

Anna STANKOWSKA, Wojciech STANKOWSKI

Institute of Quaternary Research

Adam Mickiewicz University, Poznań

^{14}C AND TL DATING OF NEOPLEISTOCENE SITES IN THE KONIN REGION

Summary. All ^{14}C and TL dates obtained till now for three sites in the vicinity of Konin are discussed in terms of their internal consistency and confronted with geologic and paleobotanical evidence. There is general agreement of all TL dates obtained from three TL dating laboratories (Warsaw, Gdynia, Gliwice), though there are distinct age inversions in dated profiles and some differences occur between individual TL dates of complementary samples.

1. INTRODUCTION

During the First Conference "Methods of Absolute Dating", held in Gliwice in March, 1983, several sites well documented by geological and paleobotanical studies have been proposed for comparative TL dating in Polish TL Dating Laboratories. The main goal of this proposal was verification of TL dating results obtained in different laboratories, using different equipment and methods. The vicinity of Konin has been proposed as one of the test areas, and particularly the site Maliniec (A. Stankowska, W. Stankowski, 1979).

In the present paper all up-to-date results of TL and ^{14}C dating are gathered for the site Maliniec, as well as two other sites in this area: Józwin 1984 (W. Stankowski, in print) and Władysławów (P. Kłysz, W. Stankowski, 1986). Presented dates were obtained from following laboratories:

- a) Radiocarbon Laboratory, Silesian Technical University, Gliwice,
- b) Laboratory of Absolute Dating in Warsaw
- c) TL Laboratory, Gdańsk University, Gdynia.

Unfortunately, comparative datings from the TL Laboratory of the Department of Physical Geography, Maria Curie Skłodowska University in Lublin, are not available.

2. CONFRONTATION OF GEOLOGIC EVIDENCE WITH ^{14}C AND TL DATES

Site Maliniec

This site, shown in Fig. 1, represents Plenivistulian sediments in form of morainic tills of the maximum extent of the last glaciation and

underlying series of flugioglacial and stagnant water deposits or deposits of periodical water flow with organic intercalations.

The site Maliniec has several ^{14}C datings made in 1979 by M. F. Pazdur (Pazdur et al, 1985), and series of TL datings performed by M. Prószyński in 1979, A. Bluszcz in 1984, H. Prószyńska-Bordas in 1985 and by S. Fedorowicz and I. Olszak in 1985. It should be noted that all those datings are in general agreement with geologic stratigraphy. However, physical appreciation of datings is not unequivocal because of significant differences and age inversions.

Fossil organic horizons from site Maliniec have been dated by the ^{14}C method. Older, basal organic series "Maliniec I" was ^{14}C -dated to >42,500 BP and >42,900 BP. Younger organic series "Maliniec II" was dated to 22,230 BP and 22,050 BP. These dates are regarded as reference points for discussion of the TL datings.

The most complete and numerous series of TL dates was obtained from Gdynia TL Laboratory. The only one age inversion occurs in the uppermost part of the profile. Sample from basal till layer was dated to 24,000 BP, while underlying fluvioglacial sands were dated to 19,600 BP. This last date corresponds well with TL age of complementary sample, equal to 18,000 BP (according to A. Bluszcz). Third sample from same stratigraphic position yielded older TL age, equal to 23,000 BP (M. Prószyński).

Generally, all datings of the upper part of profile suggest that fluvioglacial deposits and morainic tills were accumulated after 24,000 BP. Taking into account possible ageing of TL dates, connected with pregenetic thermoluminescence of till sample and inherent errors of the TL dating method, we may conclude general consistence of all TL dates with ^{14}C dating of the organic series Maliniec II. In consequence, we should accept that the maximum advance of the Vistulian ice sheet has taken place at ca 20,000 BP.

