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Deposits of the Mazovian Interglacial (MIS 11c) beneath sinuous ridge-forms as a record of palaeogeographical transformations in Western Polesie (eastern Poland)

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Two sites (Rozkopaczew and Garbatówka) include biogenic deposits that provide a record of the Mazovian Interglacial in the Łęczna–Włodawa Lakeland (eastern Poland). The profiles comprise peat, gyttja, and organic silts occurring several metres below the present ground surface and overlain by Vistulian clastic deposits. Palynological analyses revealed a typical interglacial vegetation succession (mesocratic and telocratic phases). The sites are distinguished by their unusual location within elevated sinuous ridges. In contrast to previously known sites, interpreted as infilling depressions formerly occupied by small lakes, the examples described here indicate a change in depositional regime. Following a phase of lake development under interglacial conditions, the original depressions were filled with younger sediments, probably as a result of fluvial accumulation, and subsequently aggraded and transformed into positive landforms. The results highlight the significant role of later sedimentary and morphogenetic processes in reshaping the original relief.

Key words: Western Polesie (E Poland), Mazovian (Holsteinian, MIS 11c), Vistulian, Pleistocene, inverted relief, pollen analysis.

INTRODUCTION

This study documents and interprets biogenic deposits of the Mazovian Interglacial (MIS 11c) preserved beneath sinuous ridge landforms within the Łęczna–Włodawa Lakeland, and reconstructs the sedimentary and geomorphological processes responsible for their formation and present-day position.

The biogenic sequences investigated are inferred to have accumulated during the Mazovian Interglacial in lacustrine basins situated within subglacial channels. These channels were formed during the South Polish Glaciations (MIS 12–MIS 22; Kucharska et al., 2024). Subsequently, the channels were infilled with clastic sediments. In the Late Vistulian and at the beginning of the Holocene, as a result of later sedimentary processes, the channels became completely filled and squently aggraded, leading to the development of morphological inversion (Krawczyk and Kucharska, 2024, 2025). This process resulted in the transformation of the original negative landforms into positive landforms (sinuous ridges), beneath which the interglacial deposits are presently preserved.

The results contribute to a better understanding of landscape evolution in eastern Poland, particularly in the context of postglacial reorganization of the hydrographic network. They indicate the significant role of sinuous ridge landforms, insufficiently recognized in previous regional studies. The sinuous ridges occurring in the study area, interpreted as inverted fluvial channels (Krawczyk and Kucharska, 2025), constitute potential archives of palaeoenvironmental information.

The study is based on field investigations and exploratory drilling conducted for the revision of sheets of the Detailed Geological Map of Poland at a scale of 1:50,000 (abbreviated as SMGP – from Szczegółowa Mapa Geologiczna Polski), as well as on palynological analyses of samples collected from deposits obtained from these boreholes.

The study area is located at the junction of four macroregions: the Southern Podlasie Lowland, the Lublin Upland, Western Polesie, and Volhyn Polesie (Fig. 1). The Rozkopaczew and Garbatówka sites are situated between the Włodawa Heights to the north and the Uhrusk Hills to the south, within the Łęczna–Włodawa Lakeland. This is an ex-

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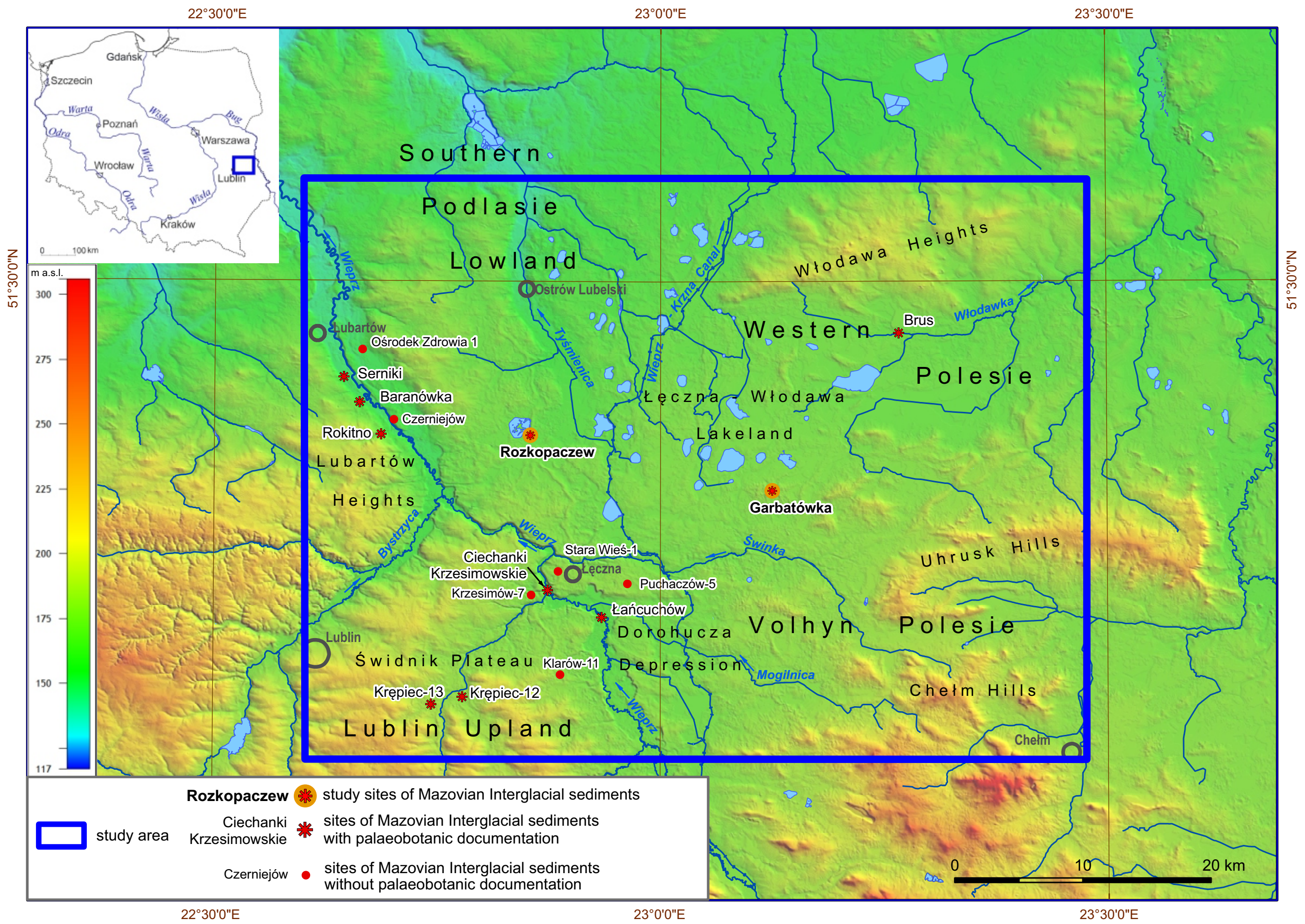

