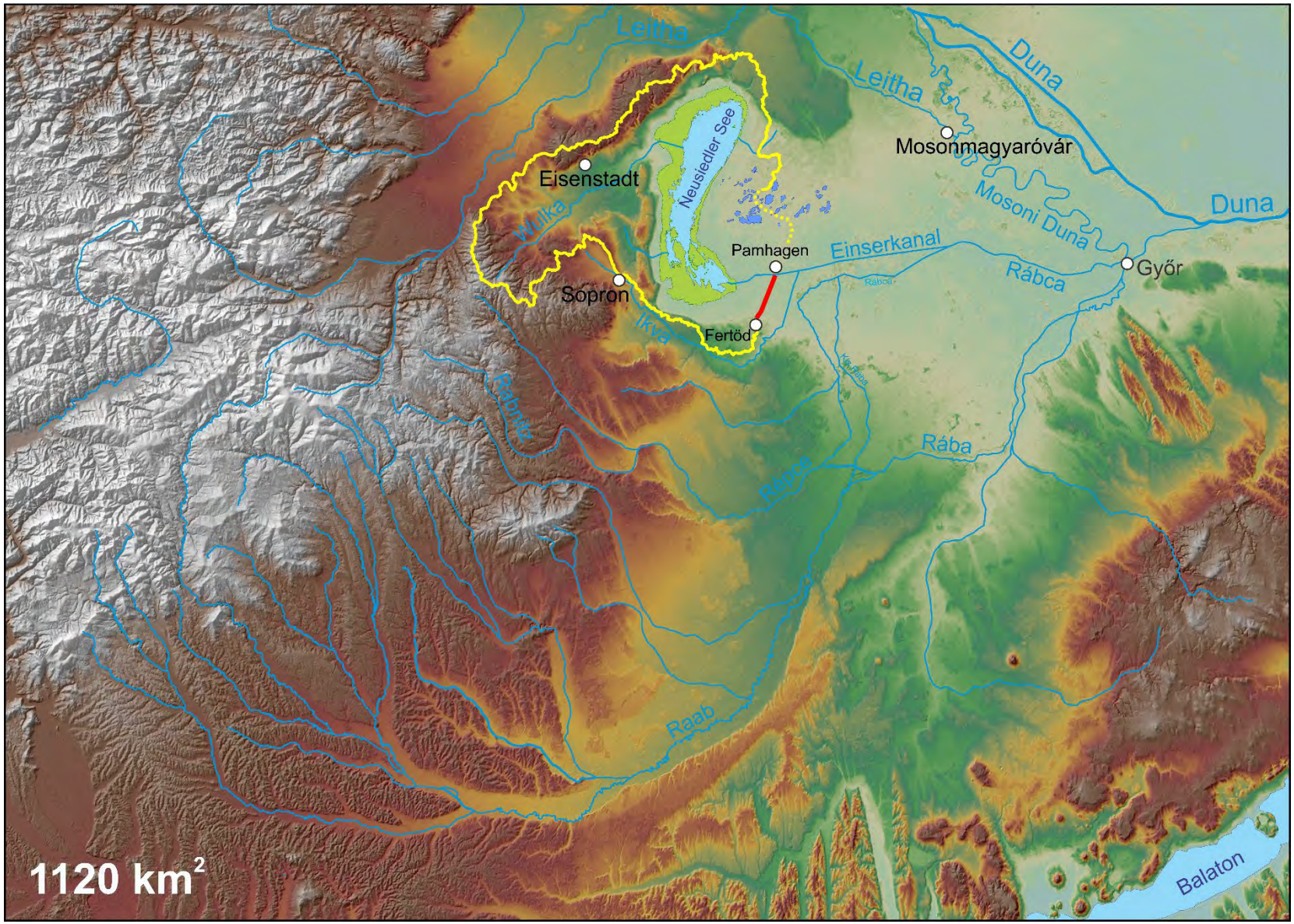


Einser Kanal: drained **11 % of water balance** (1965-2012, Maracek & Kubu 2014)

