UDC 551.4(438)

DIVERSITY AND AGE OF SEDIMENTS BUILDING KAME HILLS NEAR SUCHEDNIÓW (KIELCE UPLAND, CENTRAL POLAND) – FIRST RESULTS

T. Kalicki, P. Przepióra, Ł. Podrzycki
Jan Kochanowski University in Kielce, Institute of Geography, Department of Geomorphology, Geoarchaeology and Environmental Management, ul. Świętokrzyska 15, 25–406 Kielce, Polska;
tomaszkalicki@ymail.com

The kame hills and terraces in the northern part of the Świętokrzyskie voivodeship (central Poland) were the subject of research in the 1970s. In 2019, further research was started using new methods to determine the age and genesis of the sediments that build this forms. A 15-meter high profile was made to expose one of the kame at the active sand pit western site. Two excavators and a climbing harness were used for this purpose. The exact descriptions and photographic documentation of the entire outcrop was made. The samples for grain size analysis using the sieve and planimetric methods was obtained, as well 11 samples for TL dating were also taken. The obtained results were compared with the existing knowledge on the glaciation of this part of Poland.

Keywords: kame hill; terrace; age and genecis of sediments; Poland.

The research area is located on the Suchedniów Plateau in Kielce Upland [4, 5], which is the northern part of the Mesozoic margin of the Holy Cross Mountains (central Poland) (Fig. 1). The site is located in the Kruk Forest at Zagórska street, about 1.5 km westward of the Suchedniów centre. It is the north-western part of the Kamionka river catchment, which is the right tributary of the Kamienna river.

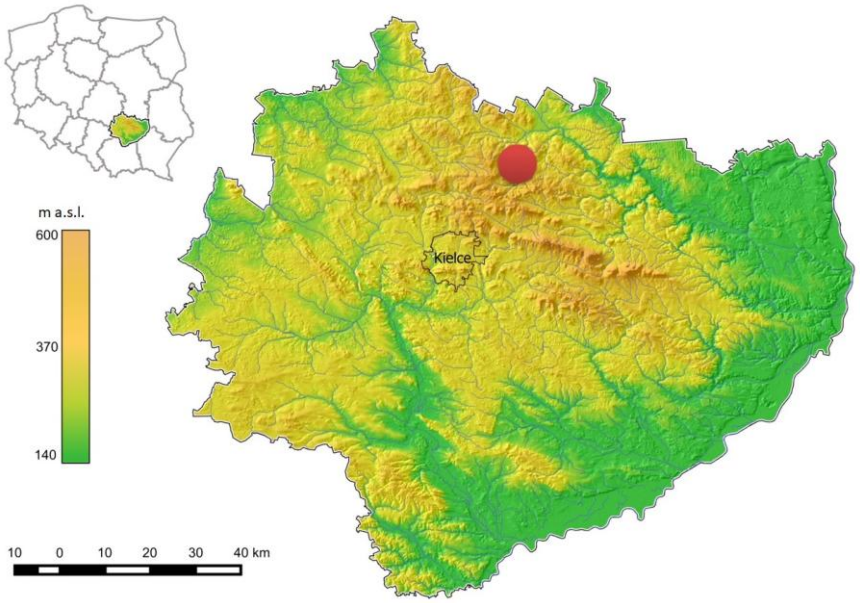

Figure 1 – Location of study area on Digital Elevation Model
(by M. Frączek, P. Przepióra based on data from CODGiK: MGGP Aero, No. GI-FOTO.703.44.2014)

During the Middle Polish glaciation (Saalian glaciation), plate and thick-lined Lower Triassic sandstones with inserts of clay, marl and iron ores were covered by glacial and fluvial sands with gravels, tills and dammed lake deposits [1, 2]. The kame hills and terraces in this area were created during the entrance of the ice sheet from the eastern and northern sides to the lower, middle and par-

tially upper part of the Kamionka river catchment. Fluvioglacial sediments were accumulated between two glacial lobes, creating characteristic inter-lobe forms. The terminal moraine accumulation created here are mostly relics of higher kame terraces and gravel kames formed during the deglaciation of the ice sheet in this part of Poland [6]. Coarse sediments also build higher fluvial terraces of Kamionka river [3].

Figure 2 – Field works with the use of heavy equipment (excavators) and climbing harnesses while preparing an over 15-meter profile (photo P. Przepióra 2019)

The Kruk sandpit site was already the subject of research in the 1970s [6]. At that time, the sediments building the kames in this part of the area were characterized, mostly their relative age and origin. The aim of the latest research is to determine the exact origins and age of the sediments based on modern laboratory methods. For this purpose, a 15-meter-high outcrop was made. In the field works an 2 excavators and mountaineering equipment was used in hard to reach places of this profile (Fig. 2). A total of 69 samples were collected for grain size analysis using the sieve method and 11 samples to thermoluminescence dating (TL) was selected. A exact lithostratigraphic, sedimentological description and photographic documentation was also made.

