GEOLOGIJA. 2005. Nr. 50. P. 19–26
© Lietuvos mokslø akademija, 2005
© Lietuvos mokslø akademijos leidykla, 2005

Stratigrafija • Stratigraphy • Ñòðàòèãðàôèÿ

Comparison of luminescence (TL and OSL) dating results from selected loess profiles in SE Poland and the NW Ukraine

Stanisùaw Fedorowicz,

Maria Ùanczont,

Adam Muc

Fedorowicz St., Ùanczont M., Muc A. Comparison of luminescence (TL and OSL) dating results from selected loess profiles in SE Poland and the NW Ukraine. *Geologija*. Vilnius. 2005. No. 50. P. 19–26. ISSN 1392-110X.

Five periglacial loess profiles, three from Poland and two from the Ukraine, were selected for dating luminescence methods (TL and OSL). In regional terms, they include loess of the Carpathian (Tarnawce, Dybawka), peri-Carpathian (Zarzecze, Halyè) and Podolia facies (Velykyj Hlyboèok). Local transport and alimentation factors were of predominant importance for the formation of this loess. The loess is stratigraphically differentiated. It is characterized by a considerable total thickness (more than 10 m); in the case of Polish profiles covered by the analysis (except for Tarnawce), the youngest (Vistulian) near-surface layers are thicker, while in the case of Ukrainian profiles these are older layers. We correlated the stratigraphic diagrams of Polish and Ukrainian loess.

89 samples were collected for dating purposes from five profiles. Of these samples, 19 were OSL-dated. The samples were collected from the layers the age of which, according to the geological interpretation of profiles, did not exceed 250 ka BP. TL dating results were presented as a histogram. The function of TL and OSL date distribution for the same samples was presented on one chart. The following conclusions may be drawn from the statistical analysis of results: TL dating results of the Polish and Ukrainian loess form the time ranges that correspond to periods of increased global Eolian accumulation;

– TL dating results are older than OSL dating results for the same samples;

– results of TL and OSL dating of the youngest samples allow for the description of this relation as a formula.

Key words: Carpathian and Pericarpathian loesses, TL dating, OSL dating, chronostratigraphy

Received 24 December 2004, accepted 08 April 2005

Stanisùaw Fedorowicz. University of Gdañsk, Department of Geomorphology and Quaternary Geology, 80–950, ul. Dmowskiego 16A, Gdañsk Poland. E-mail: geosf@univ.gda.pl

Maria Ùanczont. Department of Physical Geography and Palaeogeography, Maria Curie-Skùodowska University, al. Kraúnicka 2 c, d, 20-817 Lublin, Poland. E-mail: lanczont@biotop.umcs.lublin.pl

Adam Muc. Gdañsk University of Technology, Faculty of Electrical and Control Engineering, Chair of Power Electronics and Electrical Machines, ul. Sobieskiego 7, 80-216 Gdañsk, Poland, E-mail: mucadam@wp.pl

INTRODUCTION

Thermoluminescence began to be applied in geological research 50 years ago. Since that time, significant changes in the measurement methodology and apparatus have taken place. The changes concern measurement techniques, the ways of material treatment for analysis and calculations. The thermoluminescence methods (TL), which have been applied for years, have been modernized and updated and are gradually supplemented with newer methods, in particular the method of optically stimulated luminescence (OSL).

During the period of 40 years TL age analysis furnished thousands of dates evidenced in the natural science literature. It is estimated that circa 10,000 TL dates were established in Poland and further research has been continued until now. The first results obtained by OSL methods appeared in the world literature *ca.* 10 years ago. Nevertheless, discussions of results obtained by various methods and in various laboratories are rare. In this study, an attempt will be made to compare TL and OSL dating results of samples from five loess profiles.

LUMINESCENCE DATING

The age of Quaternary deposits may be determined by luminescence methods. Deposits to be dated must have been exposed to solar radiation for a sufficiently long time to reduce the energy stored in mineral grains (Fedorowicz, 2003). At present, in physical measurements of luminescence for geological purposes TL and OSL methods are used. The processes that lead to excitation and emission of TL and OSL are explained in the physics literature (Bluszcz, 2000; Fedorowicz, 2003).

There is a large number of differences between the two methods. The differences mainly concern the physical aspects, but also the geological ones. One of the differences relates to luminescence excitation. Thermoluminescence is excited by heating of grains to a temperature of *ca.* 500 °C. In optically stimulated luminescence, excitation takes place due to grain exposure to the light of adequate wavelength. The dose absorbed by the grains is determined through the interpretation of the so-called TL glow curve in the TL method and of the OSL shine-down curve in the OSL method. In both methods, the energy dose absorbed by grains is proportional to the number of charge carriers stored in traps. The time of grain exposure to sunlight has a decisive role in the TL and OSL dating; the TL and OSL methods differ from signal zeroing methods (Bluszcz, Pietrzak, 2001). Grain exposure to light, even a short-term one, leads to zeroing of OSL signal. The reduction of TL signal is slower, and if the grain exposure to light is not sufficient, the TL signal may only decrease. When the exposure of grains to light ceases and they are covered, they start accumulating energy inside. In the case of a long-term grain exposure to solar radiation, residual luminescence levels were identical in both methods. In this situation, it may be expected that the TL age of the sample will be identical (TL = OSL). If the time of grain exposure to light was short, the initial levels of stored energy were different (*e.g.*, the initial TL signal was larger than OSL). In this case it may be expected that TL > OSL.

