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New radiocarbon datings of the Late Glacial and Holocene organic deposits of the Janoszyce furrow, Dobrzyń Lakeland

ABSTRACT: Organic deposits of Janoszyce furrow, Dobrzyń Lakeland, are represented by two peat layers separated and underlied by lacustrine chalk. The radiocarbon datings have shown that older peat layer originated in the Allerød, and the younger — in the Pre-Boreal. The formation of organic layers was accompanied by serveral flows of loamy and sandy deposits, resulting from the climatic changes and the melting of dead ice blocks, the intensity of which was changing in time. Lacustrine chalk and black clay, directly underlying the older, Allerød peat layer, are dated at the older Dryas and Bølling, respectively.

INTRODUCTION

The Janoszyce furrow is one of several evorsional furrows developed in the area SW of Płock, Dobrzyń Lakeland, Central Poland (Fig. 1), and subjected to the Baltic (Würm) Glaciation (*cf.* Lamparski 1964, Skompski & Słowański 1964, Kozłowska 1972). The Janoszyce furrow has undergone some transformations since its origin, but, nevertheless, it remains clearly marked on the background of postglacial highland and flat fluvioglacial horizons of the Skrwa river, the right tributary of the Vistula (Fig. 2).

The geological structure of the furrow is recognized due to shallow boreholes and several excavations. These works were mainly concentrated along 500 m section of the furrow at western side of the greatest lake (*cf.* Fig. 2).

The results of all the fieldworks and the relevant literature are given elsewhere (Lamparski 1976). Here, taking into account certain differences in development of geological processes depending on the width of furrow, the history of the furrow is discussed separately for its narrower (Fig. 4 *A-H*) and wider (Fig. 5 *A-H*) sections, respectively.

Organic deposits dated using radiocarbon methods are represented by two peat and two lacustrine chalk layers underlied by black clays with badly preserved mollusk shells. The extent of the organic deposits is small, only locally exceeding the margins of the furrow.

DEVELOPMENT OF THE JANOSZYCE FURROW

The formation of the Janoszyce furrow resulted from intensive bottom erosion and eversion by waters flowing through ice tunnel towards the east, i.e. towards marginal zone of the Baltic (Würm) Glaciation icesheet. The furrow rapidly disappears in that direction, passing into a narrow sinuous esker with well-developed side furrows. The latitudinal

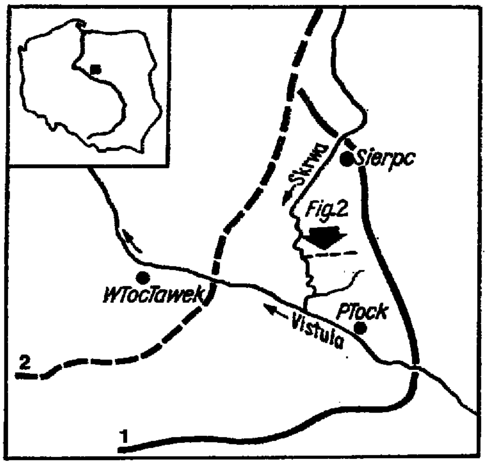
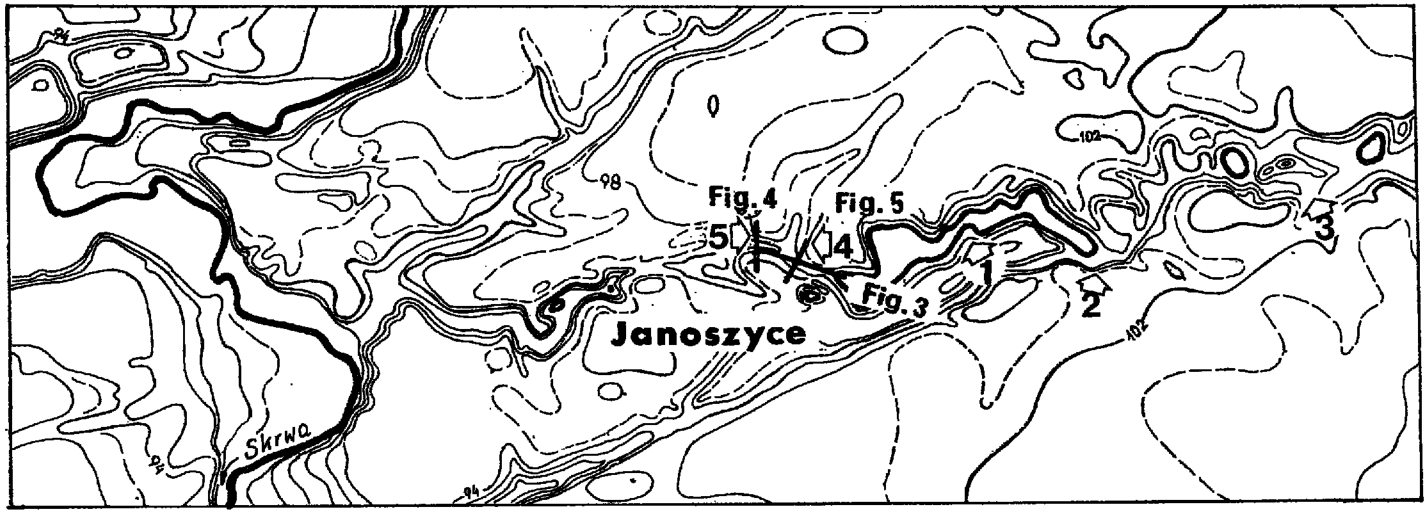