Organic series Maliniec I (^{14}C dated as older than 42,000 BP) is bracketed with TL dates of A. Bluszcz, equal to 67 ka BP and 67 ka BP, and with TL dates of S. Fedorowicz, equal respectively to 69 ka BP and 92 ka BP. Taking into consideration inherent errors of the TL method, all dates obtained on samples from upper part of the profile, from top to the organic series Maliniec I, may be regarded consistent. On the other hand, TL datings of sands underlying organic series Maliniec I are characterized by more distinct scatter. Dates obtained in TL Laboratories in Gliwice and Gdynia may be regarded as consistent, while TL dates of complementary samples obtained by H. Prószyńska-Bordas are younger. It should be noted that for these sands H. Prószyńska-Bordas has obtained for same samples different TL dates in different laboratories: 51 ka BP in Warsaw TL Laboratory and 42 ka BP in Cambridge TL Laboratory.

Taking into account all dates available for the Maliniec site we may conclude that in spite of age inversions and existing differences

MALINIEC

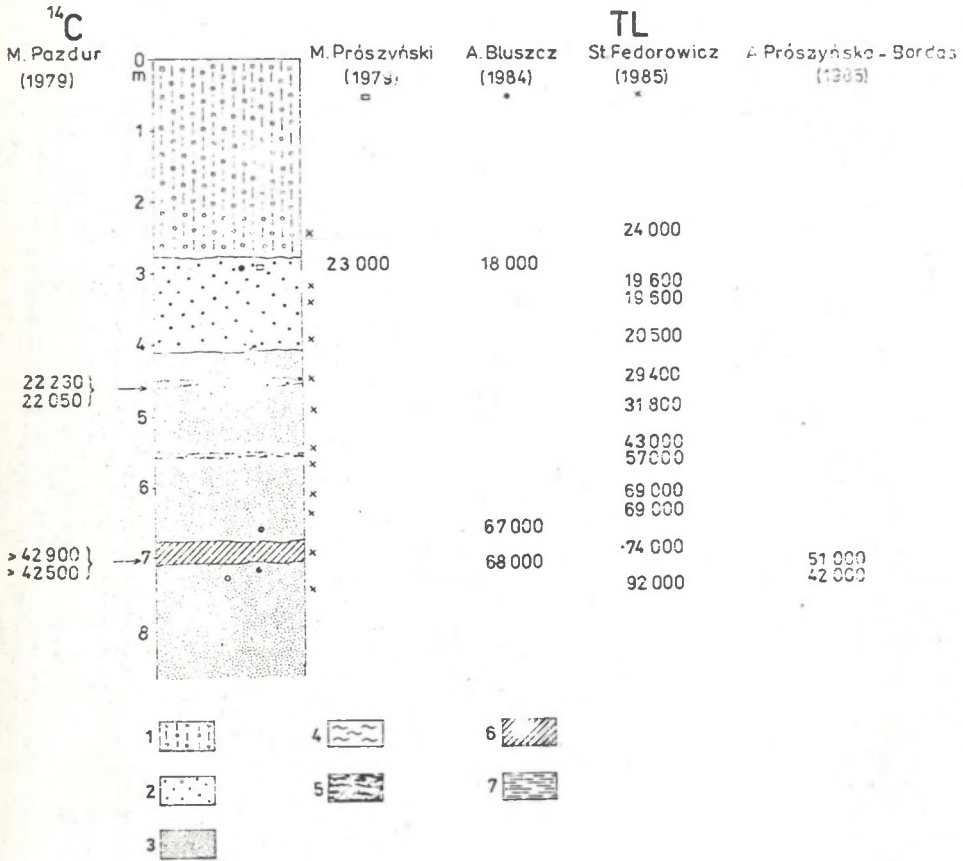


Fig. 1. Generalized profile of sediments in the Malinieć site. Explanations: 1 - morainic tills; 2 - sands and gravels; 3 - fine sands with thin intercalations of varigrained sands and fine gravels; 4 - stratified silts and finegrained sands; 5 - intercalations of organic sands with peat; 6 - peat; 7 - gyttja

Rys. 1. Uproszczony profil osadów na stanowisku Malinieć. 1 - gliny morenowe; 2 - piaski i żwiry; 3 - piaski drobnoziarniste z cienkimi wkładkami piasków różnoziarnistych i żwirków; 4 - warstwowane mulki i piaski drobnoziarniste; 5 - wkładki piasków organicznych z torfem; 6 - torf; 7 - gytja

between complementary samples, they are comparable from the paleogeographic point of view. The dates give evidence for the presence of the Vistulian ice sheet in the Konin region not earlier than 20-21 ka BP. Moreover, the existence of any older ice cover in the eastern part of the Great Poland Lowland during the whole last cool period (Würm Vistulian) must be excluded.