closed since 10th March 2015

Wulka 32.4 Mm^3/a

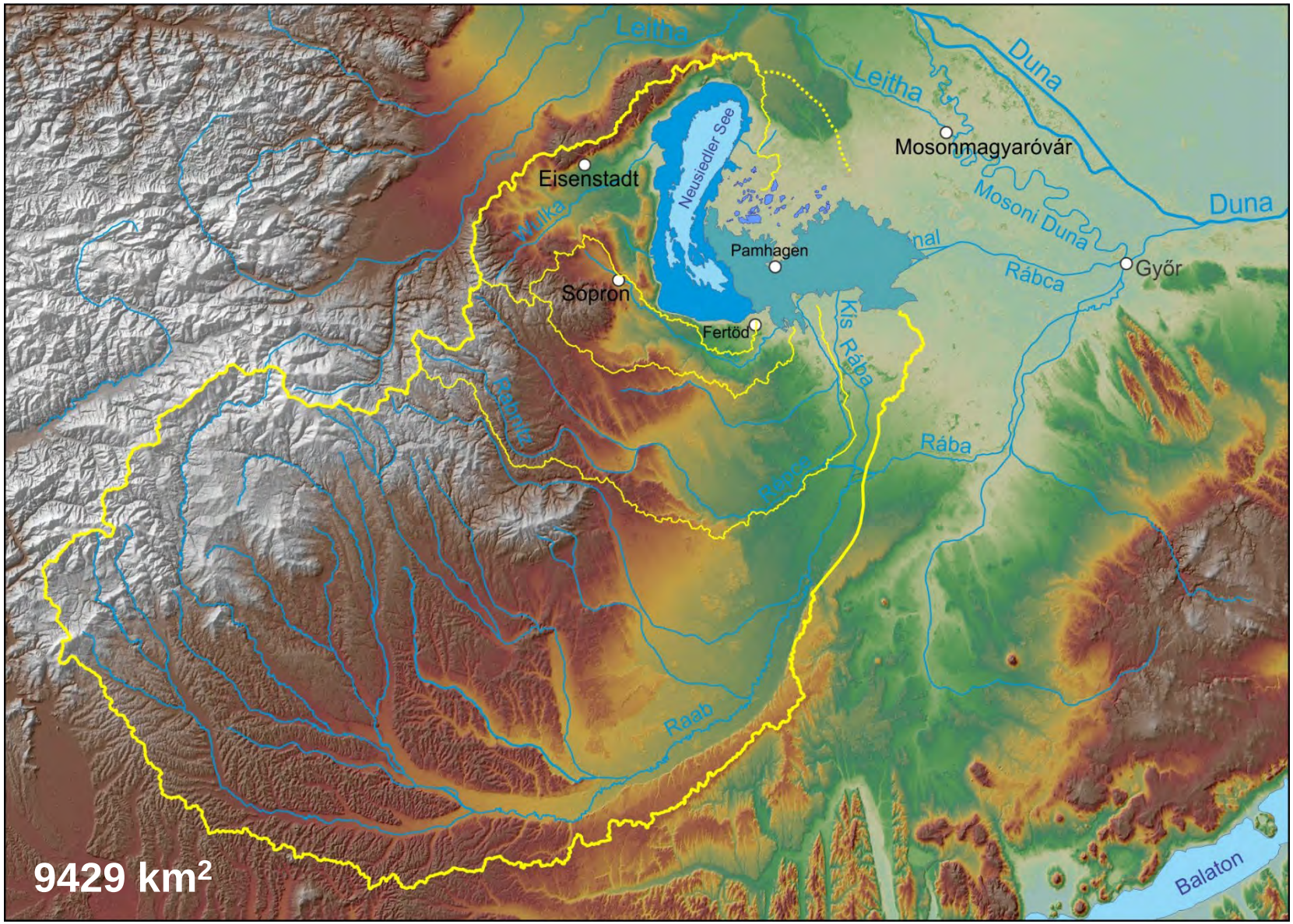
Palaeohydrology: present-day catchment



Draganits et al. 2022

Original catchment

Wulka 32.4 Mm^3/a
Ikvá 31.5Mm^3/a
Rabnitz 60.8 Mm^3/a
Raab (212.6 Mm^3/a)



Draganits et al. 2022

1853 Raab flood (1871)

Kovács (2010): Neusiedler See **117.60 m als Adria**

Eurasian Steppe biome

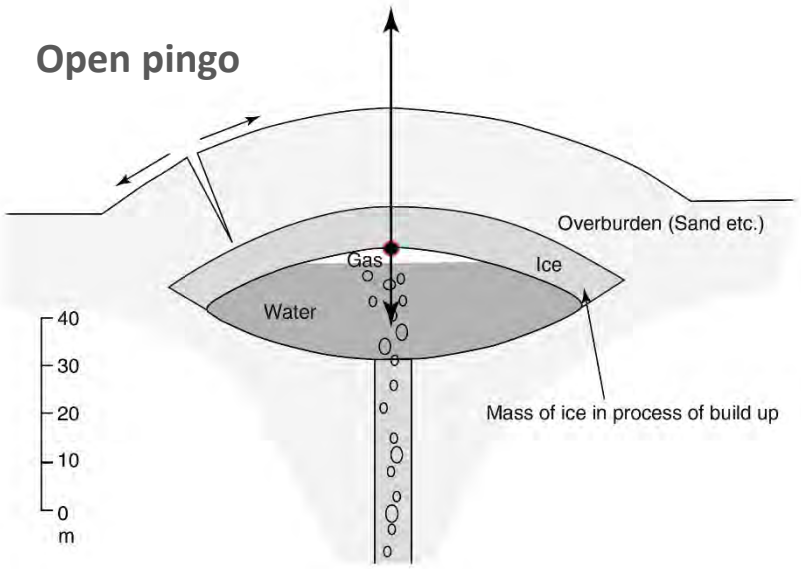
Török et al 2020

Seewinkel: shallow lakes

Seewinkel

Ochsenbrunnlacke, 2023

Pingo model (Riedl 1965)