Differences in age measurement results obtained by luminescence methods may follow from different techniques and measurement methodology (Bluszcz, 2000; Fedorowicz, 2003); *e.g.*:

– different measurement apparatus,

– different measurement methods of an equivalent dose and dose rate. The age is their quotient in the luminescence methods,

– different grain fractions analysed and the initial treatment of mineral material,

– different measurement accuracy and technique (single-portion, single-grain, multiple-portion methods).

MEASUREMENT METHODS

TL dating was conducted by S. Fedorowicz. A dried deposit, 0.5 c. dm of in volume, was spectrometrically measured in terms of ^{40}K, ^{226}Ra, ^{228}Th. Twenty measurements were made, each lasting 2,000 s. Nuclide values were converted into α, β, γ radiation doses. Adjustments were made for humidity (Aitken, 1983, Aitken, Xie, 1985).

The dose rate is a sum of alpha, beta and gamma radiation and cosmic radiation. It was measured with a MAZAR spectrometer. The equivalent dose (ED) was conducted spectrometrically on the 80–100 μm fraction of grains sifted earlier from the entire sample mass. The grains were successively treated with 10% HCl and HF acids for 1 hour. After the samples had been rinsed with distilled water and dried, the extracted grains were divided into seven portions. The first portion was used to measure natural thermoluminescence. The remaining portions were exposed to the ultraviolet lamp to reduce the energy stored in the grains. After the energy in the grains had been zeroed, the remaining energy was measured in them (*e.g.*, a so-called residual thermoluminescence). The remaining five portions were radiated from a cobalt bomb with gamma rays of the values enough to regenerate the energy acquired initially by the grains under analysis. The equivalent dose was measured in many portions by the regeneration method with the aid of a reader-analyser (RA 94). The samples were heated to a temperature of 400 °C at a heating speed of 8°/s. A dozen or so glow curves were measured for each portion. The test plateau was also conducted to check whether a sample is not in a saturation condition.

The OSL dating was conducted at the laboratory of the Silesian Technical University in Gliwice under a research grant (BW 1230–5-125-3). The dose rate was determined spectrometrically with the use of a γ and α radiation spectrometer by Canbera. The dose rates for U, Th, K were calculated on the basis of activity measured and with the use of conversion coefficients specified by Aitken (1983). Adjustments for humidity were made in accordance with the Aitken