Fig. 1. Location of the study area with sites of the Mazovian Interglacial marked

tensive plain rising to elevations of ~167–180 m a.s.l., located within the Wieprz River basin. The plain includes numerous lakes and small elevations of various origin. It is surrounded by considerably higher areas (>200 m a.s.l.), including the Lublin Upland, the Chełm Hills, the Uhrusk Hills, and the Włodawa Heights (Fig. 1).

The biogenic deposits of the Mazovian Interglacial documented to date in the Polesie region are located within terrain depressions, forming sedimentary infills of small water bodies that functioned under changing climatic conditions and retained their negative relief forms during cooling phases (e.g., Pochocka-Szwarc et al., 2024), as well as within river valleys (e.g., Kucharska et al., 2024). In contrast, the deposits described in the present paper occur beneath gentle topographic elevations, indicating a change in the depositional regime: the original depressions were overlain by deposits of different character, became morphologically obscured, and are presently expressed in the landscape as positive relief forms.

The palaeogeography of this region is characterized by a lake district in which there were numerous shallow water bodies, usually up to several metres deep. Following the retreat of the Sanian 2 ice sheet (MIS 12), some water bodies survived in various states of preservation to the present day, while others underwent ecological succession and transformed into peatlands.

To the south of the maximum extent of the Odranian Glaciation (MIS 6), several tens of Mazovian Interglacial sites have been identified to date. In particular, numerous sites occur north of the study area (Hrynowiecka et al., 2014, 2019; Hrynowiecka and Pidek, 2017; Pochocka-Szwarc et al., 2024). The most comprehensively documented profile occurs at Ossówka, where ~50 m of biogenic deposits have been recorded (Krupiński, 1995; Nitychoruk et al., 2005, 2018), whilst within the study area, the site at Brus is of key importance (Pidek, 2003).

South of the Włodawa Heights, and thus within the area under study, ten sites dating to the Mazovian Interglacial have been documented through palynological analysis (including those described in this paper; Table 1): these are the southernmost sites of this interglacial in this part of Poland.

Palynologically documented sites with Mazovian Interglacial deposits, located south of the Włodawa Heights (Table 1 and Fig. 1), are situated within present-day river valleys and have been partly exposed by erosion. In the Wieprz River valley, these sites are located at Serniki, Baranówka, Rokitno, Ciechanki Krzesimowskie, and Łańcuchów, whilst the Brus site is situated in the Włodawka valley and Krępiec in the Stoki River valley.

Against this background, the Rozkopaczew and Garbatówka sites are distinctive in that they are situated outside the present-day hydrographic network, on elevated areas with shallow sub-Quaternary bedrock. They occur within elongated, sinuous ridges oriented approximately north-south.

The landform at Rozkopaczew has an average height of 6.1 m, a width of ~450 m, and a length of ~7 km, with the site located at its southern end. At Garbatówka, the landform reaches an average height of 3.2 m, a width of ~250 m, and a length of ~3.5 km, with the site situated in its central part. The inter-

Table 1

List of sites with the Mazovian Interglacial within the study area

Site	m a.s.l.	Location	Palaeobotanic documentation	Publication
Rozkopaczew	169.0	positive landform	yes	Krawczyk (2023a); this study
Garbatówka	181.0	positive landform	yes	Kucharska (2023a); this study
Serniki (Syrniki)	148.5	depression	yes	Sobolewska (1956)
Baranówka	152.0	depression	yes	Kucharska et al. (2024)
Rokitno	159.6	depression	yes	Janczyk-Kopikowa (1983)
Brus	168.5	depression	yes	Pidek (2003); Hrynowiecka and Pidek (2017)
Ciechanki Krzesimowskie	160.5	depression	yes	Brem (1953); Jahn (1956)
Łańcuchów	164.5	depression	yes	Paszewski (1949); Jahn (1956); Środoń (1960)
Krępiec-13	184.4	depression/positi-ve landform	yes	Harasimiuk and Henkiel (1980a, b); Janczyk-Kopikowa (1981)
Krępiec-12	178.0	depression	yes	Harasimiuk and Henkiel (1980a, b); Janczyk-Kopikowa (1981); Kucharska et al. (2024)
Ośrodek Zdrowia 1	151.5	depression	no	Łozińska-Stępień et al. (1985); Kucharska et al. (2024)
Czerniejów	155.4	depression	no	Jahn (1956)
StaraWieś-2	179.5	positive landform	no	Harasimiuk and Henkiel (1980a, b); Kucharska et al. (2024)
Puchaczów-5	176.4	depression	no	Harasimiuk and Henkiel (1980a, b); Kucharska et al. (2024)
Krzesimów-7	175.1	positive landform	no	Harasimiuk and Henkiel (1980a, b); Kucharska et al. (2024)
Klarów-11	179.5	positive landform	no	Harasimiuk and Henkiel (1980a, b); Kucharska et al. (2024)

glacial deposits do not form part of these landforms, which are composed of clastic Vistulian deposits, but occur beneath them.

A similar setting is observed at the archival Krępiec-13 site, which is also associated with a sinuous ridge landform, although located within the Stoki River valley.