Fig. 1

Location map of the Janoszyce furrow (arrowed, *cf.* Text-fig. 2); indicated are the limits of the maximum extent of the Baltic (Würm) Glaciation: *1* Leszno glaciphase, *2* Poznań glaciphase

course of the Janoszyce furrow was related to an icesheet lobe markedly projected to the east, so called the Płock lobe. The channel deeply incised by glacial waters in older glacial deposits, was subsequently partly infilled with a series of fluvioglacial gravels and sands a few meters thick. When ceiling of the ice tunnel collapsed, some sections of the furrow were infilled with dead ice blocks while others became the site of accumulation of limnoglacial kames made up of silty-sandy deposits (Fig. 3). Infilling of some sections with ice and others with silty-sandy deposits saved the furrow from burial in times of formation of several descending fluvioglacial horizons along the axis of the recent Skrwa river. These horizons are characterized by well-developed erosional hummocks covered with very thin mantle of sander sands. They were formed in times of gradual recession of the icesheet in the north-western direction.

Apart from limnoglacial deposits originally formed between dead ice blocks completely filling some sections of the furrows there are several kame terraces, ridges (Pl. 1, Figs 1—2) and hummocks (Pl. 2, Fig. 1). At present, in the furrow there occur over a dozen lakes of either the erosional, circular kettle type or wider lakes separated by kame ridges (Pl. 1, Fig. 1).



Morphology of the proximal (western) segment of the Janoszyce furrow (*cf.* Text-fig. *1*); to the west, fluvioglacial levels and terraces of the Skrwa valley; to the east, fragment of the glacial highland

Indicated are lines of geological sections (*cf.* Text-figs 3—5), and places of taking the photos: *1* (Pl. 1, Fig. 1), *2* (Pl. 1, Fig. 2), *3* (Pl. 2, Fig. 1), *4* (Pl. 2, Fig. 2) and *5* (Text-fig. 6)

The longitudinal section through the Janoszyce furrow (Fig. 3) shows that the eastern and western lakes are separated by kame deposits. This indicates the existence of two dead ice blocks, between which an intense limnoglacial accumulation of silts and sands proceeded and resulted in the filling of that section of the furrow.

The formation of fluvioglacial horizons in the axis of the recent Skrwa river valley started when the furrow became almost completely filled with fluvioglacial deposits under the ice cover (Figs 4*A*, 5*A*) and subsequently with dead ice blocks or limnoglacial deposits (Figs 4*B*, 5*B*) in connection with the recession and subsequent stay of the icesheet at the line of new series of front moraines. The furrow filled with ice and silty-sandy deposits became covered by moderately thick series of deposits of the sander type (Figs 4*C*, 5*C*). This situation did not change till the end of the Baltic (Würm) Glaciation. An intensified melting of buried dead--ice blocks started presumably in the Bølling times, giving rise to a small depression. In that depression formed black clays with mollusk remains (Figs 4*D*, 5*D*) and subsequently, in the Older Dryas, sandy blue-grey lacustrine chalk (Figs 4*E*, 5*E*). The comparison of size and depth achieved by the basin in times of deposition of the black clays and lacustrine chalk, respectively, has shown that the effects of climate amelioration from the Bølling times were fully marked with some delay in the Older Dryas (*cf.* Oszast 1957, Wasylikowa 1964). This means that an intensified melting of buried dead-ice blocks took place not before the Older Dryas. The