Site Józwin

In this site (see Fig. 2), similarly to the previously described site Maliniec, uppermost part of profile is built of morainic tills, overlying differentiated water-laid deposits with fossil organic series. Main difference between these sites is in the fact that the last, and at the same time basic organic series in the Józwin site was paleobotanically recognized as the Eemian series (unpublished study of K. Tobolski).

Two uppermost organic horizons from the site Józwin 1984 were dated by the ^{14}C method (M. F. Pazdur), yielding dates: >46 ka BP and >39 ka BP for younger organic level, and >46 ka BP and >50 ka BP for the older one. Same levels were dated with the TL method by A. Bluszcz to 60 ± 10 ka BP and 70 ± 12 ka BP, respectively.

A series of TL dates from Gdynia TL Laboratory is generally in agreement with the results from Gliwice Laboratory, but shows some age inversions. As in the case of the Maliniec site there is an inversion of TL age in the upper part of profile. TL dates of morainic tills are older than corresponding dates of underlying fluvioglacial sands. It is worthwhile to note that TL dates for the Józwin 1984 profile are very close to dates obtained on complementary samples from the Maliniec profile. In the lower part of profile occurs another age inversion, which, in the light of dating accuracy, may be regarded as insignificant. The TL date of sample from sands immediately overlying the uppermost fossil organic horizon is obviously younger than the dates obtained in the Gliwice Laboratory. On the other hand, TL date on sands from depth 9.5 m (79 ka BP) is in good agreement with Gliwice dates.

Finally, we may conclude that all datings obtained for site Józwin 1984 are in general agreement, considering both their physical sense and paleogeographical meaning. Paleogeographical conclusions are similar to those following from the studies of the Maliniec site.

Site Władysławów

Site Władysławów is situated slightly to the south of the maximum extent of the Vistulian glaciation, and, therefore, morainic tills of this glaciation are not present here. Plenivistulian sediments are represented in this profile by thin series of horizontally laminated silts and fine sands (see Fig. 3). Starting from depth 1.6 m below present surface thin intercalations of organic substance occur in the profile. Two upper-