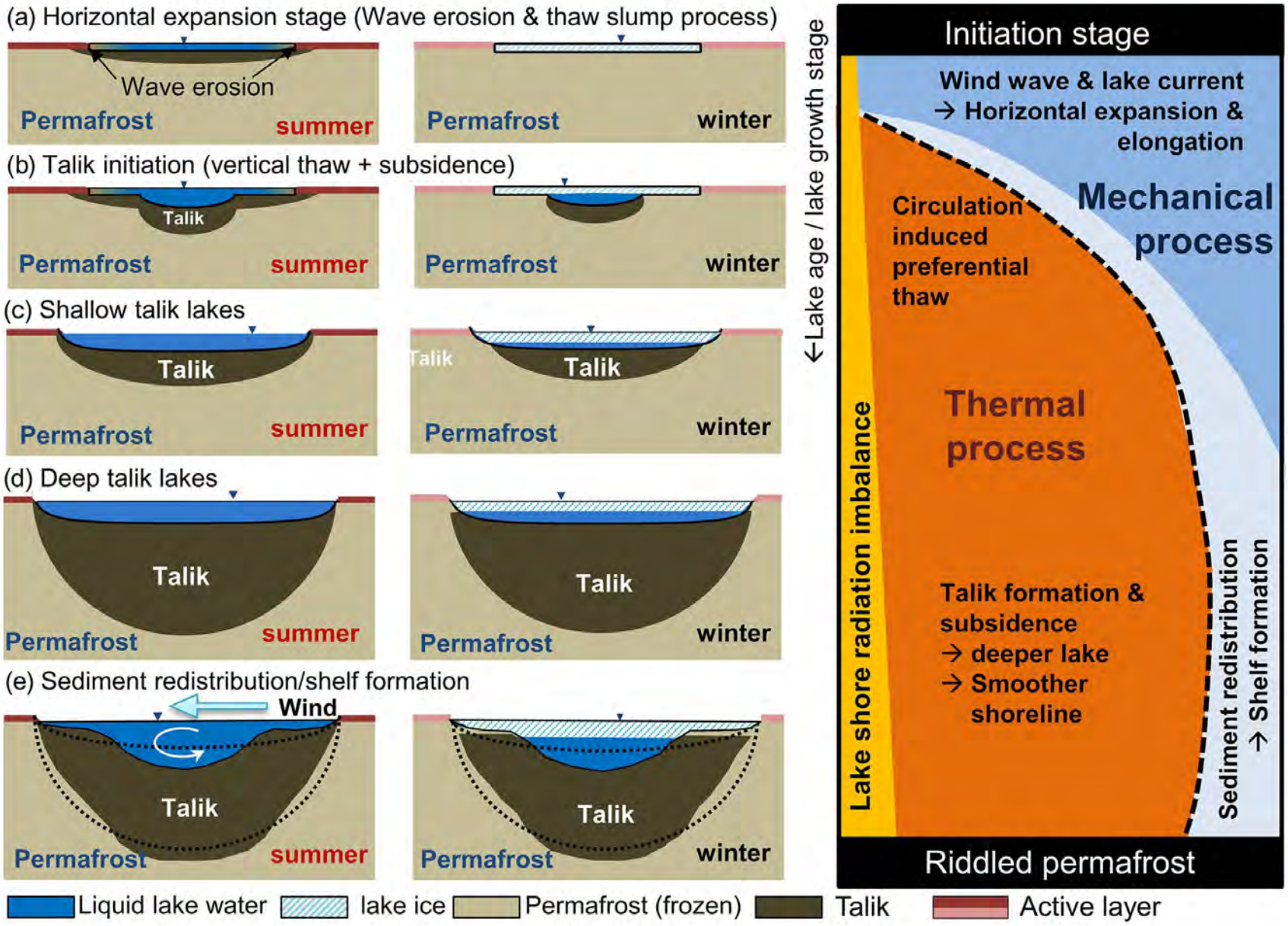
Yoshikawa (2013)

Northern Canada

- Diameter usually **< 0.6 km**
- typically **solitary features** or **in small groups**