MATERIALS AND METHODS

During the SMGP update, a review of previous research was carried out, archived drilling profiles were verified, and new fieldwork was conducted: geological mapping and geophysical surveys (Krawczyk, 2023a, b; Krawczyk and Kucharska, 2023a, b; Kucharska and Krawczyk, 2023a, b; Kucharska, 2023a, b).

Based on archival materials, our own field research and analysis of the geological situation, sites for exploratory drilling were selected. One of the sites was located in a depression where shallow Eemian deposits had already been initially documented (Kucharska and Krawczyk, 2023a). The remaining three were located on extensive, elongated sinuous ridges. Our investigations, supported by geophysical surveys, revealed the presence of erosional valleys beneath these ridges, which were interpreted as subglacial channels (Kucharska et al., 2024; Krawczyk and Kucharska, 2025). The infill of these channels is heterogeneous and, in many cases, contains fine-grained clastic as well as biogenic deposits. This also indicated the potential occurrence of lacustrine deposits within these locations. Despite the highly unusual occurrence of lacustrine deposits beneath positive landforms, it was decided to risk searching for them.

GEOLOGICAL MAPPING

The geological mapping of involved conducting field surveys during which observations of the land surface were carried out, natural and anthropogenic exposures were described, and shallow hand-drilled boreholes reaching depths of 2–3 m were drilled.

To analyse the geological structure of the site area, we utilised our own exploratory boreholes, archived boreholes, and electrical resistivity tomography (ERT) surveys carried out for the purpose of producing geological maps. The resistivity surveys were performed using the Roll Along method with an electrode spacing of 10 m, involving the sequential transfer of cable arrays to the forward section of the profile. A cable set mounted on reels and equipped with 21 take-outs was used. The data acquired were processed and interpreted using the *RES2DINV* software package.

EXPLORATORY DRILLING

Exploratory boreholes were drilled using a rotary drilling system (WH type). The drilling rig is powered by a hydraulic system driven by a stationary engine. The drilling was carried out dry, without the use of drilling fluid, employing spiral augers mounted on 1.2 m drill rods. The borehole diameter is 10.0 cm. The boreholes were not cased. Drilling was carried out in 1.0 m runs. Following the withdrawal of the auger, samples for palynological analyses were collected from the material retained on the auger spirals, with sampling intervals ranging from 5 to 25 cm depending on the deposit type.

POLLEN ANALYSIS

One cm³ sediment samples were collected for pollen analysis. Calcium carbonate was removed using a 10% HCl solution, and humic acids were removed by heating in a 10% KOH solution.

Separation of the mineral and organic fractions was carried out by flotation, using $ZnCl_2$ with a specific gravity of ~2.1 g/cm³ (Nakagawa et al., 1998). The organic fraction was then subjected to standard acetolysis (Faegri and Iversen, 1989). Sporomorphs mounted in anhydrous glycerine were counted under 400× magnification. In both the Rozkopaczew and Garbatówka successions, the state of preservation and frequency of sporomorphs in the samples analysed samples were sufficient to obtain reliable pollen spectra.

The drilling proved lacustrine deposits at all sites investigated. In the depression selected, the occurrence of Eemian Interglacial deposits was confirmed (Kucharska and Krawczyk, 2023a). In the next borehole, located on a ridge, lake deposits were encountered, though barren. Promising samples were obtained at the remaining two sites. These were the Rozkopaczew and Garbatówka boreholes (Fig. 1). Palynological analyses were carried out, confirming the presence of lacustrine deposits, which were dated to the Mazovian Interglacial (MIS 11c; Table 2).

RESULTS

The study provided detailed lithological and palynological data for the Rozkopaczew and Garbatówka sites, where Mazovian biogenic deposits were documented (Fig. 2). The geological structure and geomorphological context of these sites is unusual, these deposits occurring beneath elevated sinuous ridge landforms, which is of significant importance for the interpretation of their origin and the subsequent evolution of the relief.

ROZKOPACZEW SITE

The Rozkopaczew borehole (Fig. 1) encountered Mazovian Interglacial deposits at a depth of 9.2–12.0 m, located within the Ostrów Lubelski SMGP sheet (Krawczyk, 2023b), with the

Table 2

Chronostratigraphic correlation of the Lower, Middle and Upper Pleistocene between Poland (Ber et al., 2007; Marks et al., 2018, modified; Marks, 2023, modified, 2026, modified), NW Europe (Ber et al., 2007; Lindner and Marks, 2008), the Alps (Lindner, 1991; Mojski, 1993) and Belarus and Ukraine (Lindner et al., 2006; Lindner and Marks, 2012)

Stratigraphy		Poland			NW Europe		Alps		E Europe		MIS
					Germany				Belarus	Ukraine	
Holocene				Holocene		Holocene		Holocene	Holocene		1
Pleistocene	Upper	North Polish Complex		Vistulian		Weichselian		Würm	Poozerian	Valdy	2-5d
				Eemian		Eemian		Riss/Würm	Muravinian	Pryluky	5e
	Middle	Middle Polish Complex	Odranian	Odranian + Wartanian	Saalian	Drenthe+ Warthe	Riss	Riss II	Pripyatian	Dnieperian 2	6
				Lublinian		Schöningen		R I/R II	Shklovian	Kaydaky	7
				Krznanian		?		Riss I	?	Dnieperian 1	8
				Zbójnian		Reinsdorf		Pre-R/R I	Smolenskian	Potagaylivka	9
				Liviecian		Fuhne		Pre-Riss	Cooling	Orelian	10
				Mazovian		Holsteinian		Mindel/Riss	Alexandrian	Likhvinian	11c
				Sanian 2		Elsterian		Mindel	Berezinian	Okaan	12
				Ferdynandovian		Cromerian		Günz/Mindel	Belovezhian	Lubenian	13–15
				Sanian 1				Günz	Narevian	Sulian	16
	Lower			Augustovian (Podlasian)							17–19(21)
				Nidanian (Narevian)							20(22)