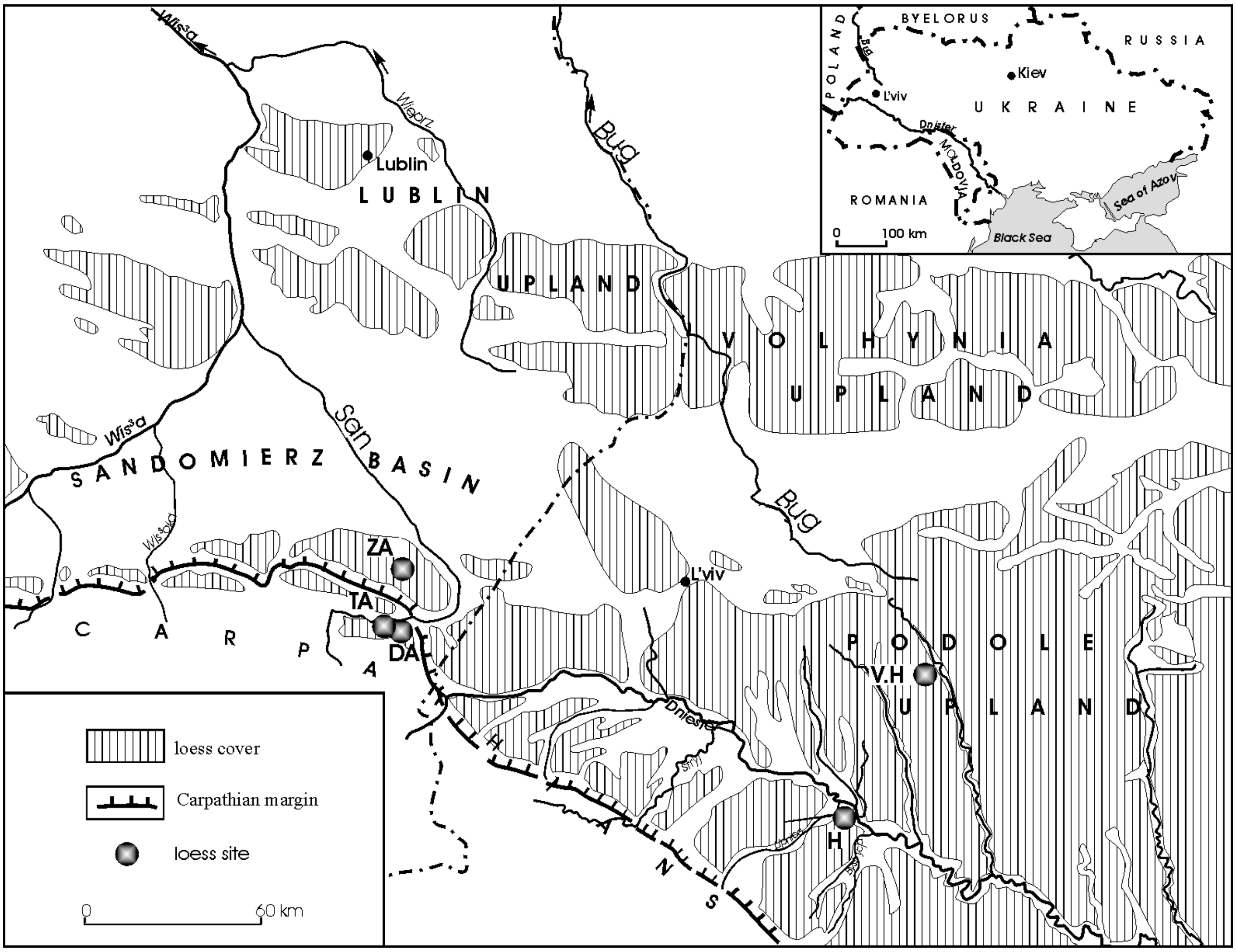

Fig. 1. Location map of investigated profiles. H – Halyè, Velykyj Hlyboèok, TA – Tarnawce, DA – Dybawka, ZA – Zarzecze

Geographical coordinates (latitude, longitude): Halyè (24°12'12", 49°01'51"); Velykyj Hlyboèok (25°32'38", 49°36'10"); Tarnawce (22°41'06", 49°47'40"); Dybawka (22°41'20", 49°47'15"); Zarzecze (22°32'05", 49°59'50")

1 pav. Tirtø profiliø vietos: H – Halyè, Velykyj Hlyboèok, TA – Tarnawce, DA – Dybawka, ZA – Zarzecze. Geografinës koordinatës (platuma, ilguma): Halyè (24°12'12",49°01'51"); Velykyj Hlyboèok (25°32'38", 49°36'10"); Tarnawce (22°41'06", 49°47'40"); Dybawka (22°41'20", 49°47'15"); Zarzecze (22°32'05", 49°59'50")

and Xie method (Bluszcz, 2000). The equivalent dose was measured by the regeneration method of single SAR portions after an initial extraction, *i.e.* treatment of 125–200 µm fraction grains with HCl and HF acids. The equivalent dose was determined with an apparatus produced in the Riso National Laboratory (Bluszcz, 2000).

OBJECT OF STUDY

The study was focused on periglacial loess profiles from Southern Poland and Western Ukraine (Fig. 1). Ukrainian loess is part of western peripheries of the great loess area referred to as the Eastern European Loess Province, which is considered to be one of the largest on a global scale. The Polish loess is actually situated beyond this area and is connected with the occurrence of patches of these deposits in Central Europe. In the Ukraine, there are several distinct loess areas with vast thick covers; such areas mainly include the Volhynia–Podolia Upland, East Carpathian Foreland, the Dnieper area and the Black Sea costal lowlands. The Polish loess is mainly found in the area of uplands and mountain forelands in the South. In respect of uplands, these are the Lublin, Sandomierz and Cracow regions, while in respect of forelands and mountains, these are the Carpathian and Sudeten regions (Maruszczak, 1991; Ùanczont, 1999; Ùanczont, Wojtanowicz, 2000).

Loess from the above-mentioned areas shows certain regularities. Its thickness increases from the West to the East (from 10 to > 40 m). The intensity of loess dust accumulation decreases with the height above sea level and increases with the climate dryness. Dust was transported at various (shorter and longer) distances, but local alimentation and transport were predominant (Chlebowski et al., 2003). The stratigraphic schemes of the Polish and Ukrainian

Table. **Results of parallel luminescence examination (TL and OSL) of loess samples**
Lentelë. **Lioso mëginiø liuminescencijos (TL ir OSL) rezultatø palyginimas**