The kame hill is mostly made of different-grained sands with gravels with intercalations of finer sediments. This indicates the variability of the intensity of proglacial water flows. There are about 7 phases associated with intensive flows (high gravel content) and at least 4 with a clear decrease in the energy of the flows (increased content of silty sediments) (Fig. 3). In the lowest part of the profile, stabilization of sedimentation conditions is visible, when medium and fine sands with a tendency of finninng downwards were accumulated. All these sediments are covered in the upper part of the profile with a 1-2 meter layer of moraine sediments (numerous sandstone and rapakivi granite boulders).

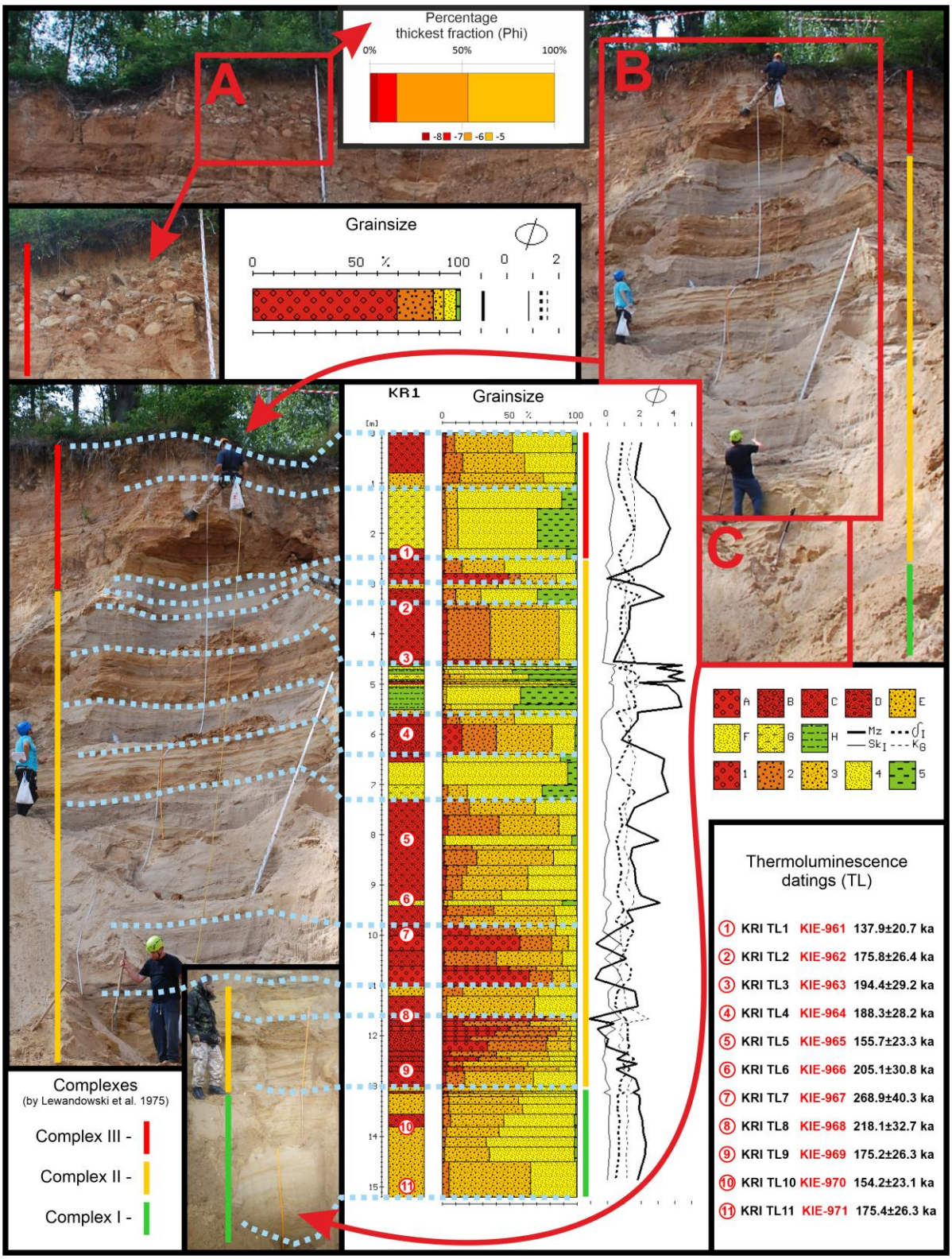

Figure 3 – The KR1 profile (photo T. Kalicki and P. Przepióra 2019) with the TL datings, sedimentary complexes and grain size analysis (planimetry and sieve method)