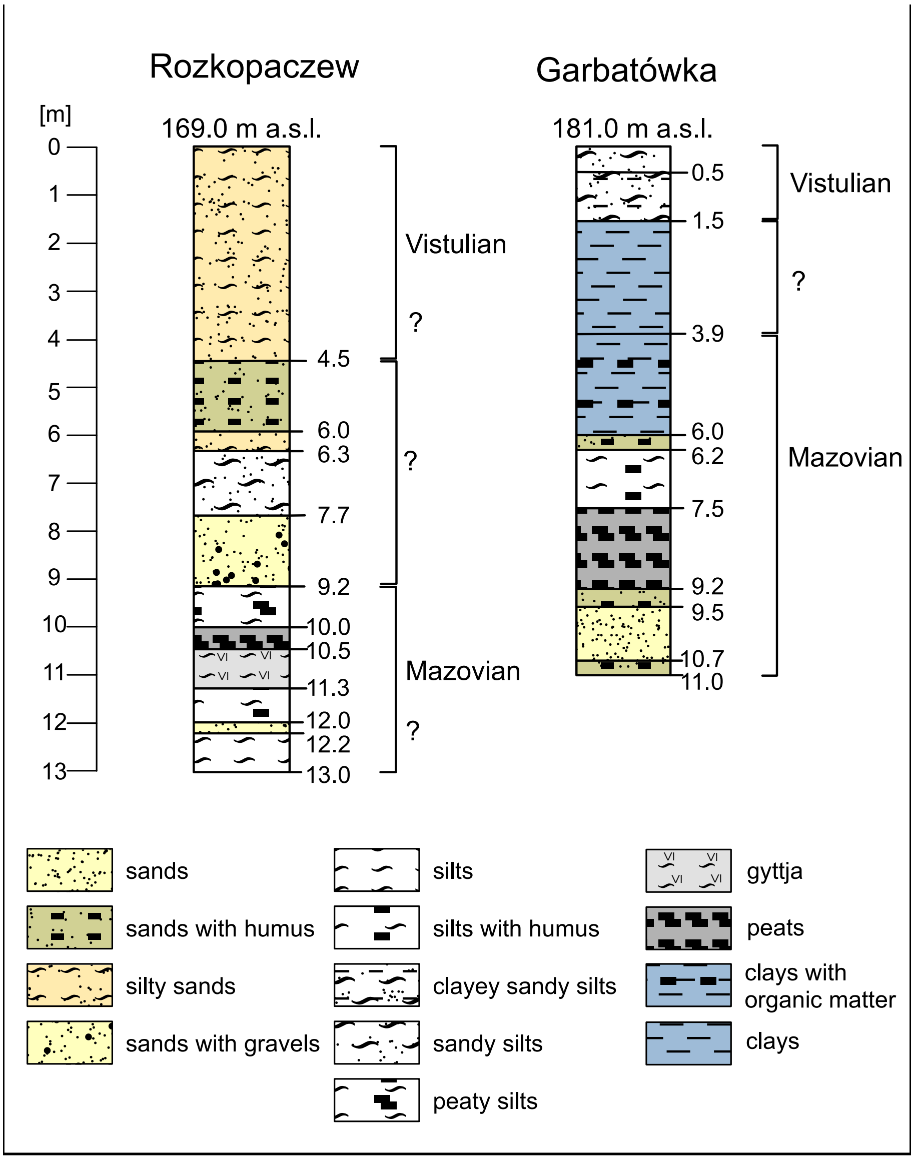

Fig. 2. Lithological profiles of the Rozkopaczew and Garbatówka boreholes

following geographic coordinates (WGS-84): 22°51′11″ E and 51°23′48″ N.

The Rozkopaczew site is located within the Ostrów Lubelski municipality (Lubartów County), ~2 km south of the village of Rozkopaczew and ~250 m south-east of the Lake Mytycze shoreline. The site is situated within cultivated farmland, ~100 m north of a small forest. It is situated in the Southern Podlasie Lowlands, at an elevation of 169.0 m a.s.l., in the southern part of a landform described as an inverted fluvial channel (Krawczyk, 2023a, b; Krawczyk and Kucharska, 2025). This landform, together with a similar ridge located to the west of Lake Mytycze, forms part of a sinuous ridge system with a general N–S orientation, extending from the Ostrów Lubelski area to the vicinity of Łęczna and reaching a length of >30 km.

In the area of Lake Mytycze, the ridge is over 6 km long, up to 450 m wide and has a relative height of 3–5 m. Its surface is level and relatively flat, with minor local relief differences of up to ~1 m. The landform is surrounded by fluvial-periglacial plains, on which depressions filled with peat and lacustrine deposits have developed (Fig. 3).

The ridge surface is composed of fluvial-periglacial sands and silts up to 4.5 m thick (Fig. 3). Dating of surface deposits from a sample collected ~2 km north of the site indicates their accumulation during the Late Vistulian (13.5 ±2.2 ka BP; Krawczyk, 2023a, b).

To the west, the ridge borders Lake Mytycze, whilst to the east it transitions into a plain composed of fluvial-lacustrine and floodplain deposits associated with the Middle Polish and Northern Polish glaciations. To the south, there are depressions filled with lacustrine-fluvial deposits of the Vistulian Glaciation, and Holocene peat deposits (Krawczyk, 2023a, b).

Geophysical surveys (Fig. 4) and boreholes revealed a pronounced bedrock depression beneath the ridge, interpreted as a deep subglacial channel (Krawczyk, 2023a; Kucharska et al., 2024). Outside the subglacial channel, the pre-Quaternary bedrock (Cretaceous) rises to elevations of 150–160 m a.s.l. (Krawczyk, 2023a).

