MACROMEANDERS IN CENTRAL EUROPE: A CASE STUDY FROM THE HOLY CROSS MOUNTAINS REGION (POLAND)

T. Kalicki, P. Kusztal

Jan Kochanowski University, Institute of Geography and Environmental Sciences, Department of Geomorphology and Geoarchaeology, Poland, tomaszkalicki@ymail.com, roch1990@gmail.com

One of the important issues in palaeogeographic research is the time of the macromeanders functioning. They were studied in Europe, i.a. in lowlands, uplands and structural basins near mountains [2], [3], [4], [5], [7], [8], [9], [11], [12], [13], [14], [15], [16], [18], [19]. Their formation was connected with environmental changes during the Late Vistulian [12]. The beginning of the macromeanders phase in individual valleys was not synchronous (epe, bölling, alleröd) due to local factors [5], [10], [17]. Most of these channels in Central Europe was cut off not earlier than in the Bölling and not later than in the Preboreal (between 13 and 9.3 ka BP). Organic sediments in bottoms of their fills were mostly dated at the younger part of Late Vistulian (Allerød-Younger Dryas) and the beginning of the Holocene [5], [12], [13].

So far, only the Czarna Nida macromeanders generation has been recognized in the Holy Cross Mountains region (Fig. 1). The bottom of the fill of one of them was palynological dated at the Allerød-Younger Dryas transition, and organic sediments above sandy overbank deposits of this fill were radiocarbon dated at 9670±45 BP [9]. These dating results are compatible with the timeframe of functioning and filling of macromeanders in Central Europe [5]. New data from Czarna Konecka river valley (Fig. 1-2) indicate an earlier development of large meanders in the north-west margin of the Holy Cross Mountains.

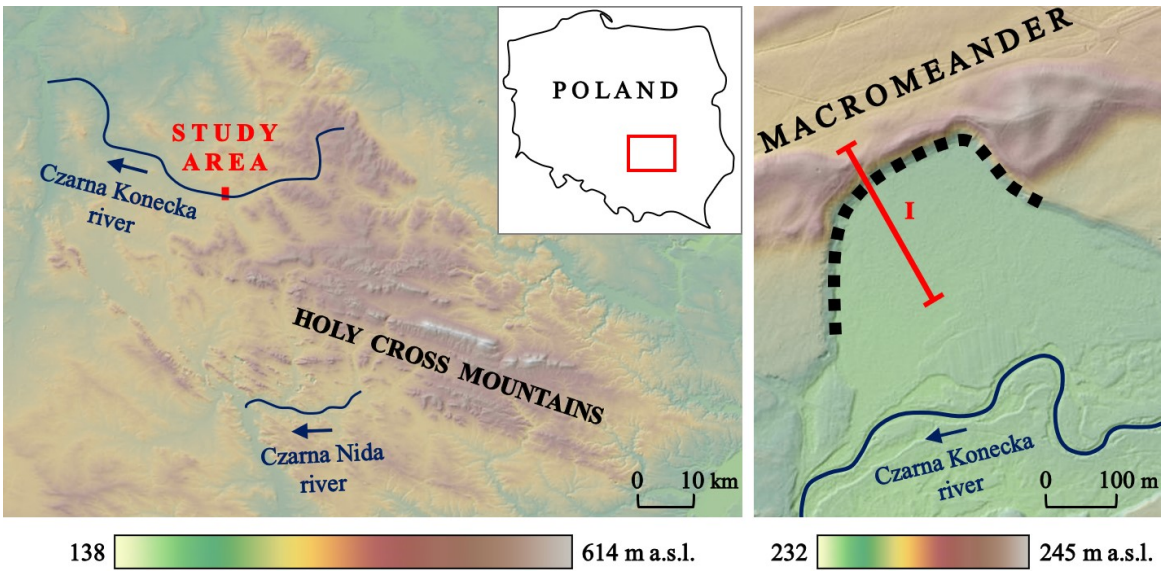

Fig. 1. Location of the study area and the cross-section line (I) (geoportal.gov.pl)

The macromeander undercutting Czarna Konecka terrace and dune (Fig. 1-2) was cut-off before the Late Vistulian. Fine-clastic overbank deposits, peaty silts, and after 14 100±120 BP (cal. 15 496-14 836 BC, MKL-5189) biogenic sediments were accumulated in the created oxbow-lake. Peats filled the entire palaeochannel, and later covered the sandy point bar. This led to create a peat bog plain. Silty peats at the top part of the 44A profile (next to the peat bog edge, see Fig. 2) could be connected with phase of increased fluvial activity, during which the entire valley floor was flooded many times, and flood waves transported the overbank deposits to the bottom of the deepest part of the oxbow-lake (from 1930±50 BP, cal. 39 BC-222 AD, MKL-5188).