	Lab. No (UG)	TL age (ka BP)	Lab. No (Gd. TL)	OSL age (ka BP)	OSL age interval (ka BP)	Stratigraphic unit
H.Ic/1	5630	17.4 ± 2.6	717	10.62 ± 0.39	10.2–33.5	Vistulian loess (Upper Pleniglacial)
H.Ic/3/2	5633	20.0 ± 3.2	718	18.1 ± 1.3	12.2–22.9	Vistulian loess (Upper Pleniglacial)
H.Ic/2	5631	19.0 ± 2.9	721	15.49 ± 0.59	14.1–23.3	Vistulian loess (Upper Pleniglacial)
H.IIa/1	5608	108.3 ± 12.3	742	54.6 ± 1.6	20.7–77.7	Eemian soil
H.IIa/4	5611	152.1 ± 20.8	722	62.7 ± 3.7	17.5–186.0	Wartanian loess
H.IIa/8	5615	171.6 ± 21.9	743	38.2 ± 1.5	13.7–97.0	Lublinian soil
H.Iia/10	5617	164.9 ± 24.7	720	49.4 ± 2.0	33.5–115.0	Odranian loess
TA–1	5666	12.6 ± 1.4	727	9.27 ± 0.3	6.7–3.8	Vistulian loess (Upper Pleniglacial)
TA–2	5667	16.6 ± 1.5	728	12.82 ± 0.46	6.0–18.8	Vistulian loess (Upper Pleniglacial)
TA–4	5669	30.8 ± 3.2	729	29.9 ± 1.3	8.1–36.7	Vistulian loess (Middle Pleniglacial)
TA–14	5679	136.3 ± 15.0	725	40.1 ± 1.5	34.0–59.6	Wartanian loess (Middle Wartanian)
TA–16	5681	60.2 ± 8.2	726	40.4 ± 2.0	17.0–72.3	Wartanian loess (Middle?Lower Wartanian)
DA–2	5688	10.9 ± 1.4	719	8.14 ± 0.55	6.1–12.4	Vistulian loess (Upper Pleniglacial)
DA–5	5691	10.4 ± 1.4	744	6.1 ± 0.42	0.6–10.6	Vistulian loess (Upper Pleniglacial)
DA–6	5692	14.6 ± 1.6	723	10.08 ± 0.39	9.1–26.9	Vistulian loess (Upper Pleniglacial)
DA–9	5695	15.8 ± 2.0	724	11.55 ± 0.37	8.9–14.3	Vistulian loess (Upper Pleniglacial)
V.H–11	5645	38.0 ± 4.9	755	9.04 ± 0.27	9.0–60.3	Vistulian loess (MiddlePleniglacial)
V.H-13	5647	81.0 ± 10.2	754	52.3 ± 2.0	13.0–96.3	Vistulian loess (Lower Pleniglacial)

loess were correlated with the European loess (Boguckyj, Ùanczont 2002, Maruszczak, 1994, 1996). According to Maruszczak (1991), Poland's oldest loess (LN) was formed in the age range of 350–300 ka BP, the older loess (LS) in the range of 300–130 ka BP, and the younger loess (LM) in the range of 100–12 ka BP. The following age ranges are specified for Ukrainian loess: Tiligul loess 440–500 ka BP, Dnieper loess 240–290 ka BP, Tiasmyn loess 140–210 ka BP, Uday loess 38–75 ka BP, Bug loess – 13.7–26.0 ka BP, Pryèernomorsk loess 9–12.2 ka BP (Gozhik et al., 1995).

In 2001–2003, samples were collected for the purposes of TL dating from the following loess profiles: Halyè (H) near Ivano-Frankivsk in East Carpathian Foreland and Velykyj Hlyboèok near Tarnopol (V. H.) in Podole in Ukraine, as well as Tarnawce (TA) and Dybawka (DA) in the Carpathian Foothills in the Przemyœl region and Zarzecze near Przeworsk, which is situated in the Kañczuga Plateau in the area of the peri-Carpathian loess plateau (Fig. 1). Based on a comprehensive analysis, the stratigraphy of the Polish profiles was prepared by M. Ùanczont from the Maria Curie-Skìodowska University in Lublin and the stratigraphy of Ukrainian profiles by M. Ùanczont and A. Boguckyj from the I. Franko National University in Lvov (*e.g.*, Ùanczont 1997; Ùanczont et al., 1999; Ùanczont, Boguckyj, 2002; Boguckyj et al., 2003). The samples were collected directly from exposures, *ca.* 20 samples from each; these were both loess and paleosol samples. First, they were dated by the TL method and then the age of selected samples was specified by the OSL method. The TL results were already presented (Fedorowicz et al., 2003, 2004 a, 2004 b, 2004 c). Table presents the results of parallel TL and OSL dating and time ranges of the results from single measurements by the OSL method, including information on the stratigraphic position of the layers.

ANALYSIS OF DATING RESULTS

Singhvi (1998), who had at his disposal dating results of 457 loess samples from various regions obtained in different laboratories all over the world, conducted their statistical analysis (Bluszcz, 2000). The results were shown in four groups of age ranges: 15–27 ka BP, 42–86 ka BP, 110–270 ka BP, 360–400 ka BP. These ranges correspond to the phases of increased aeolian accumulation in the world.

The Gdañsk Laboratory has dating results of eight Polish loess profiles with a total number of samples amounting to 129. It is a relatively large set of dating results, which allows for statistical analysis. Each of the eight profiles is represented by a dozen or so loess samples and several samples from soil paleosols. Samples the age of which was determined by the TL method, come from layers in which the deposit age should not exceed 250 ka BP. Out of 129 samples from the loess profiles, 73 samples represented loess. The histogram presents the results of their TL age determination (Fig. 2). The distribution of the results is also presented by the function of TL date distribution (Fig. 3). On this basis, it may be supposed that TL dates of Polish loess are distributed similarly as shown in the loess statistics in the world. They are also consistent with the time ranges presented in Maruszczak's publication (1991). The maximums found in the younger loess area correspond very well to its further division into lower-level units.