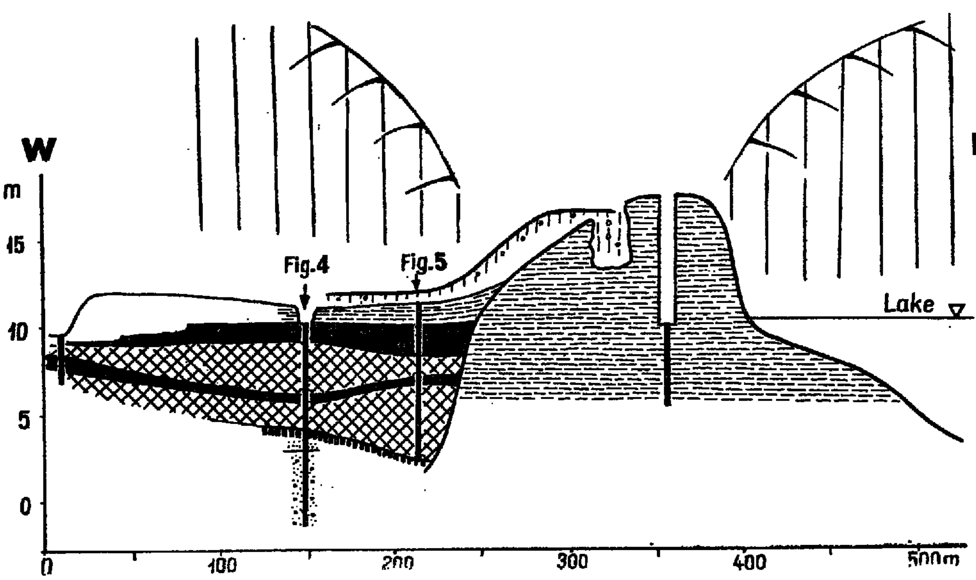
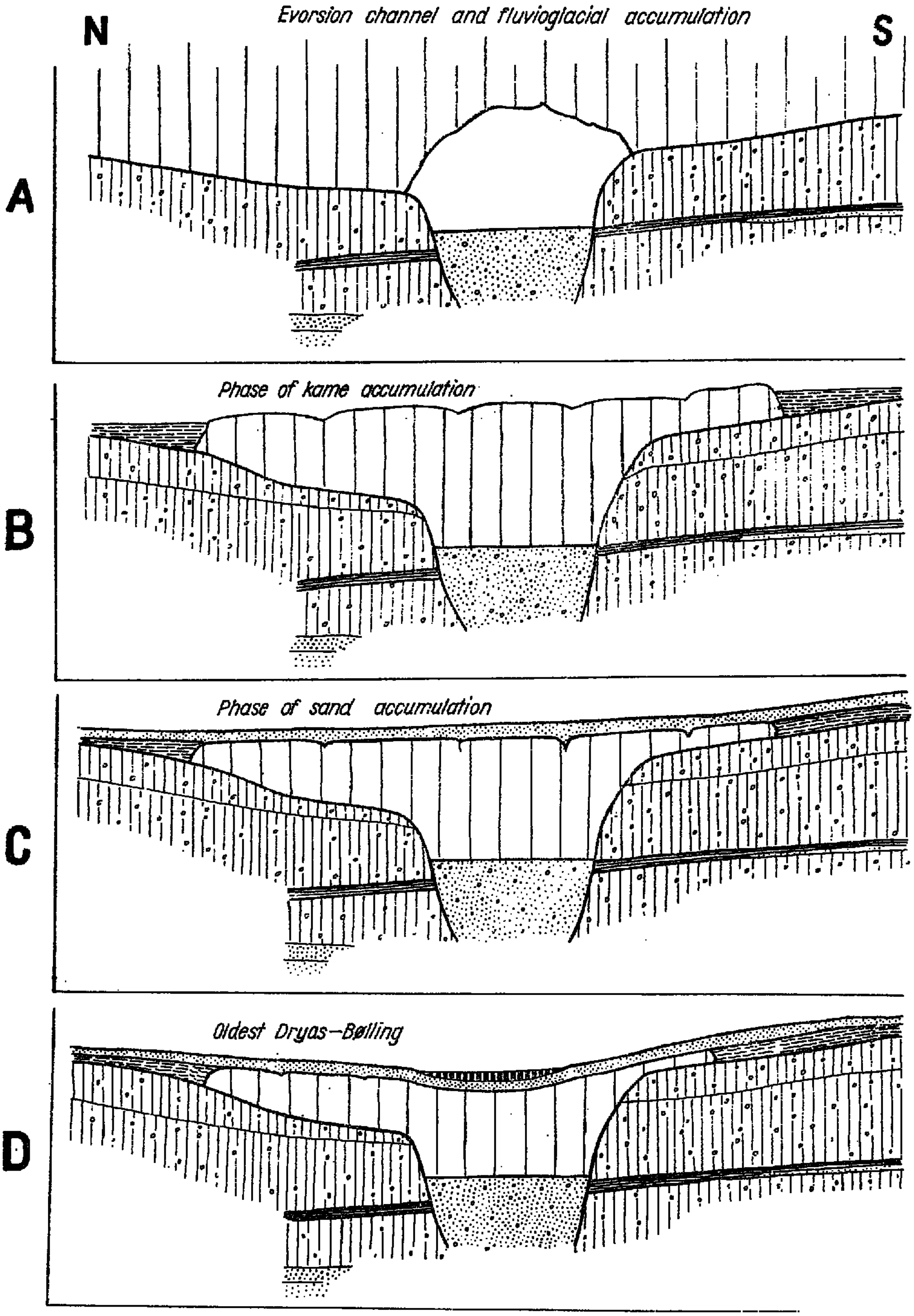