The lithological profile of deposits in the Rozkopaczew borehole (169.0 m a.s.l.) is as follows:

0.0–4.5 m – medium-grained sands with occasional gravels and silts, yellow;

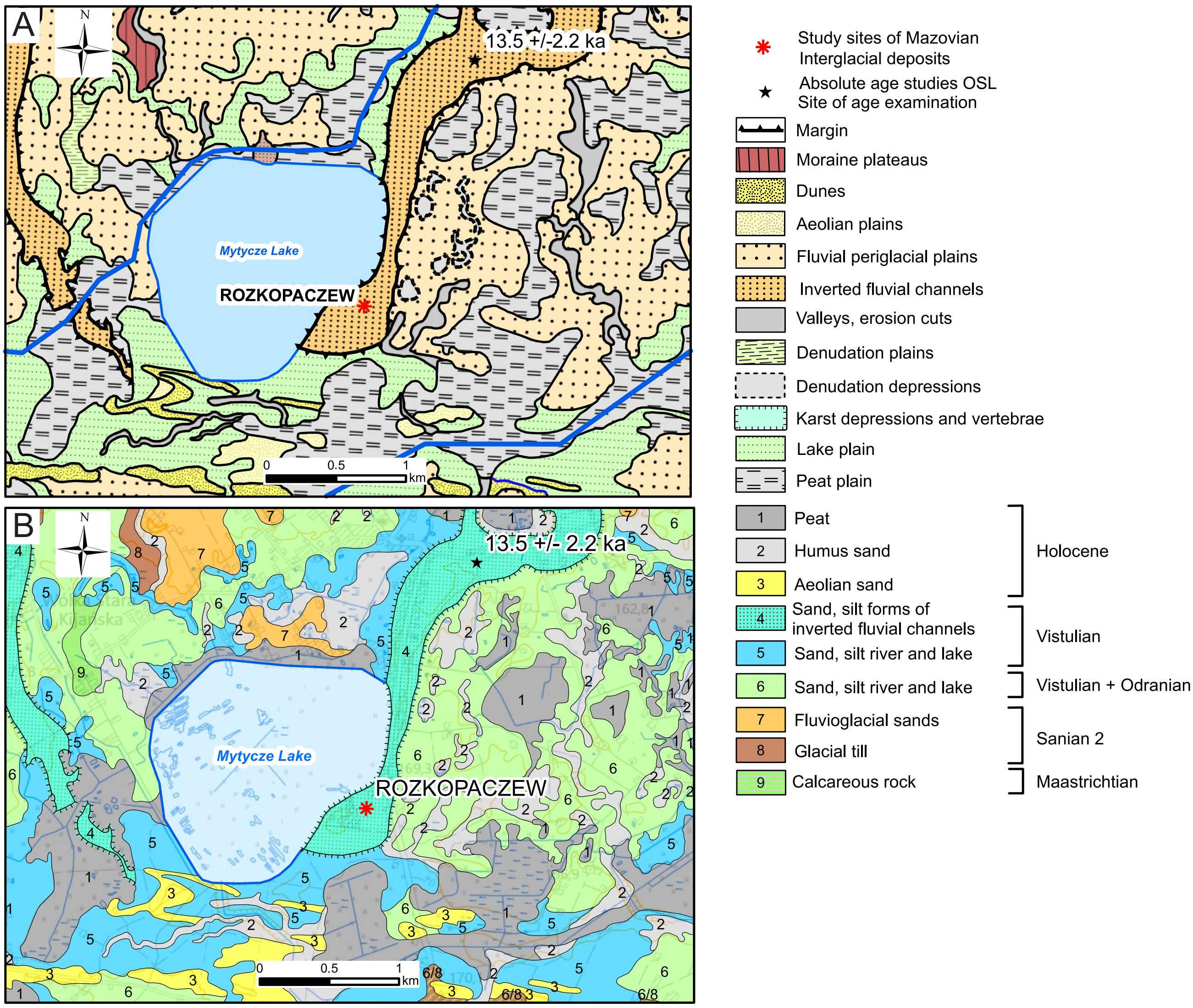

Fig. 3A – geomorphological sketch and B – geological map of the Rozkopaczew site area

4.5–6.0 m – medium- and fine-grained sands with humus, parallel-laminated, brown;
6.0–6.3 m – silty sands with fine gravel, brown;
6.3–7.7 m – sandy silts, grey;
7.7–9.2 m – medium- and coarse-grained sands with gravels (2–3 cm), grey;
9.2–10.0 m – peaty silts / peaty gyttja, brown, sandy in the top part;
10.0–10.5 m – well-decomposed peat, loose;
10.5–11.3 m – grey-olive gyttja;
11.3–12.0 m – laminated silt with humus laminae and numerous faunal remains;
12.0–12.2 m – medium-grained sands, yellow;
12.2–13.0 m – compact grey silt with cuboidal fracturing.

The vegetation sequence from Rozkopaczew begins with the development of fir–hornbeam (*Abies–Carpinus*) forests, with the participation of oak (*Quercus*) and hazel (*Corylus*). Pollen of tree taxa considered exotic for the younger Quaternary but occurring in Poland during the Mazovian Interglacial was also identified: *Pterocarya, Carya, Celtis and Parrotia*. Pine (*Pinus sylvestris* type) and tree birches (*Betula alba* type) constituted only a minor component of these communities (Fig. 5).

In the spectra from depths of 1090 and 1070 cm, a decline of hornbeam and fir in favour of pine and birch is observed. An opening of the landscape is also evident, indicated by an increase in the proportions of herbaceous pollen, mainly grasses (Poaceae undiff.), mugworts (*Artemisia*), and sedges (Cyperaceae).

Spectra from depths of 1140 to 1090 cm represent the late mesocratic phase of the interglacial (period III according to Szafer, 1953). The uppermost spectrum, at 1040 cm, belongs to the telocratic (terminal) phase of the Mazovian Interglacial (period IV) and is characterized by the development of mixed pine-birch forests, with a minor component of spruce and increased landscape openness.