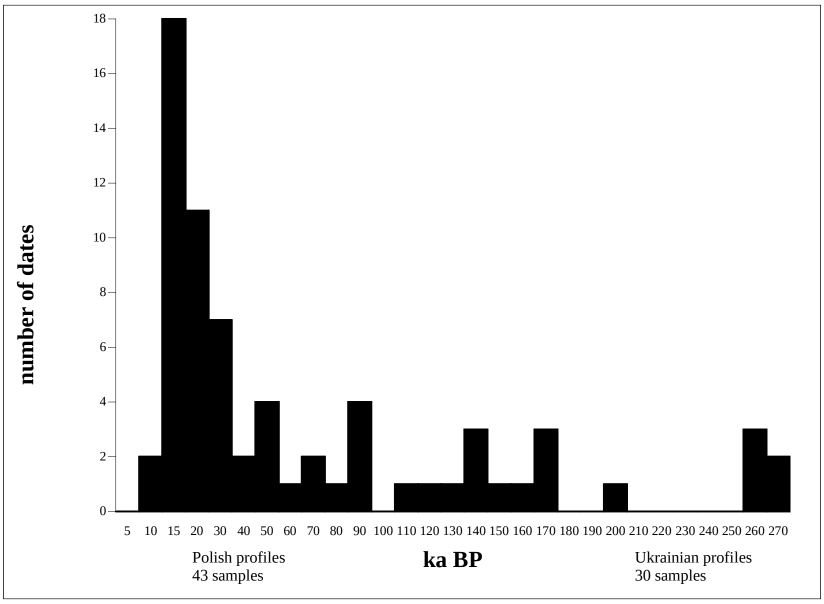

Fig. 2. Histogram of TL results for loess from five profiles in SE Poland and the NW Ukraine

2 pav. Pietryèiø Lenkijos ir Ðiaurës Vakarø Ukrainos liosø penkiø profiliø TL rezultatø diagramos

Eighty-nine samples out of the 129 samples refer-

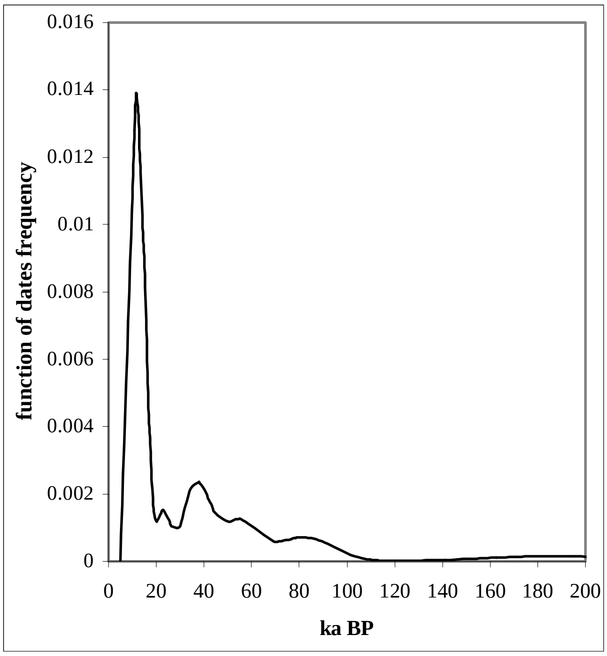

Fig. 3. Function of date frequency distribution from five loess profiles in SE Poland and the NW Ukraine

3 pav. Pietryèiø Lenkijos ir Ðiaurës vakarø Ukrainos liosø penkiø profiliø datø pasiskirstymo daþnumo funkcija

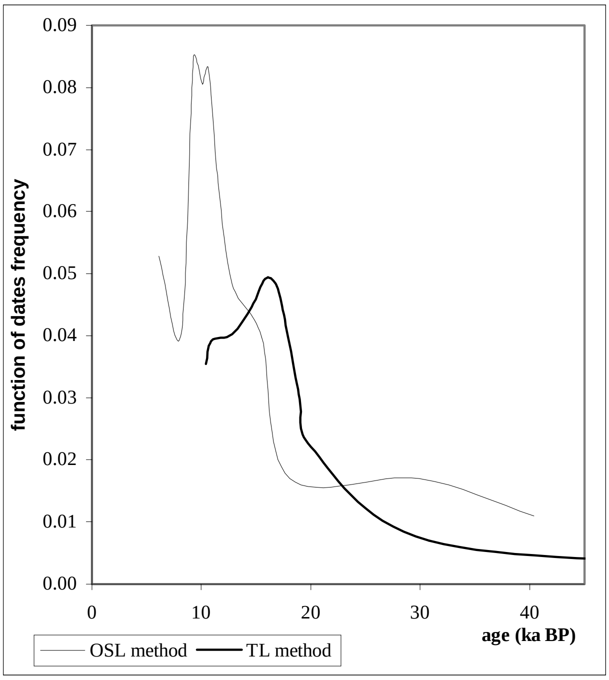

Fig. 4. Function of TL and OSL date distribution for the same loess samples

4 pav. Tø paèiø lioso mëginiø Th OSL datø pasiskirstymo funkcija red to above come from the above specified Polish (Dybawka, Tarnawce, Zarzecze) and Ukrainian profiles (Velykyj Hlyboèok and Halyè). Forty-seven of these samples consisted of loess, and 19 of them were first dated with the TL method and next with the OSL method. Based on the results obtained, the function of date frequency distribution was constructed for both methods in one chart (Fig. 4). Both curves show high similarity. A shift of the two curves may be noted in relation to one another. Besides, the curve of OSL result distribution is higher in relation to TL dates. It is due to a smaller measurement error (the so-called uncertainty) in the OSL method.