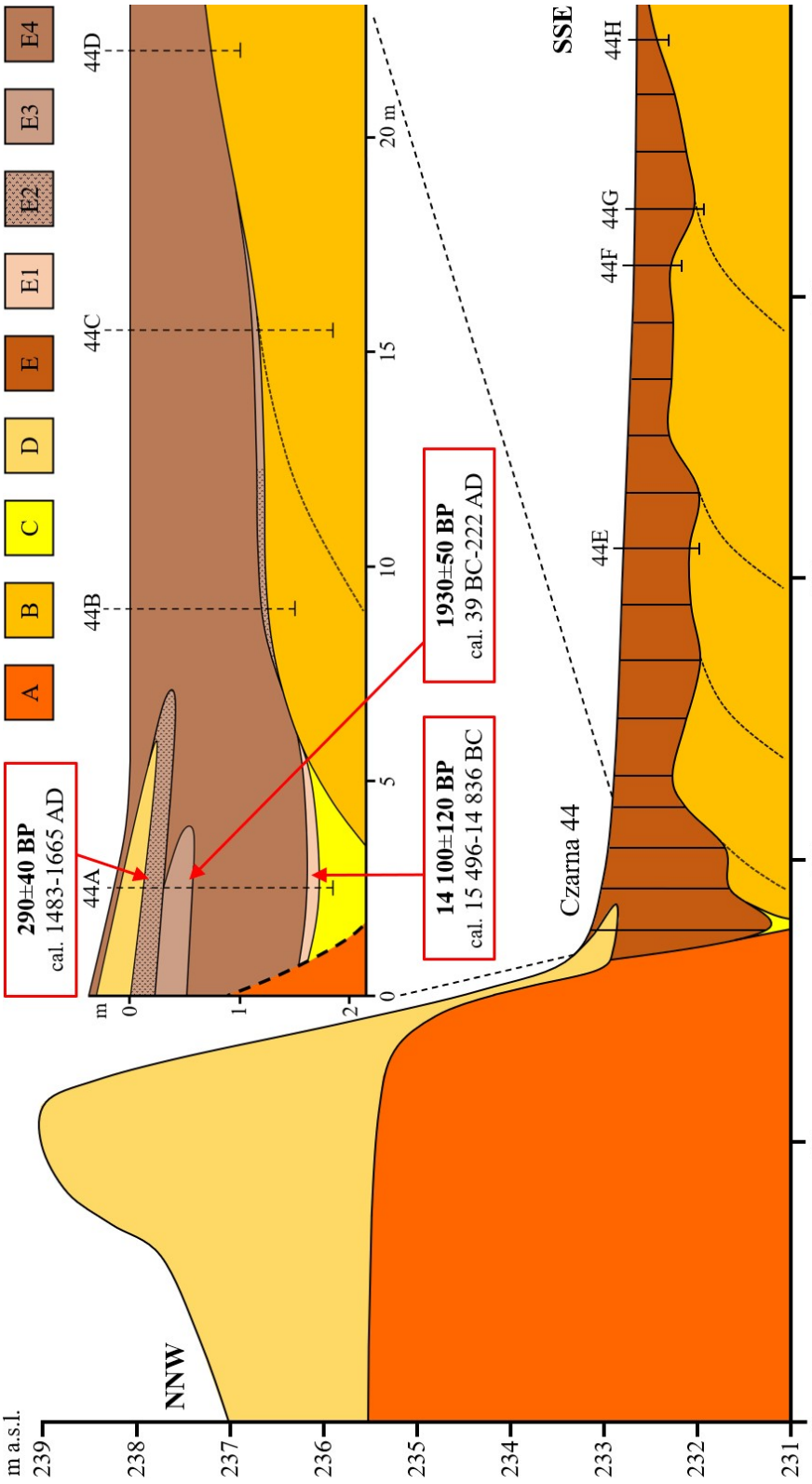

Fig. 2. Section across the macromeander in the Czarna Konecka river valley at Sielpia Mała (Czarna 44 site)
A – sandy alluvia of the terrace, B – sandy alluvia of the floodplain, C – fine-clastic sediments of the palaeomeander fill, D – aeolian/colluvial sands, E – organic sediments (different types) of palaeomeander fill and peat bog on the floodplain (E1 – peaty silts, E2 – sandy and silty peats, E3 – silty peats, E4 – peats/detritus)

The phase in this period is known from Central European valleys [5], also from the Czarna Konecka river valley, where the sedimentation type change (organic → clastic sediments) in the palaeochannel was analogically dated at 1930±60 BP [6]. Later deposition of mineral material and accumulation of colluvial sands on peats (after 290±40 BP, cal. 1483-1665 AD, MKL-5187) reflect the activation of aeolian processes on the dune and wash out on its steeper slope during the Little Ice Age. These were the effects of anthropogenic deforestation in order

to obtain wood for metallurgical activities in the Old-Polish Industrial District (OPID). Collapse of the OPID contributed to growth of the forest on the dune and a decrease in the intensity of aeolian and slope processes. These environmental changes initiated the present-day accumulation of organic sediments in the edge part of the peat bog (Fig. 2).

The very early development of Czarna Konecka macromeanders can be connected with the warming after the Poznań phase of the Vistulian (epe), which Dzieduszyńska and Forysiak [1] date for Central Poland at about 18-17 cal. BP (the Kamion phase). This untimely change in the river pattern (from braided to meandering) could also be a consequence of the influence of local conditions.