JÓZWIN

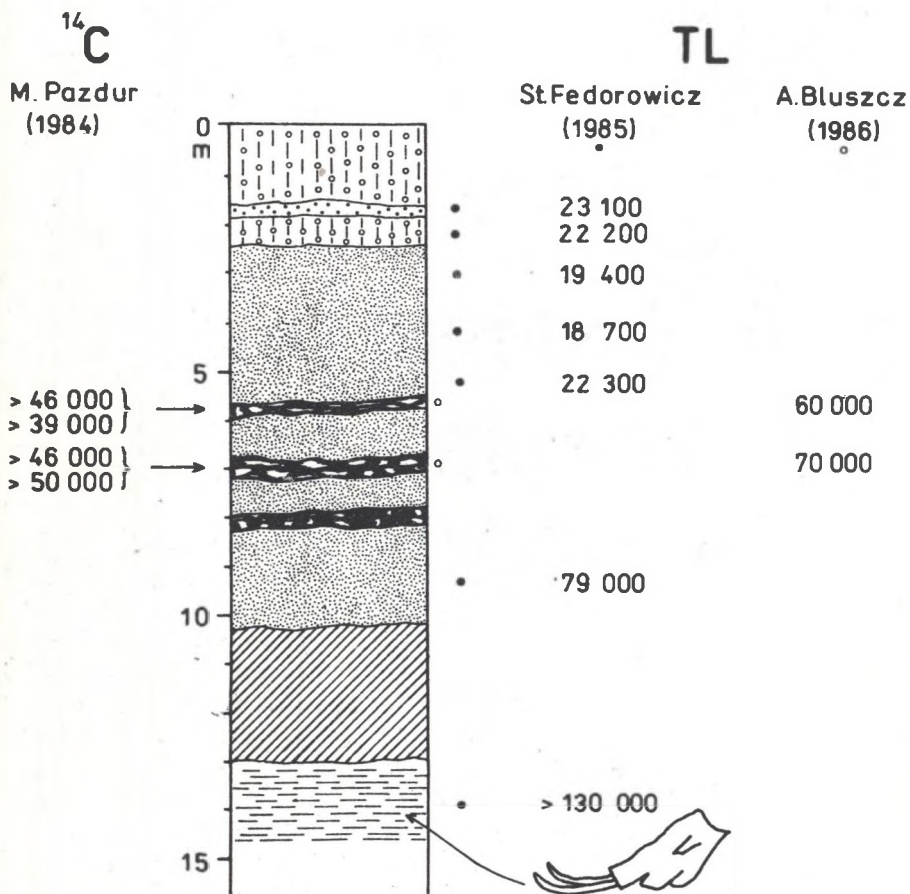


Fig. 2. Profile of sediments in the Józwin site. For explanations see Fig. 1

Rys. 2. Profil osadów na stanowisku Józwin. Objaśnienia jak na rys. 1, most organic intercalations were ^{14}C dated to 44.8 ka BP and 37.9 ka BP (upper organic level) and 40.7 ka BP and >41 ka BP (lower organic level). Two other, well developed organic horizons, were also dated with radio-carbon, yielding following results: >41 ka BP and >42 ka BP (upper horizon) and >52 ka BP and >44 ka BP (lower horizon). Below these organic

WŁADYSŁAWÓW

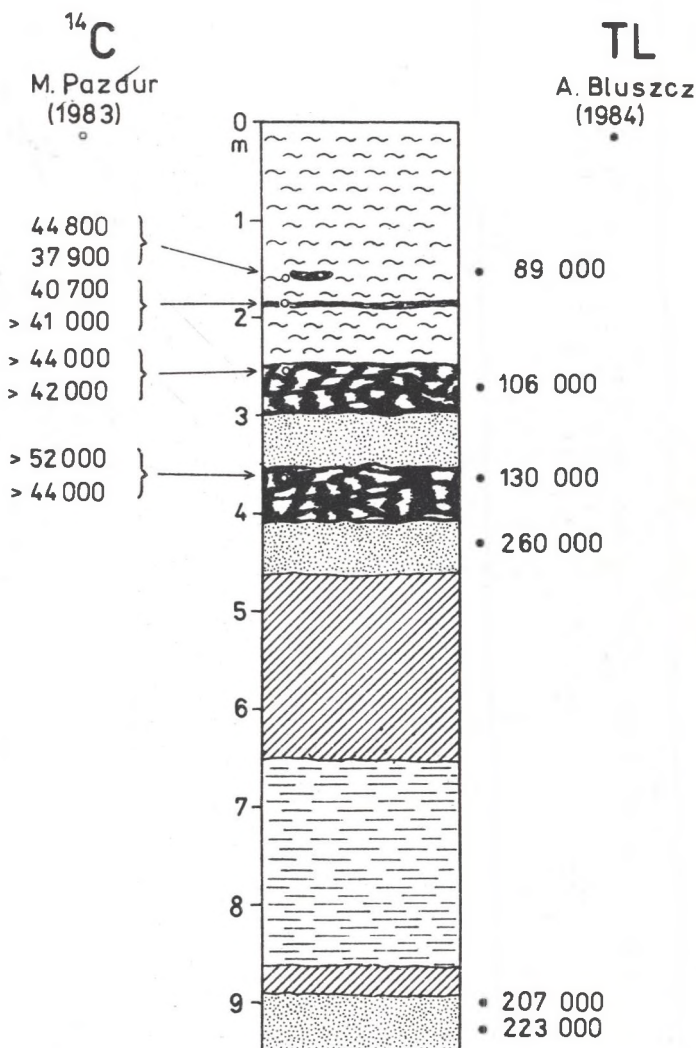


Fig. 3. Profile of sediments in the Władysławów site. For explanations see Fig. 1

Rys. 3. Profil osadów na stanowisku Władysławów. Objaśnienia jak na rys. 1

intercalations occurs thick organic series of Eemian age, as was proved by paleobotanical studies (K. Tobolski, unpublished manuscript).