A chart was also made in the TL = f (OSL) logarithmic scale for all the 19 samples examined with the two methods (Fig. 5). It may be noted that the youngest results are condensed while the oldest results are dispersed. The chart shows a certain interpretation dependency between the results obtained. The next regularity consists in the fact that the TL dating results are older than OSL dating results. This observation led to the development of another TL = f(OSL) chart for the sample age up to 50 ka BP. This time the regularity was presented in the linear scale (Fig. 6). The TL and OSL dating results are nearly parallel in relation to the regression line. It was these results for which geometrical interpolation was conducted.

It turned out that the line for the 11 results might be described by the following equation:

TL = OSL + 4,

where TL and OSL stand for sample age in ka BP and 4 means 4 ka BP.

Limited to the range of 20 ka BP (older upper loess) (Maruszczak, 1991), the results show a correlation which may be described in a mathematical formula allowing to convert the results of both methods. At this phase of studies, it is difficult to determine whether it is a coincidence or a regularity. It is likely that a larger number of comparative results would answer the question.

The fact of including the dating results of TA–14 and TA–16 samples in Table is worth commenting on. After the results of both dating procedures had been obtained, it turned out that their age was substantially younger in relation to the stratigraphic interpretation conducted by the naturalists. The results were also significantly younger than the dating results of samples situated below and above them. For this reason, we decided to collect samples on site once again. The TL measurement repeated on the new material confirmed that the first samples were most probably incorrectly stored after collection. The first and repeated results are presented in Table; it is evident what a short-term unplanned exposure to solar radiation may cause. In the same short time it contributed to the decrease of TL age and a substantial reduction of OSL age.

The parallel dating of samples by the TL and OSL methods brought about one more benefit. The single-portion SAR method applied in OSL measurements showed a substantial differentiation of grain age in the samples covered by the analysis. The OSL age result presented in Table was obtained for the youngest groups of results. There were also older grains whose age was not included in the final result. The final examination of OSL measurements allowed us to focus on older portions. It turned out that in all the samples where the TL age was older than the OSL age, there were also groups of grains with an older age similar or identical to the TL age. The occurrence of grain groups with an older age informs the researcher who determines age by the OSL method that the energy stored in the grains was not reduced in all of them during their last exposure to solar radiation. It is common know-

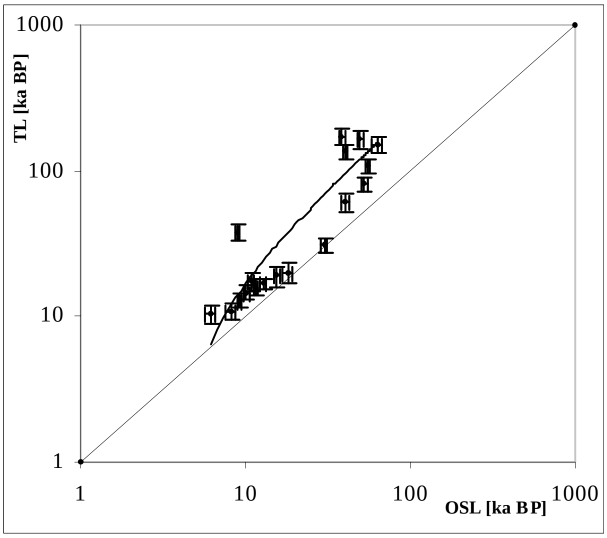

Fig. 5. Diagram of TL = f(OSL) results for loess samples in the logarithmic scale

5 pav. Lioso mëginiø TL = f(OSL) rezultatø diagrama

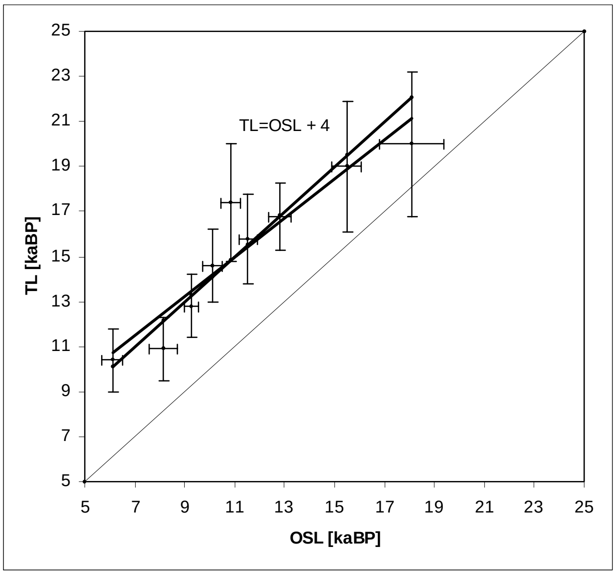

Fig. 6. Diagram of TL = f(OSL) results for samples from older upper loess (LSg)

6 pav. Senesnio virðutinio lioso (LSg) mëginiø TL = f(OSL) rezultatø diagrama ledge that the way of a loess grain to its final deposit may have been very complex and multi-stage. Loess was accumulated by winds of highly changeable transport directions and differentiated dynamics and the loess material deposited could have been redeposited many a time, in particular on slopes, and subject to differentiation under the influence of water and wind. Therefore, it may not be excluded that the dating results, even if inconsistent with expectations, are of a highly informative value for naturalists as regards the conditions of loess deposit transport and accumulation. Undoubtedly, collaboration between naturalists and physicists is indispensable in loess age determination.