GARBATÓWKA SITE

The Garbatówka site (Fig. 1) documents Mazovian Interglacial deposits encountered in the Garbatówka research bore-

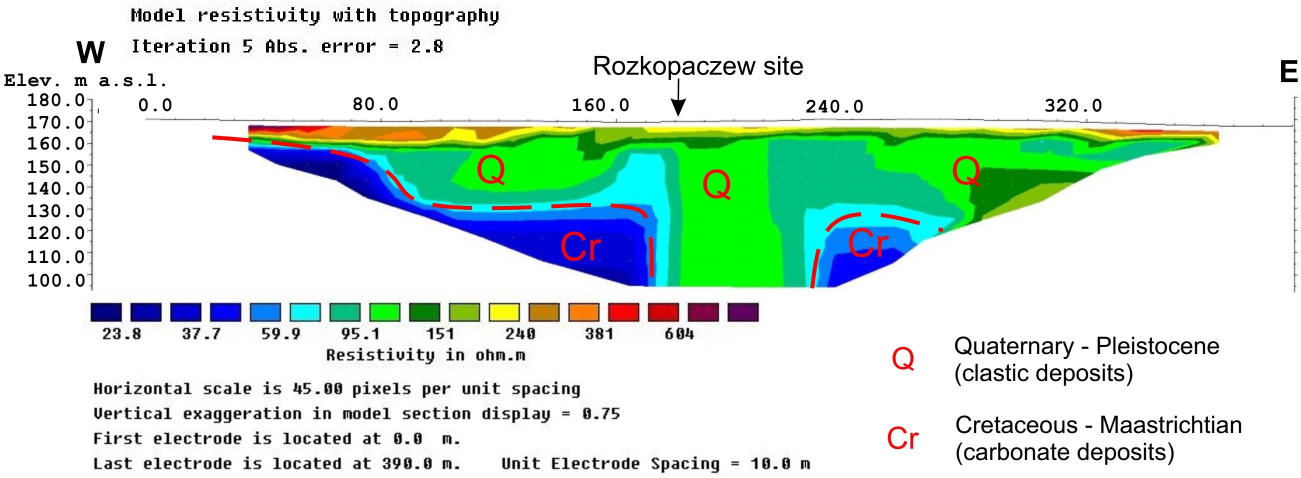

Fig. 4. ERT profile in the area of the Rozkopaczew documentation site (Krawczyk and Kamiński, 2024 simplified)

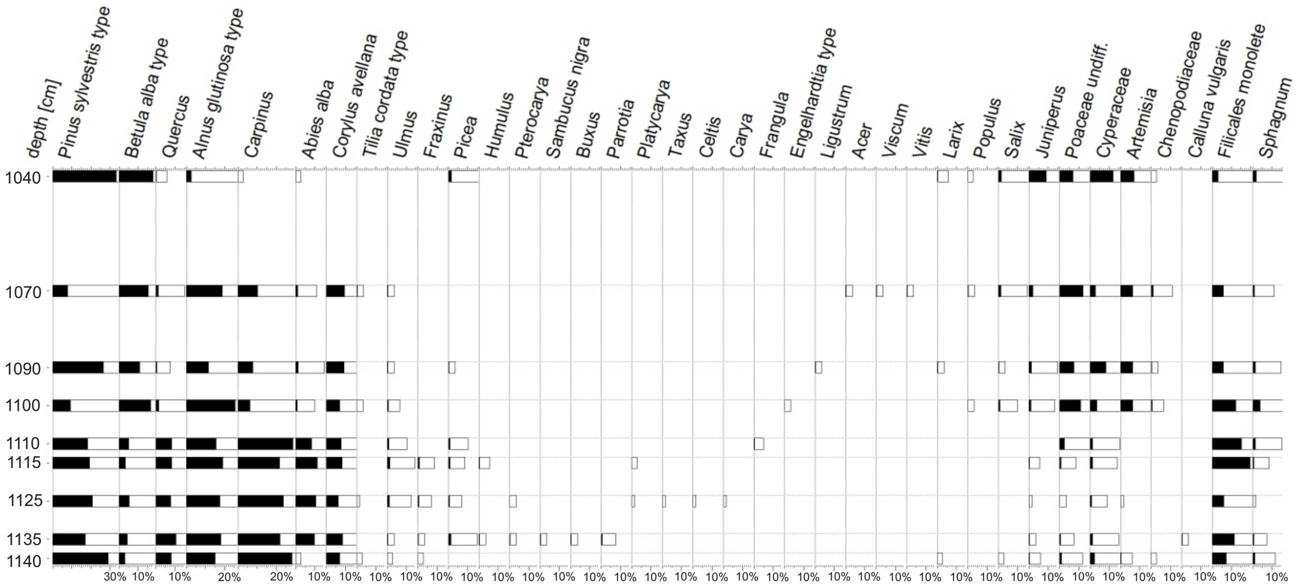

Fig. 5. Simplified pollen diagram for the Rozkopaczew site (W. Granoszewski)

hole, located within the Orzechów Nowy SMGP sheet (Kucharska, 2023b), with the following geographic coordinates (WGS-84): 23°07′25″ E and 51°21′23″ N.

The site is located in the municipality of Cyców (Łęczna County), ~0.5 km east of the village of Garbatówka and 2–3 km south of the Uściwierz, Rotcze and Sumin lakes. It is situated on farmland, near the local road between Garbatówka and Świerczów-Kolonia.

The site is positioned on the Łęczna–Włodawa Lakeland, within the central part of an elongated NE–SW trending landform at an elevation of 181.0 m a.s.l. This landform, a sinuous ridge, is interpreted as an inverted fluvial channel (Krawczyk and Kucharska, 2025). The ridge is ~3.5 km long. In the area of the site, its width exceeds 200 m, and it rises to ~3 m above the surrounding terrain. The landform is surrounded by young Holocene peat and lacustrine plains, whereas on the south-western side it adjoins a denudational plain built of shallowly exposed Cretaceous (Maastrichtian) strata (Fig. 6; Kucharska, 2023b).

In the vicinity of the site, the surface is composed of sandy silts with fine gravels associated with the Vistulian Glaciation (Fig. 6). Dating of the deposits indicates a Late Vistulian age (13.8 ±2.7 ka BP; Kucharska, 2023a, b). A characteristic feature of the area is the shallow occurrence of Cretaceous rocks, which are locally exposed at the surface (Fig. 6). The surface of the pre-Quaternary basement in this region rises to ~177–180 m a.s.l.