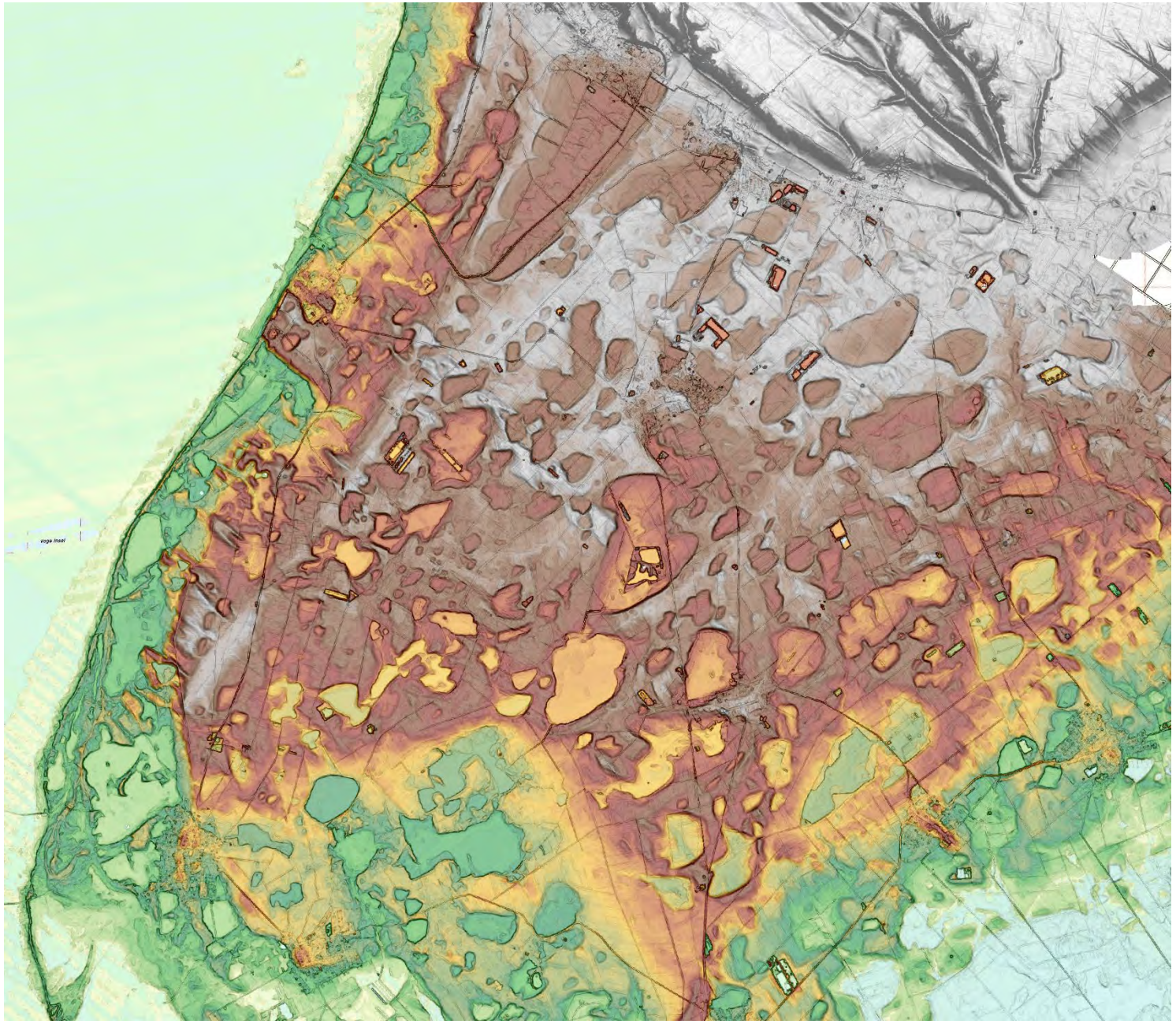
Yoshikawa (2013)