References

Aitken M. J. 1983. Radioactivity data using SI units. *PACT*. ***9***. 65–71.

Aitken M. J., Xie J. 1985. Moisture correction for annual gamma dose. *Ancient TL*. ***8***. 6–9.

Bluszcz A. 2000. Datowanie luminescencyjne osadów czwartorzædowych – teoria, ograniczenia, problemy interpretacyjne. *Zeszyty Naukowe Politechniki Úlàskiej, seria Matematyka–Fizyka*. ***86***. *Geochromonetria 17*. Gliwice.

Bluszcz A., Pietrzak M. 2001. Datowanie metodami OSL i TL próbek osadów pyùowych z profilu Ùazy. *Geneza, litologia i stratygrafia utworów czwartorzædowych. T. III, seria Geografia*. ***64***. Wydawnictwo Naukowe UAM, Poznañ.

Boguckyj A., Cyrek K., Ùanczont M., Madeyska T., Sytnyk O. 2003. Middle Paleolithic stratigraphy in Podolia and East Carpathian Foreland, Ukraine. *The Joint Workshop Meeting Loess and Paleoenvironments*. INQUA Loess Commission, INQUA Carbon Commission. May 26 – June 1, Moscow, Russia. 13.

Boguckyj A., Ùanczont M. 2003. Loess stratigraphy in the western part of Ukraine. *The Joint Workshop Meeting Loess and Paleoenvironments*. INQUA Loess Commission, INQUA Carbon Commission, May 26 – June 1. Moscow, Russia. 14.

Chlebowski R., Lindner L., Barczuk A., Boguckij A., Goýik P., Ùanczont M., Nejbert K., Jarosiñska U., Trzciñski J., Wojtanowicz J. 2003. Êródùa materiaùu i warunki akumulacji górnego lessu mùodszego (bugskiego) w poùudniowo-wschodniej Polsce i zachodniej Ukrainie. *IV Seminarium "Geneza, litologia i stratygrafia utworów czwartorzædowych". UAM Poznañ*, 13–14. X. 2003. 3–6.

Fedorowicz S., Boguckyj A., Ùanczont M. 2003. Wyniki badañ chronostratygraficznych osadów lessowych z profilu Halicz (Ukraina) na podstawie kolekcji próbek z 2002 roku. Lessy i paleolit Naddniestrza Halickiego. *Materiaùy XII ukraiñsko-polskiego seminarium terenowego – Stratygraficzna korelacja lessów i osadów lodowcowych Ukrainy i Polski*. Halicz, 15–19 IX 2003.

Fedorowicz S. 2003. Thermoluminescence method; outline of history, foundations, principle, possibilities, perspectives and limitations. *Geologija*. ***41***. Vilnius. 28–35.

Fedorowicz S., Ùanczont M., Boguckyj A. 2004. Thermoluminescence dating of loess deposits in the multilayer palaeolithic site Velykyi Hlyboèok in the Podolia (Ukraine). *Geochronometria* (in press).

Fedorowicz S., Ùanczont M., Boguckyj A. 2004. Luminescence dating of the Halyc profile (Ukraine) on the basis of the samples collected in 2002. *Geochronometria* (in press).

Fedorowicz S., Ùanczont M. 2004. The age loess deposits at Dybawka, Tarnawce and Zarzecze (SE Poland) based on luminescence dating. *Geologija*, ***47***. Vilnius. 8–14.

Gozhik P., Shelkoplyas V. & Khristoforova T. 1995. Development stages of loessial and glacial formations in Ukraine (stratigraphy of loesses in Ukraine). *Annales UMCS*. ***50***. Lublin. 65–74.

Ùanczont M. 1995. Regional stratigraphy and lithology of the Carpathian loess deposits in Przemyúl environs. *Bull of the Polish Ac. of Sciences. Earth Sciences*. ***43***(*1*). 1–14.

Ùanczont M. 1997. Lessy okolic Przemyúla (Loesses in Przemyúl environs). *Rocznik Przemyski*. ***33***(*4*). *Nauki Przyrodnicze*. 3–44.

Ùanczont M., Boguckyj A. 2002. Badane profile lessowe i stanowiska paleolityczne Naddniestrza halickiego (sum. The examined loess sites in the Halyè Prydnistrov'ja region). [w:] T. Madeyska [red.], Lessy i paleolit Naddniestrza halickiego (Ukraina) (Loess and Palaeolithic of the Dniester River Basin, Halyè region (Ukraine)). *Studia Geologica Polonica*. ***119***. 33–181 (sum. 347–354).

Ùanczont M., Wojtanowicz J. 2000. Zonality periglacial silt deposits in Central Europe on the example of Poland. Z. Chojnicki (ed.). *Polish Geography – Problems, Researches, Applications*. UAM, Poznañ. 127–132.

Maruszczak H. 1991. *Podstawowe profile lessów w Polsce*. Wyd. i KBCz PAN i UMCS.

Maruszczak H. 1994. Korelacja chronostratygraficzna lessów Polski Poùudniowej i Ukrainy Póùnocno-Zachodniej. *Przeglàd Geologiczny*. ***42***(*9*). 728–733.