The lithological profile in the Garbatówka borehole (181.0 m a.s.l.) is as follows:

0.0–0.5 m – sandy silts with fine gravels, light brown;
0.5–1.5 m – clayey sandy silts, light brown;
1.5–3.9 m – light grey-brown clays;
3.9–6.0 m – black clays, slightly sandy, with organic matter and muscovite grains;

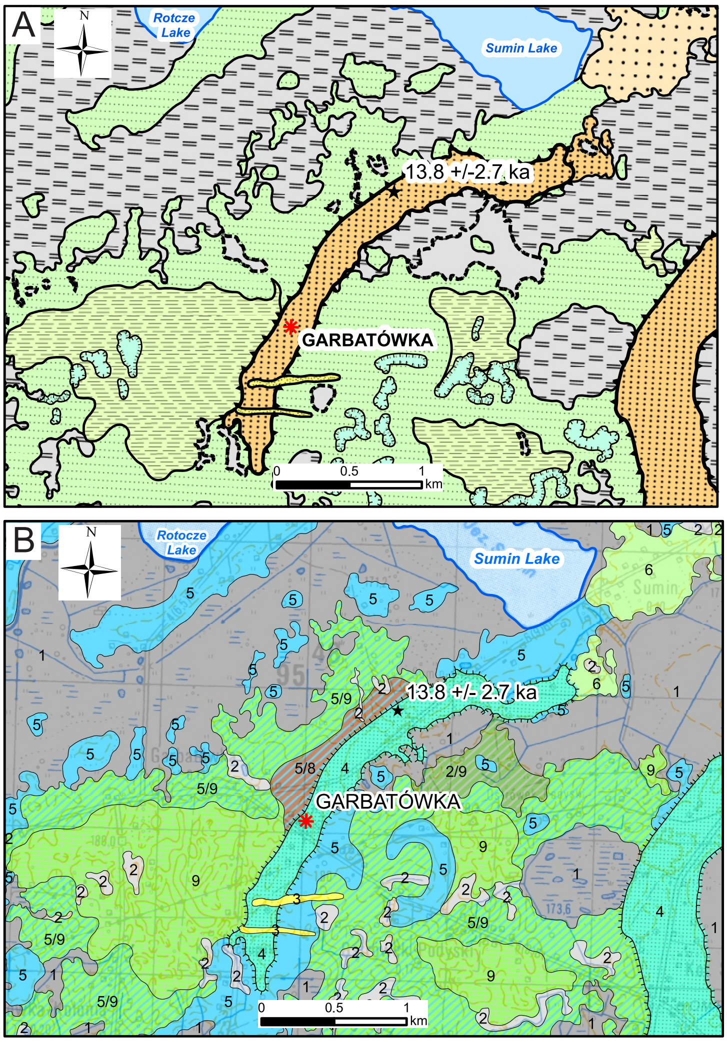

Fig. 6A – geomorphological sketch and B – geological map of the Garbatówka site area

For explanations see Figure 3

6.0–6.2 m – humic silty sands, dark grey;
6.2–7.5 m – sandy silts with organic matter, black;
7.5–9.2 m – brown-black peats; in the top part, sandy peats with an admixture of peaty silts;
9.2–9.5 m – peaty sands, grey;
9.5–10.7 m – fine-grained sands, slightly silty, grey;
10.7–11.0 m – peaty sands, grey

In the pollen succession from Garbatówka, three stages of forest vegetation changes can be identified. The oldest stage, represented by pollen spectra from depths of 950 and 930 cm, documents the presence of pine–spruce (*Pinus*–*Picea*) forests with a minor contribution of hazel, oak (*Quercus*), hornbeam, and fir (Fig. 7).

In turn, the spectra from 900, 870, and 850 cm correspond to hornbeam-fir forest communities characteristic of the Mazovian Interglacial and represent the mesocratic stage (Period III) of the interglacial succession.

The three uppermost spectra (770, 750, and 725 cm) record a return to mixed boreal forests (pine–birch assemblages) and represent the late phase of Period III of the interglacial. The two youngest spectra, characterized by a markedly high proportion of open-land vegetation (Poaceae, Cyperaceae, *Artemisia*) and an almost complete absence of thermophilous arboreal pollen, indicate their attribution to the telocratic (Period IV) stage of the interglacial.

DISCUSSION

In the study area, two main types of Mazovian Interglacial lake can be distinguished: kettle lakes and tunnel-valley lakes (known as ribbon lakes).