Model of thermokarst lake evolution

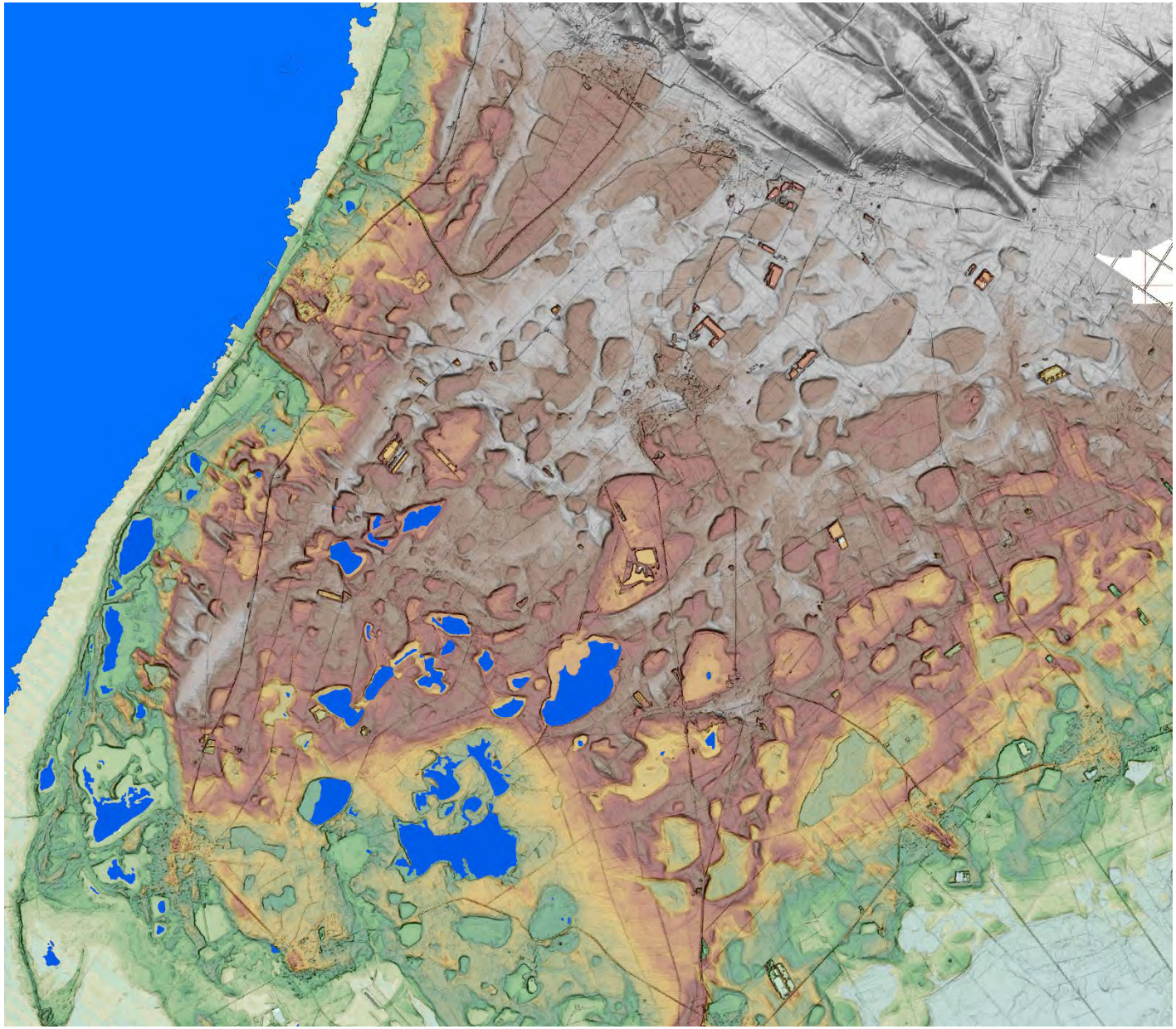


Ohara et al. 2022

Digital terrain model



Digital terrain model with modern lakes

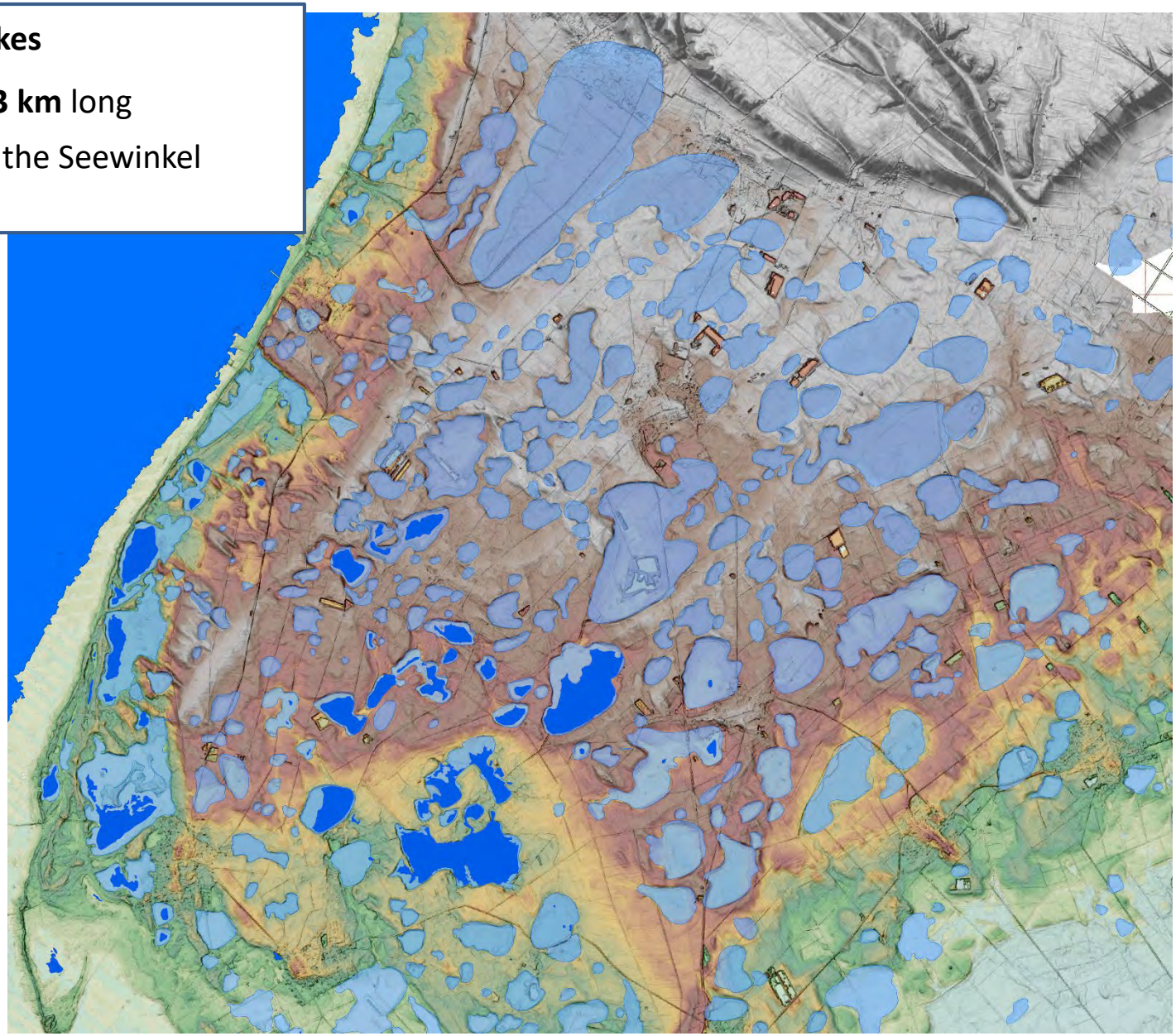


10x10 m, 60% transparent hill shade, 60 % transparent slope

Modern lakes and former lakes

Shallow lakes