REFERENCES

1. Dzieduszyńska, D., Forysiak, J. 2019. Chronostratigraphy of the Late Vistulian in Central Poland and the correlation with Vistulian glacial phases. Studia Quaternaria, 36, 2, 137-145.
2. Gębica, P., Jacyšyn, A. 2021. Age of terrace levels and palaeomeander systems in the light of overestimated radiocarbon datings (the case study of the Dniester River valley, West Ukraine). Studia Geomorphologica Carpatho-Balcanica, 55, 99-128.
3. Kalicki, T. 1987. Lateglacial paleochannel of the Vistula river in Kraków-Nowa Huta. Studia Geomorphologica Carpatho-Balcanica, 21, 93-108.
4. Kalicki, T. 1991. The evolution of the Vistula river valley between Cracow and Niepołomice in Late Vistulian and Holocene times. In: L. Starkel (ed.), Evolution of the Vistula river valley during the last 15 000 years, part IV. Geographical Studies, Special Issue, 6, Zakład Narodowy im. Ossolińskich, Wydawnictwo PAN, Wrocław, 11-37.
5. Kalicki, T. 2006. Zapis zmian klimatu oraz działalności człowieka i ich rola w holoceńskiej ewolucji dolin środkowoeuropejskich. Prace Geograficzne nr 204, Instytut Geografii i Przestrzennego Zagospodarowania im. Stanisława Leszczyckiego PAN, Warszawa.
6. Kalicki, T., Zaborska, D. 2020. Channel and sedimentation type changes in Czarna Konecka river valley – new data (Polish Uplands). In: О.В. Лукашёв, В.И. Зуй, В.Н. Губин, А.Ф. Санько, Г.И. Литвинюк, Д.Л. Творонович-Севрук, К.В. Куприянюк (ed.), МАТЕРИАЛЫ I Международной научной конференции „Проблемы региональной геологии Запада Восточно Европейской платформы и смежных". Издательский центр БГУ, Mińsk, 125-129.
7. Klimek, K. 1992. The age of transformation of Subcarpathian river channel pattern during Late Vistulian. Papers and Abstracts of Symposium GLOCOPH '92, Kraków-Mogilany.
8. Kozarski, S., Rotnicki, K. 1977. Valley floors and changes of river channel patterns in the North Polish Plain during the Late Würm and Holocene. Quaestiones Geographicae, 4, 51-93.
9. Krupa, J. 2015. Natural and anthropogenic channel pattern changes in the mid-mountain valley during the Late Glacial and Holocene, Polish Uplands. Quaternary International, 370, 55-65.
10. Notebaert, B., Verstraeten, G. 2010. Sensitivity of West and Central European river systems to environmental changes during the Holocene: A review. Earth-Science Reviews, 103, 3-4, 163-182.
11. Panin, A.V., Sidorchuk, A.Yu., Chernov, A.V. 1999. Historical background to floodplain morphology: examples from the East European Plain. In: S.B. Marriott, J. Alexander (ed.), Floodplains: Interdisciplinary Approaches. Geological Society, London, Special Publications, 163, 1, 217-229.
12. Starkel, L. 2001. Historia doliny Wisły od ostatniego zlodowacenia do dziś. Monografie, 2, Instytut Geografii i Przestrzennego Zagospodarowania im. Stanisława Leszczyckiego PAN, Warszawa.
13. Starkel, L. 2002. Younger dryas-Preboreal transition documented in the fluvial environment of Polish rivers. Global and Planetary Change, 35, 157-167.
14. Starkel, L., Granoszewski, W. 1995. The Younger Dryas paleomeander of the Wisłoka river at Wola Żyrakowska near Dębica. In: L. Starkel (ed.), Evolution of the Vistula river valley during the last 15 000 years, part V. Geographical Studies, Special Issue, 8, Wydawnictwo Continuo, Wrocław, 91-100.
15. Szumański, A. 1983. Paleochannels of large meanders in the river valleys of the Polish Lowland. Quaternary Studies in Poland, 4, 207-216.
16. Szumański, A. 1986. Postglacjalna ewolucja i mechanizm transformacji dna doliny dolnego Sanu. Kwartalnik AGH, Geologia, 12, 1, 1-92.
17. Vandenberghe, J. 2003. Climate forcing of fluvial system development: an evolution of ideas. Quaternary Science Reviews, 22, 20, 2053-2060.
18. Vandenberghe, J., Kasse, C., Bohncke, S., Kozarski, S. 1994. Climate-related river activity at the Weichselian-Holocene transition: a comparative study of the Warta and Maas rivers. Terra Nova, 6, 5, 476-485.
19. Wójcicki, K.J. 2005. Wpływ zmiennych środowiskowych na zapis facjalny w późnovistuliańskich i holoceńskich wypełnieniach starorzeczy Rudy, Kłodnicy i Osobłogi. Czasopismo Geograficzne, 76, 4, 295-328.