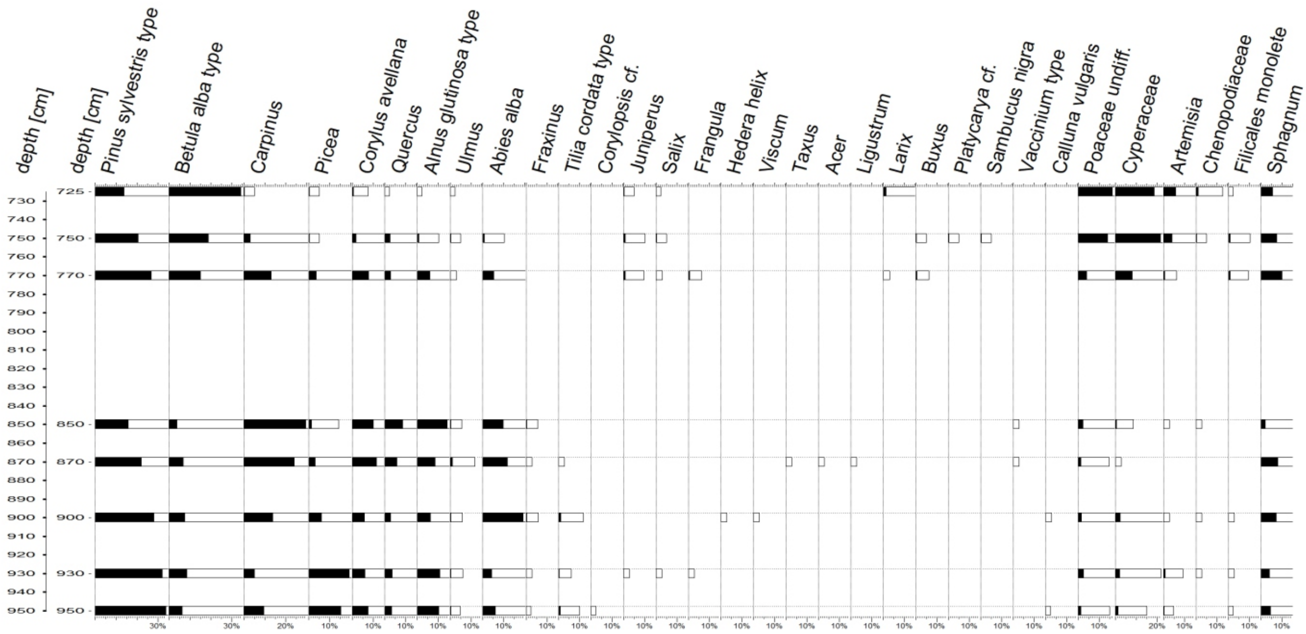

Fig. 7. Simplified pollen diagram for the Garbatówka site (W. Granoszewski)

Kettle lakes formed in depressions left by dead-ice blocks, which developed following the retreat of the Sanian 2 ice sheet. Tunnel-valley lakes originated in deep erosional incisions, which were commonly subsequently integrated into fluvial systems or meltwater drainage networks (e.g., the palaeolakes of Serniki, Łęczna and Krępiec; Kucharska et al., 2024; currently occupied by the Wieprz and Stoki rivers).

The existence of these palaeolakes is confirmed by biogenic deposits (peat, silts, peaty clays) documented at numerous sites (Brem, 1953; Sobolewska, 1956; Janczyk-Kopikowa, 1981, 1983; Pidek, 2003; Hrynowiecka-Czmielewska, 2010; Hrynowiecka et al., 2014; Hrynowiecka and Pidek, 2017; Pochocka-Szwarc et al., 2021, 2024). Under conditions of climatic change, the basins became shallower and dried out, and the depressions were filled with younger clastic sediments.

In most cases, former lakes are reflected in the contemporary relief as topographic depressions: basins, peat plains, or segments of fluvial valleys. Following the retreat of the ice sheet, geomorphological stability prevailed, with a tendency towards repetition of landform patterns, while denudational processes played a significant role in the gradual modification of the primary relief.

In some locations, such as Rozkopaczew and Garbatówka, lacustrine sedimentation did not continue, nor were the depressions incorporated into the fluvial network – the palaeorelief was not reproduced. The Mazovian Interglacial deposits (corroborated by vegetation succession evidence) transitioned from the lacustrine stage to fluvial sedimentation, which at some point was interrupted; waters changed course and never returned to their former channels. The accumulation of younger clastic sediments caused an inversion of the relief; former depressions became elevations (several metres above the surrounding area), forming sinuous ridges (Krawczyk and Kucharska, 2025).

The study area lies outside the extent of the Odranian Glaciation, which means that the deposits overlying the biogenic sediments of the Mazovian Interglacial period are not of glacial origin. According to the most recent findings, the last ice sheet to cover this area was that of the Sanian 2 Glaciation (Marks et al., 2018; Hrynowiecka et al., 2019; Żarski and Kucharska, 2020; Żarski et al., 2024). Consequently, a postglacial origin of the sinuous ridge forms analysed should be excluded. These features cannot be interpreted as crevasse landforms, eskers, or kames. In addition to Rozkopaczew and Garbatówka, a similar process of palaeorelief transformation has been documented within a subglacial channel south of Łęczna at the Klarów site (Fig. 1; Harasimiuk and Henkiel, 1981; Krawczyk and Kucharska, 2023a). This process leads to the formation of untypical geomorphological arrangements, in which original lake depressions may now occur beneath topographic highs, rather than, as in most cases, in depressions. Such palaeorelief transformation means that the contemporary landform does not directly reflect former sedimentary conditions, which in the absence of borehole data significantly hinders identification of these structures.

CONCLUSIONS

During fieldwork related to updating of the Detailed Geological Map of Poland, boreholes were drilled in which organic deposits of the Mazovian Interglacial were documented at considerable depths (~9–12 m at Rozkopaczew and ~7.5–9.2 m at Garbatówka). These lacustrine deposits are overlain by younger clastic deposits forming the contemporary topographic highs.

1. Palynological analyses have shown that the biogenic deposits at the Rozkopaczew and Garbatówka sites represent the Mazovian Interglacial, and that the succession of vegetation in both profiles is consistent and synchronous, encompassing the mesocratic and telocratic phases.

2. During the Mazovian Interglacial period, the sites under investigation were occupied by lake basins associated with subglacial channels. After the lakes disappeared, the depressions were filled with biogenic sediments and subsequently

overlain by clastic deposits. Mazovian Interglacial deposits in Western Polesie occur in various positions, indicating their association with different types of lake basin.

3. During the Vistulian, substantial sediment accumulation occurred in areas previously occupied by biogenic deposits, leading to relief inversion: former lacustrine depressions (associated with subglacial channels) became aggraded and presently occur as positive landforms (sinuous ridges of inverted fluvial channel type) (Krawczyk and Kucharska, 2025).

4. The location of the Rozkopaczew and Garbatówka sites is exceptional, as lacustrine deposits of the Mazovian Interglacial occur here beneath present-day topographic elevations rather than, as is typically the case, within depressions. This significantly complicates their identification based solely on terrain morphology. The Rozkopaczew and Garbatówka sites are among the southernmost occurrences of the Mazovian Interglacial.

5. The nature of the overlying deposits and the location of the area outside the reach of later glaciations indicate that these landforms do not have a glacial origin (such as eskers or kames), but are the result of post-depositional transformations and fluvial and denudational processes during the Vistulian and Holocene.

6. The presence of sinuous ridges may reflect the course of subglacial channels from the Sanian 2 (MIS-12) and serve as an indicator of the presence of as yet undocumented lacustrine deposits from the Mazovian Interglacial, which is of significant importance for further palaeogeographical research in the region.

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