The site Władysławów has also a series of TL dates. Sediments overlying the Eemian organic series yielded dates (from top to base): 89, 106

and 130 Ka BP. These dates seem to be aged in the light of corresponding ^{14}C dates. Results of TL and ^{14}C datings of complementary samples in this profile show very similarity to those obtained in the Józwin 1984 profile, where ^{14}C dates: >46 Ka BP and 39 Ka BP correspond to TL date 60 ± 10 Ka BP, and ^{14}C dates: >46 Ka BP and >50 Ka BP correspond to TL date 70 ± 12 Ka BP.

Other TL dates of sandy sediments over- and underlying Eemian series are excessively aged. Moreover, they show distinct age inversions. We suppose that unsatisfactory results of TL dating, which contradict paleobotanical data, are caused by nonlinear behaviour of the TL signal of quartz grains.

3. CONCLUSIONS

Evaluation of all datings obtained for sites of Vistulian sediments in the vicinity of Konin we may conclude, that:

1. as confronted with paleogeographical analysis there is general agreement of results of isotopic dating with geologic and paleobotanical evidence;
2. differences of individual dates and age inversions are connected with inherent errors of dating methods, as well as with the nature of dated sediments. In case of TL dates age inversions are most probably caused by incomplete reduction of pregenetic TL of dated sediments of glacial origin;
3. there exist significant differences of TL dates obtained in different laboratories; it seems that some TL dates from Gliwice TL Laboratory are aged.

TL dates of sediments still need very cautious treatment in stratigraphical analyses; it seems that the reliability of the TL dating method is limited to age range not exceeding 80-100 Ka BP. It seems also that in order to avoid serious errors in stratigraphical studies it is necessary to deal only with series of TL dates instead of single values, and preferably obtained from same laboratory. Available TL dates should be considered as approximate values of age, and may be even relative dates, and in every case they should be related to the results of other methods of dating, including ^{14}C method, as well as to the results of detailed geologic and paleobotanical studies.

ACKNOWLEDGEMENTS

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Wpłynęło do Redakcji 15 grudnia 1986 r

**DATOWANIA ^{14}C I TL W STANOWISKACH NEOPLEJSTOCENU
OKOLIC KONINA**

Streszczenie

W artykule przedstawiono dyskusję wszystkich dotychczas uzyskanych datowań metodami ^{14}C i TL z trzech stanowisk neoplejstocenu w okolicach Konina pod względem ich wewnętrznej spójności oraz zgodności z danymi geologicznymi i paleobotanicznymi. Stwierdzono ogólną zgodność datowań metodą TL, uzyskanych w trzech laboratoriach (Warszawa, Gdynia, Gliwice), chociaż widoczne są wyraźne różnice dat uzyskanych dla komplementarnych próbek osadów, jak również znaczące inwersje dat w profilach.

**ДАТИРОВАНИЯ ПО МЕТОДАМ РАДИОУГЛЕРОДА И ТЕРМОЛЮМИНЕСЦЕНЦИИ ОСАДКОВ
НЕОПЛЕЙСТОЦЕНА В ОКРЕСТНОСТИ КОНИНА**

Резюме

В статье представлено анализ всех доступных до сих пор датировок методами радиоуглерода и термолюминесценции из трех разрезов неоплейстоценовых осадков в окрестности Конина. Радиоуглеродные датировки проведены в Радиоуглеродной Лаборатории Силезского Политехнического Института в Гливице, датирования методом термолюминесценции были исполнены в лабораториях в Варшаве, Гдыни и в Гливице. Обсуждается внутреннюю согласованность результатов датировки и их согласие с геологическими и палеоботаническими данными. Найдено, что результаты датировок методом термолюминесценции, выполнены в трех лабораториях, в общем смысле согласны, хотя обнаружено индивидуальные расхождения дат и даже существенные инверсии термолюминесцентного возраста в разрезах.