Fig. 3. Longitudinal section of the Janoszyce furrow; the segment west of the lake. Places of boreholes instructive for the transverse sections (Text-figs 4—5) are indicated; explanations as for Text-fig. 4


Evorsion channel and fluvioglacial accumulation
N
S
A
Phase of kame accumulation
B
Phase of sand accumulation
C
Oldest Dryas—Bølling
D

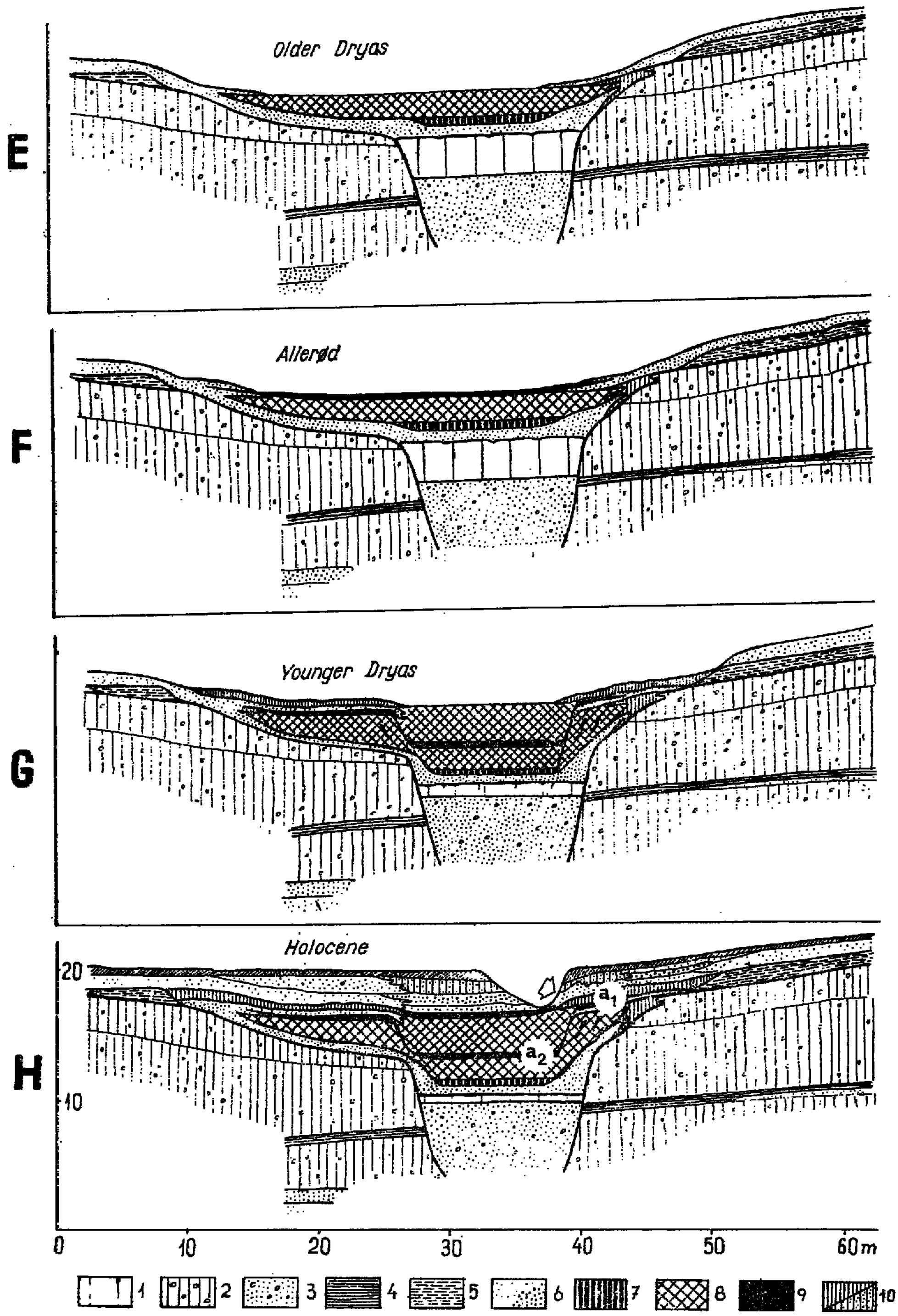
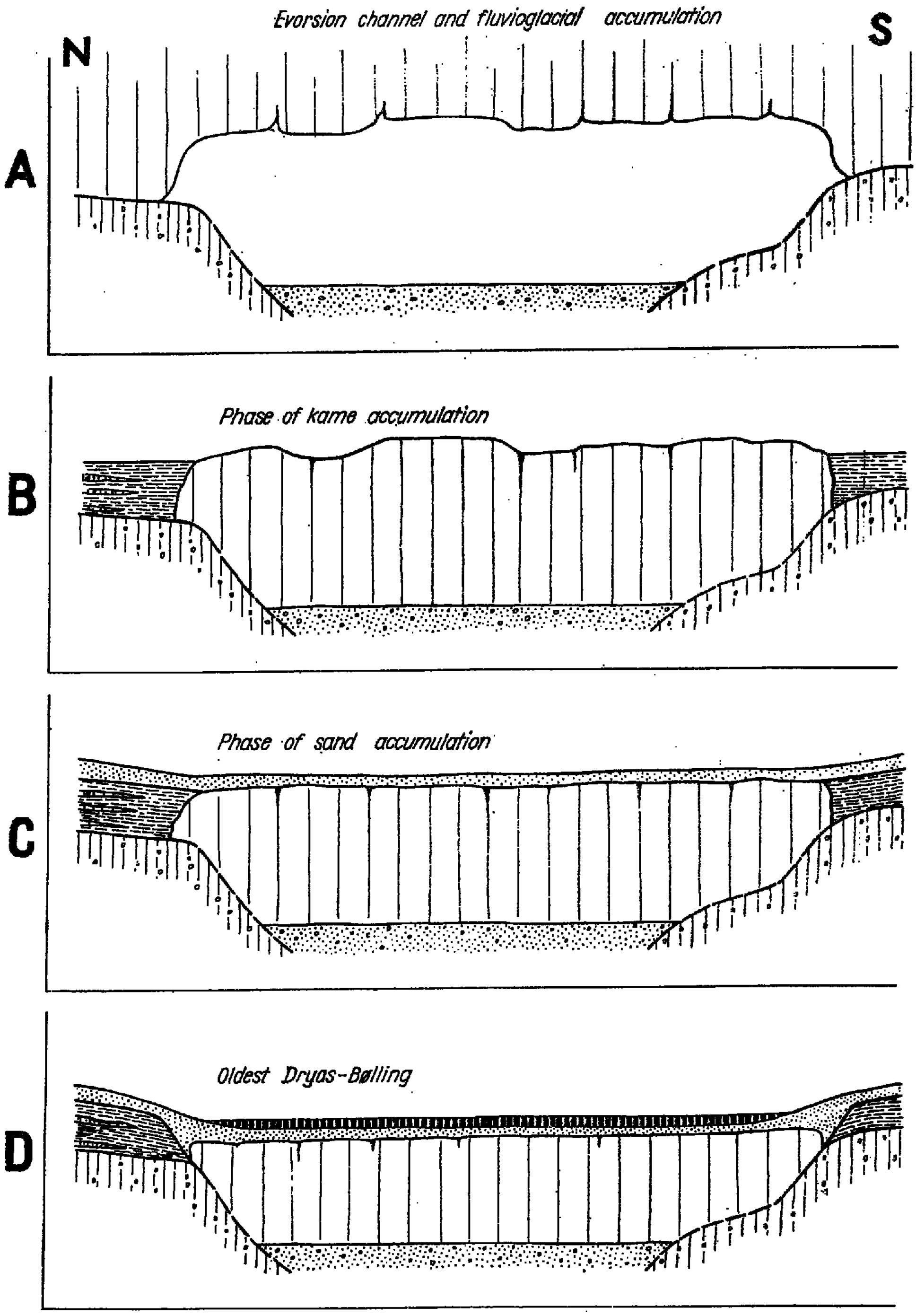