- up to **5.3 km** long
- **> 370** in the Seewinkel



10x10 m, 60% transparent hill shade, 60 % transparent slope

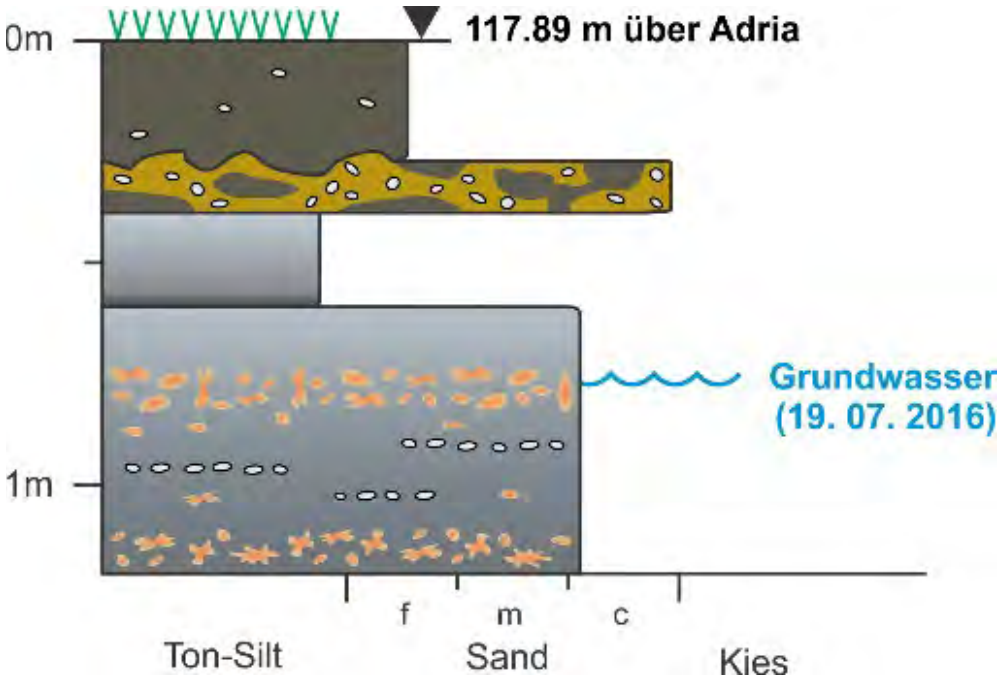
Seewinkel 2015

Andreas Ziegler (2015 04 04)

Thermokarst lakes north of Kinaruk Lake, south of Baird Inlet, Alaska, Travis flickr (2010 09 18)