Maruszczak H. 1996. Korelacja stratygraficzna lessów polskich, ukraiñskich i niemieckich. *Biuletyn PIG*. ***373***. Warszawa.107–115.

Singhvi A. K., Bluszcz A., Murthy C. S. R., Someshwar Rao M. 1998. Synthesis of luminescence chronology of loess accumulation episodes and implications for global land-see correlation. *Abstracts of PAGES Open Science Meeting*. University of London. April 20–23, 1998.

Stanisùawas Fedorowiczius, Maria Ùanczont, Adamas Mucas

PIETRYÈIØ LENKIJOS IR ÐIAURËS VAKARØ UKRAINOS LIOSØ KAI KURIØ PROFILIØ LIUMINESCENCINIO (TL IR OSL) DATAVIMO REZULTATØ PALYGINIMAS

Santrauka

Penki liosø profiliai buvo parinkti datavimui termoliuminescencijos (TL) ir optiðkai stimuliuotos liuminescencijos (OSL) metodais: trys Lenkijoje ir du Ukrainoje. Jie charakterizuoja Karpatø liosø (Tarnawce, Dybavka), Priekarpatës (Zarzecze, Halyè) ir Poliesës facijas (Velykyj Hlyboèok). Ðiø liosø su-

sidarymui didþiausià reikðmæ turëjo medþiagos ðaltiniai ir atneðimo bûdas. Liosø stratigrafinë padëtis yra skirtinga. Jø bendras storis virðija 10 metrø. Lenkijoje (iðskyrus Tarnawce) tirtø profiliø liosai yra jaunesni (Vyslos apledëjimo), Ukrainos profiliuose – senesni. Autoriai palygina Lenkijos ir Ukrainos liosø stratigrafinæ padëtá. Lenkijos ir Ukrainos liosø susidarymas yra susijæs su globalinës eolinës akumuliacijos laikotarpiais. Tø paèiø mëginiø TL nustatytas amþius yra senesnis negu OSL. Jaunesniø mëginiø TL ir OSL datavimo rezultatø santyká galima iðreikðti matematine formule.

Ñòàíèñëàâ Ôåäîðîâè÷, Ìàðèÿ Ëàí÷îíò, Àäàì Ìóñ

CÐÀÂÍÅÍÈÅ ÐÅÇÓËÜÒÀÒÎÂ ËÞÌÈÍÅÑÖÅÍÒÍÎÃÎ (ÒË È ÎÑË) ÄÀÒÈÐÎÂÀÍÈß ÍÅÊÎÒÎÐÛÕ ÐÀÇÐÅÇÎÂ ËÅÑÑÎÂ ÞÃÎÂÎÑÒÎ×ÍÎÉ ÏÎËÜØÈ È ÑÅÂÅÐÎ-ÇÀÏÀÄÍÎÉ ÓÊÐÀÈÍÛ

Ðåçþìå

Â öåëÿõ äàòèðîâàíèÿ ëþìèíåñöåíòíûìè ìåòîäàìè (ТË è OÑË) îòîáðàíû îáðàçöû èç ïÿòè ë¸ññîâûõ ïðîôèëåé. Òðè ïðîôèëÿ íàõîäèëèñü â Ïîëüøå è äâà íà Óêðàèíå. Â íèõ ïðåäñòàâëåíû ôàöèè êàðïàòñêèõ ëåññîâ (Òàðíàâöå, Äûáàâêà), ïåðèêàðïàòñêèõ (Çàæå÷å, Ãàëè÷) ëåññîâ è ëåññîâ Ïîäîëèè (Âåëèêèé Ãëûáî÷¸ê). Ëåññû óïîìÿíóòîãî ðåãèîíà óâåëè÷èâàþòñÿ â ìîùíîñòè ñ ïåðåõîäîì ñ çàïàäà íà âîñòîê. Ìîùíîñòü äîñòèãàåò ñâûøå 10 ìåòðîâ. Äëÿ îáðàçîâàíèÿ ëåññîâ âàæíîå çíà÷åíèå èìåëè èñòî÷íèê ìàòåðèàëà è ñïîñîá òðàíñïîðòèðîâêè. Ñòðàòèãðàôè÷åñêîå ïîëîæåíèå èçó÷åííûõ ëåññîâ ðàçíîå. Äàåòñÿ ñîïîñòàâëåíèå ñòðàòèãðàôè÷åñêèõ ñõåì ëåññîâ Ïîëüøè è Óêðàèíû.

Îáðàçîâàíèå ëåññîâ â Ïîëüøå è íà Óêðàèíå ñâÿçàíî ñ ýòàïàìè óñèëåííîé ãëîáàëüíîé ýîëîâîé àêêóìóëÿöèè. Ïîëó÷åííûå ÒË ìåòîäîì äàòû ïîêàçûâàþò áîëåå äðåâíèé âîçðàñò, ÷åì äàòû ïî ÎÑË ýòèõ æå îáðàçöîâ. Ðåçóëüòàòû äàòèðîâàíèÿ ìåòîäàìè ÒË è ÎÑË îáðàçöîâ áîëåå ìîëîäûõ ëåññîâ ïîçâîëÿþò îïèñàòü èõ ñîîòíîøåíèå â âèäå ìàòåìàòè÷åñêîé ôîðìóëû.