Fig. 4. Paleogeographic development of the Janoszyce furrow (narrow segment)
1 ice-cover, *2* tills, *3* fluvioglacial sands and gravels, *4* varves, *5* silts, *6* various sands, *7* black clays with mollusks, *8* lacustrine chalk, *9* peat, *10* clay and sandy delluvia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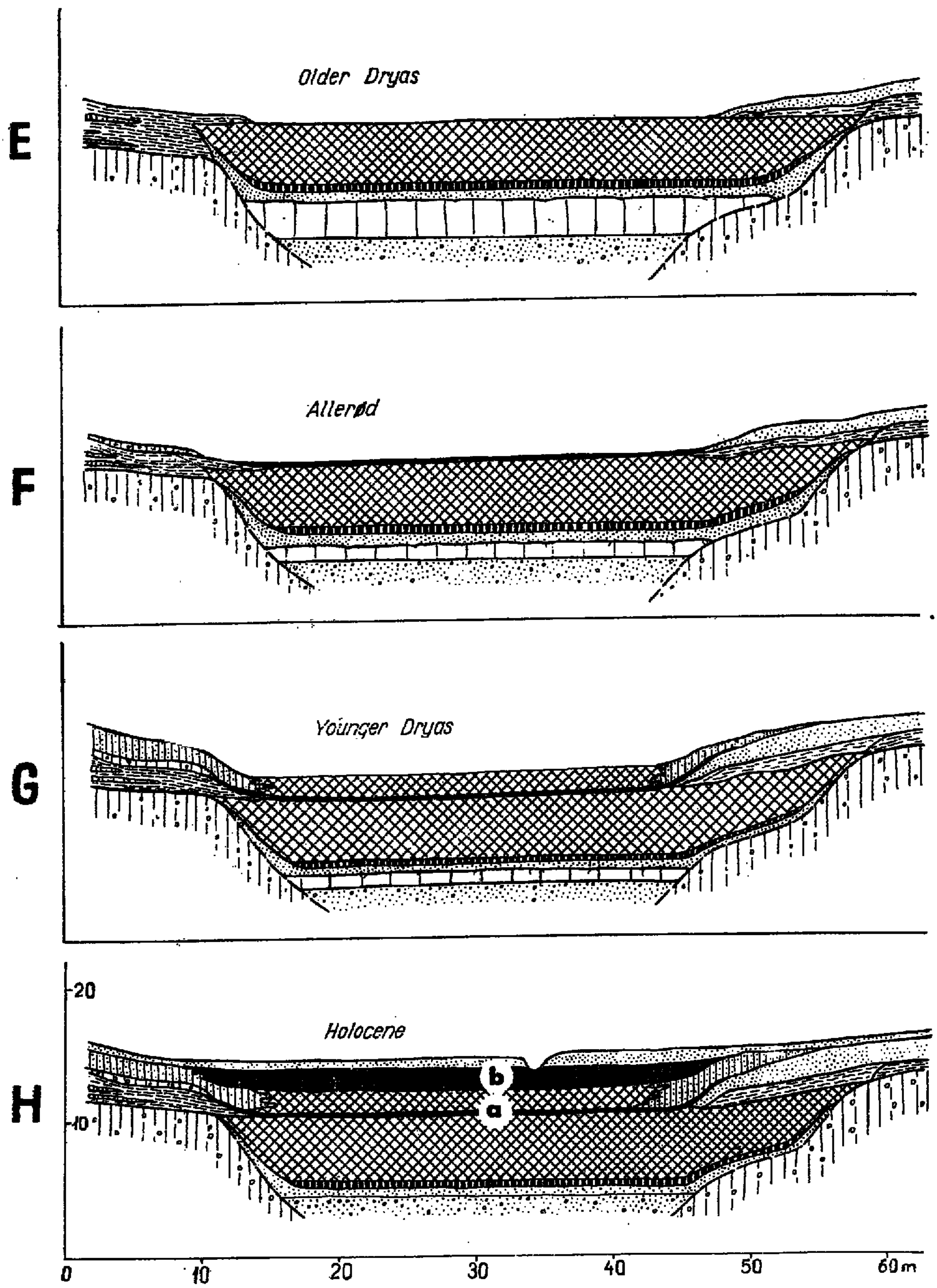