Podersdorf, Weißlacke

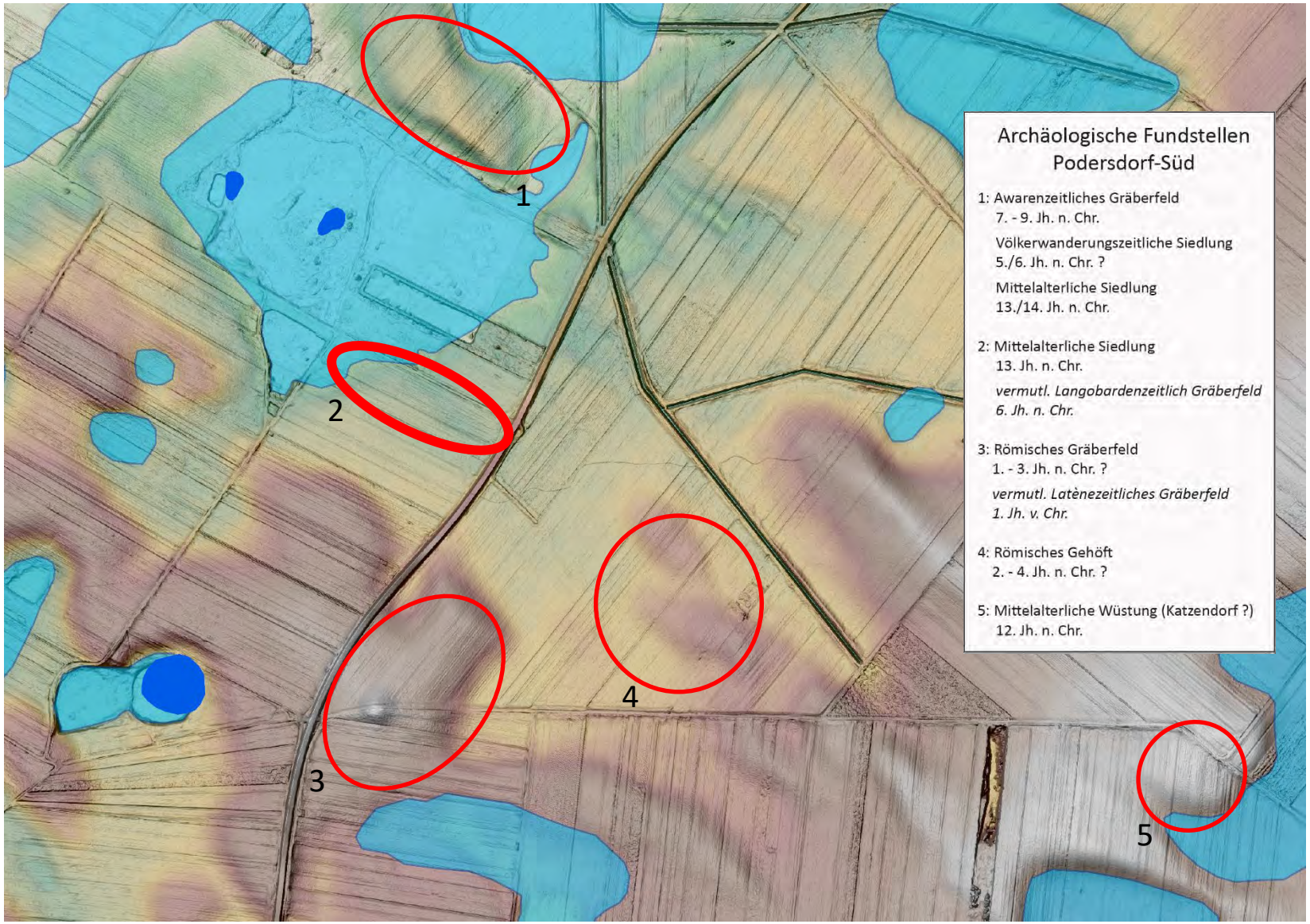
Former Weißlacke – Stratigraphy



Bivalves, gastropods, ostracods

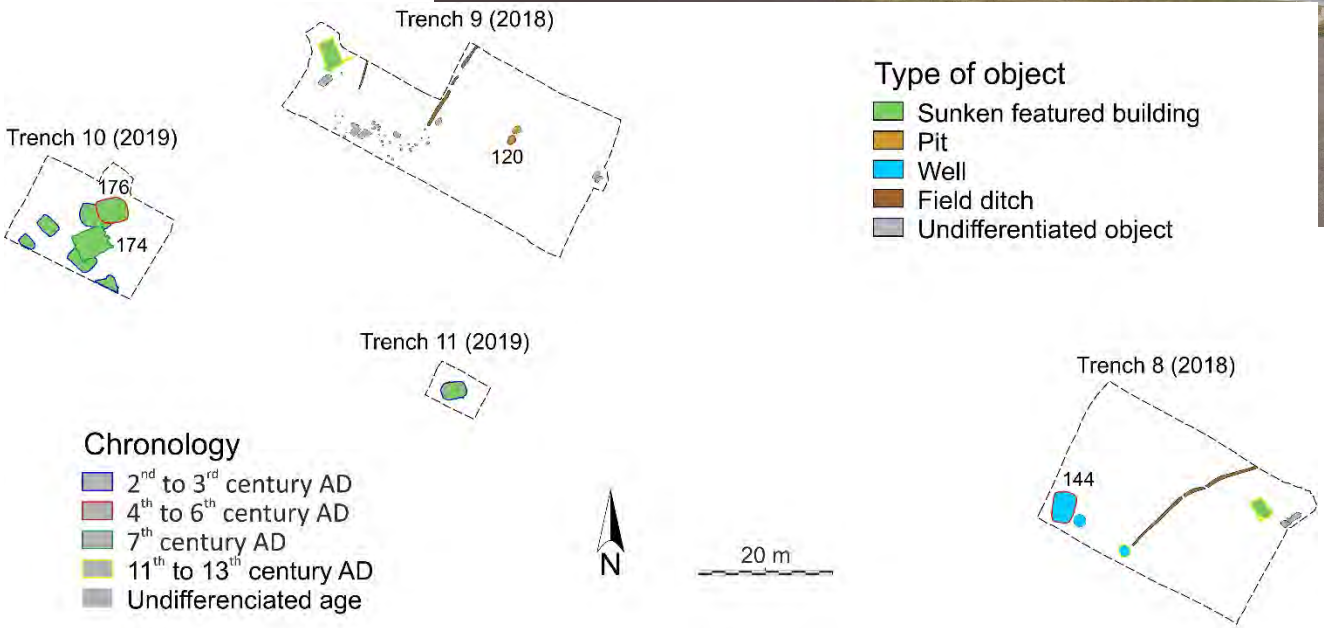
ED16/PD/18

Podersdorf am See - South



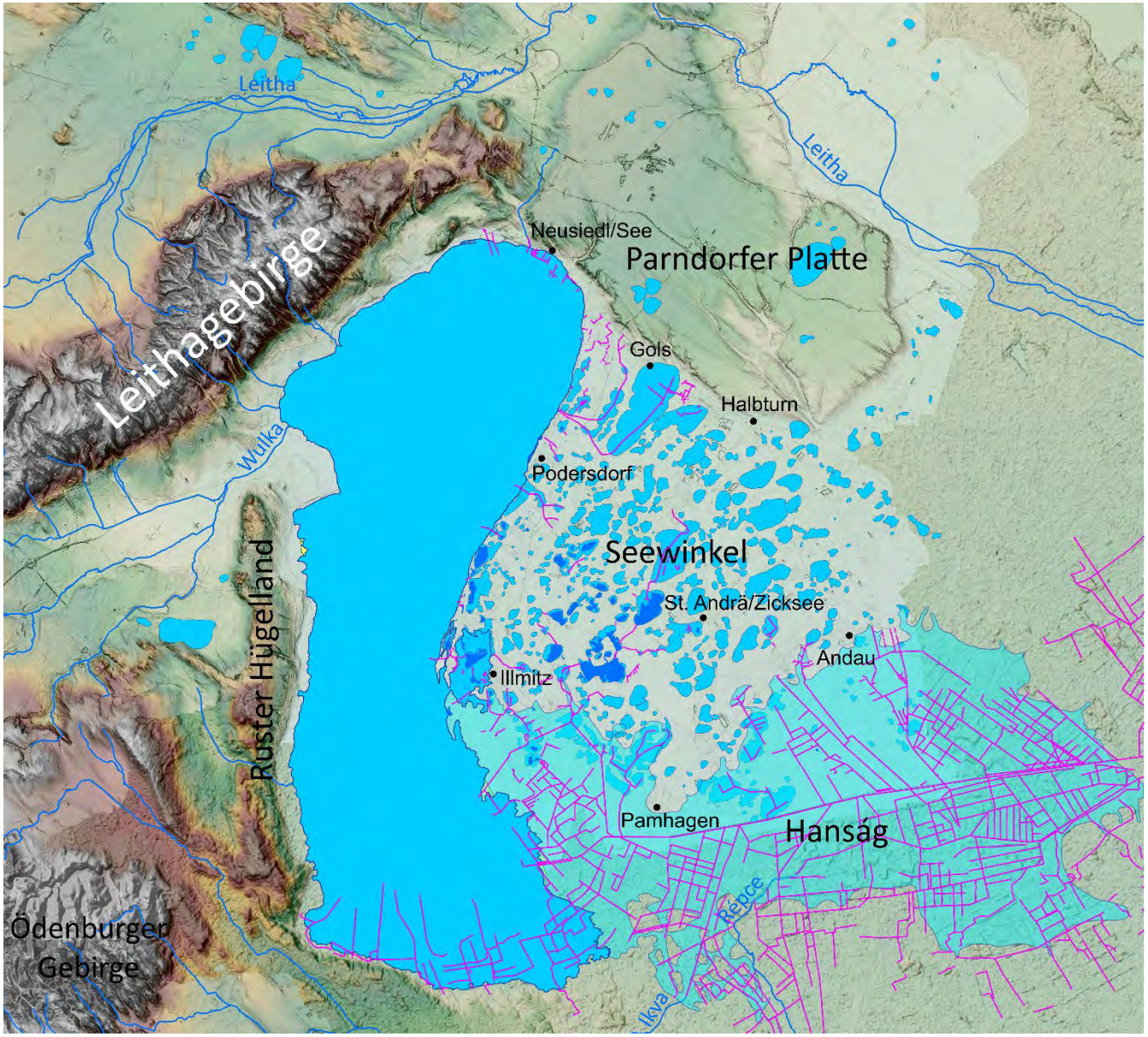
Tobias et al. 2020

Saliari et al. 2022



Saliari et al. 2022

Neusiedler See: 1784 – Hanság 1784 – shallow lakes: Holocene/present – channels: modern



Conclusions & some questions

- **Past hydrology** completely different from present situation
- Lake Neusiedl was **not** (always) an endoreic lake in the past
- **Water-level** of Neusiedler See episodically **> 2.5 m** higher than today (**117.6 m asl**)
- In the past, Lake Neusiedl (episodically) received water from the south and southeast
- Is Lake Neusiedl a „**steppe lake**“?, What is the **definition** of a „steppe lake“?
- In the past, **> 370** (thermokarst) lakes existed in the Seewinkel
- **Climatic** and **anthropogenic factors** are difficult to separate

- **Dry period 1865-1870 is no good excample for climatically driven desiccation**
- **There is no evidence for „100-times desiccatio“ in ist history**
- **Neusiedler See and Seewinkel are more complex, more variable (pH, salinity, etc.), but also more interesting than previously thought**