Fig. 5. Paleogeographic development of the Janoszyce furrow (wide segment); explanations as for Text-fig. 4

deepening of the basin resulted in marked disequilibrium of deposits from furrow slopes and thus it acted as trigger mechanism for slope flows, reflected by interfinging of slope deposits with lacustrine chalk. It is not excluded, however, that the slope deposits were directly mobilized by a climatic change and resulting changes in vegetational cover. Pollen diagram for lower lacustrine chalk layer, elaborated by the late Dr. J. Niklewski, displays a marked contribution (up to 40%) of pollens of Tertiary plants washed out of tills, that is, redeposited for the second time, and not found in overlying peat layer of Allerød age (Figs 4*F*, 5*F*).

The extent of peat formation area coincides with morphological boundaries of the furrow at its wider section, extending outside the boundaries, that is outside the ice lying in the furrow, at its narrower section situated west of the former. A further progress in melting of the

Fig. 6. Trench excavated along the section arrowed in Text-fig. 4*H*; visible are Allerød peats covered by delluvia

dead ice resulted in about 4 m subsidence of peats deposited above the ice (a_2 in Fig. 4*H*), whereas the position of peats deposited close to furrow margins remained unaffected (a_1 in Fig. 4*H*). In the first stage of the field works it was assumed that there were two different peat layers, which seemed to be supported by the fact that two peat layers are actually displayed by the wider section of the furrow (*cf*. Fig. 5). Therefore two peat samples were taken for radiocarbon dating: one from the exposure, inferred to be representative of the younger peat layer (a_1 in Fig. 4*H*), and another from a borehole, inferred to be representative of the older peat layer (a_2 in Fig. 4*H*).

The radiocarbon datings made by Dr. W. G. Mook, University of Gröningen, have shown that the peat samples are almost of the same age; the peat occurring at higher level (a_1) was dated at 11,860±100 y. B. P. and that occurring at lower level (a_2) at 11,360±100 y. B. P. (Fig. 4*H*). The Allerød age of the peat indicates that the maximum loss of the buried ice was marked again with some delay in relation to the climatic factor responsible for it; that is, the deepening of the basin took place after the end of the first phase of peat accumulation, leading to formation of the second horizon of lacustrine chalk (Figs 4*G* 5*G*). The formation of the chalk was, as previously, accompanied by slope flows which led to gradual reduction of size of the basin.

The successive phase of accumulation in the basin was connected with the formation of the second peat horizon (Figs 4*H*, 5*H*) which is situated at the same level as the hanging up Allerød peat layer at the narrower section of the furrow (a_2 in Fig. 4*H*).

The radiocarbon datings made by Prof. Dr. W. Mościcki, Silesian Polytechnic at Gliwice, have confirmed the Allerød age (11,130±290 y. B. P.) of the older peat layer (*a* in Fig. 5*H*) and they have shown that the younger peat (*b* in Fig. 5*H*) is 9910±290 y. old, i.e. it is of Pre-Boreal age of the Holocene (*cf*. Środoń 1973).

The Pre-Boreal peat layer is covered with sandy layer about 1 m thick along the wider section of the furrow (Fig. 5*H*) and with various slope deposits along the narrower section (Fig. 4*H*). These as well as underlying deposits almost completely infill the furrow in that section, obscuring the course of the ancient channel deeply incised by glacial waters. Extensive Holocene erosion acting in the Skrwa river valley has resulted in origin of narrow sinuous erosional incision (Pl. 2, Fig. 2) through which the excess of water outflows during spring thawings.

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REFERENCES

KOZŁOWSKA M. 1972. Origin of a subglacial furrow near Sierpc, Central Poland. *Acta Geol. Pol.*, 22 (1), 159—168. Warszawa.

LAMPARSKI Z. 1964. Precis de la stratigraphie du Quaternaire et morphologie de la basse Skrwa. *Acta Geol. Pol.*, 14 (3), 415—436. Warszawa.

— 1976. Geneza i rozwój rynny janoszyckiej na Wysoczyźnie Płockiej. *Biul. Geol. UW.* Warszawa.

OSZAST J. 1957. History of the climate and flora of the Dobrzyń region in the Late Glaciation and Holocene. *Biul. Inst. Geol.*, 118. Warszawa.

SKOMPSKI S. & SŁOWAŃSKI W. 1964. La vallée polygénétique de Wierzbica prés de Płock. *Acta Geol. Pol.*, 14 (3), 437—457. Warszawa.

ŚRODOŃ A. 1973. Rozwój roślinności w czwartorzędzie Polski. *In: Metodyka badań osadów czwartorzędowych.* Wyd. Geol. Warszawa.

WASYLIKOWA K. 1964. Vegetation and climate of the Late-Glacial in Central Poland based on investigations made at Witów near Łęczyca. *Biul. Peryglacjalny,* 13. Łódź.

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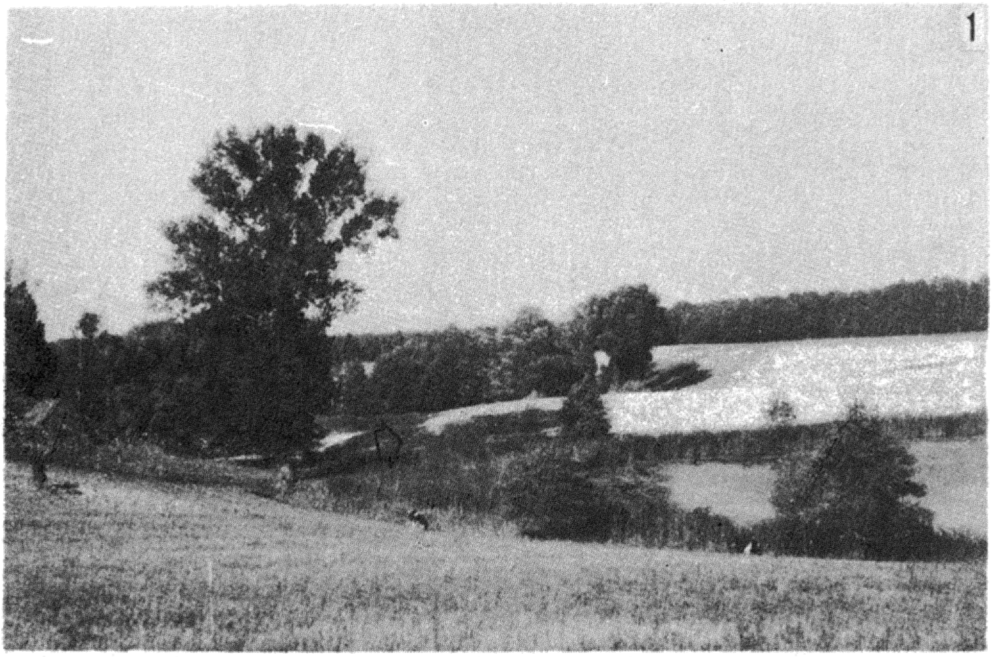
WYNIKI DATOWAŃ METODĄ ^{14}C OSADÓW ORGANICZNYCH RYNNY JANOSZYCKIEJ KOŁO PŁOCKA

(Streszczenie)

Przedmiotem pracy jest stratygrafia osadów jeziornych (w oparciu o oznaczenia metodą ^{14}C wieku torfów; finansowane przez Komitet Badań Czwartorzędu PAN) występujących w rynnie janoszyckiej na pn.-zachód od Płocka (fig. 1—2 oraz pl. 1—2). Torfy tworzą tutaj dwa poziomy, które są podścielone kredą jeziorną leżącą na czarnych iłach z fauną mięczaków. Pełna dokumentacja wykonanych tu wierceń i sond została zamieszczona w osobnej pracy (Lamparski 1976), gdzie podano wyniki datowań ^{14}C dla torfu na 11.360±100 B. P. i 11.860±100 B. P., a więc na Allerød. Ponowne datowanie stwierdziło odmienny wiek obu poziomów torfu, potwierdzając wiek starszego na 11.130±290 B. P., oraz ustalając wiek młodszego torfu na 9910±290 B. P., a więc na okres preborealny. W oparciu o powyższe wyniki przedstawiono pełny rozwój paleogeograficzny rynny od czasów późnoglacjalnych do starszego holocenu (por. fig. 3—6).



1 — Segment of the Janoszyce furrow with the lake dammed by a kame ridge (arrowed; view from SE).

2 — Another segment of the Janoszyce furrow with a kame ridge at the eastern edge of the lake (view from SW).

1 — Segment of the Janoszyce furrow, east of the lake; a kame hill in the foreground (view from SE).

2 — Another segment of the Janoszyce furrow, west of the lake, blurred by delluvia into which a temporary stream-bed is incised (view from E).