Lithology: A – gravels, B – gravels with sands, C – sands with gravels, D – silty sands with gravels, E – medium sands, F – fine sands, G – silty sands, H – sandy silts; Fractions: 1 – gravel (below -1φ); 2 – coarse sand (-1–1φ), 3 – medium sand (1–2φ), 4 – fine sand (2–4φ), 5 – silts and clay (above 4φ); Folk-Ward's grain size distribution parameters: Mz – mean size, δ_I – standard deviation, Sk_I – skewness, K_G – kurtosis

Figure 4 – The fault in depth 4 meters (complex II and III)(photo. P. Przepióra 2019)

As in the case of the research made in the 1970s in the northern outcrop of the kame [6], the present studies on the western wall confirmed the presence of three characteristic complexes of fluvioglacial sediment accumulation (Fig. 3). Complex I (lower part of the profile) is built mainly by silts and fine sands with poorly visible parallel lamination. Complex II (middle part of the profile) is built of different-grained sands, gravels and pebbles that create well visible layers. The large diversity of sediments that build this complex is related to the high variability energy of proglacial water transport. There are also clear faults resulting from dewatering those sediments (Fig. 4). Complex III (upper part of the profile) is build by sands, clays and boulders (moraine sediments), also with clear visible faults.

TL dates obtained from sediments from western wall about 175–140 ka years (Fig. 3), indicate that the form was created in the Warta stadium of the Middle Polish Glaciation, which confirmed the previous study of this area [3, 6].

The results obtained so far make it possible to determine and verify the age and genesis of the sediments that build proglacial forms in the Suchedniów region. Additional analyzes and datings clarify the results of previous studies, but also open up further discussion on the Middle Polish Glaciation in this part of Poland.

References

1. *Filonowicz P.* Objaśnienia do szczegółowej mapy geologicznej Polski 1 : 50 000, ark. Skarżysko-Kamienna. Warszawa : Wyd. Geol., 1978.

2. *Filonowicz P.* Szczegółowa mapa geologiczna Polski w skali 1 : 50 000, ark. Skarżysko-Kamienna. Warszawa : Wyd. Geol., 1978.

3. *Kalicki T., Przepióra P., Podrzycki Ł*. Struktura i geneza terasy Kamionki obok Suchedniowa // Acta Geographica Lodziensia. 2017. T. 106. S. 53–64.

4. *Kondracki J.* Regiony fizycznogeograficzne Polski. Warszawa : Wyd. UW, 1977.

5. *Kondracki J.* Geografia regionalna Polski. Warszawa : PWN, 2002.

6. *Lewandowski J., Romanek A., Studencki M.* Formy akumulacji międzylobowej w rejonie Suchedniowa // Kwart. geol. 1975. N 4. S. 887–906.

UDC 551.4(438)

THE ŚWIŚLINA RIVER VALLEY STRUCTURE AT THE DOŁY BISKUPIE SITE (HOLY CROSS MOUNTAINS, CENTRAL POLAND) – PRELIMINARY RESULTS

T. Kalicki[1], P. Przepióra[1], E. Kłusakiewicz[1], Ł. Podrzycki[1], K. Fularczyk[1], G. Pabian[2], K. Żurek[3]

[1]Jan Kochanowski University in Kielce, Institute of Geography, Department of Geomorphology, Geoarchaeology and Environmental Management, ul. Świętokrzyska 15, 25–406 Kielce, Polska; tomaszkalicki@ymail.com, pawelprzepiora1988@gmail.com

[2]Jan Kochanowski University in Kielce, Institute of Geography, Department of Geotourism and Ecological Geology, ul. Świętokrzyska 15, 25–406 Kielce, Polska

[3]Student Science Club of Geomorph**o**logists «Złoty Bażant», Jan Kochanowski University in Kielce, ul. Świętokrzyska 15, 25–406 Kielce, Polska

The structure of the Świślina river valley (Holy Cross Mountains, central Poland) was the subject of research dating back to the 1950s. Returning to this place after the years in 2014 and 2020 made it possible to use new methods in the analysis of sediments building studied area. For this purpose, climbing equipment was used to get to hard-to-reach places. Samples were taken for grain size and geochemical analysis. The results of analyzes based on magnetic separation of microscopic slags were also taken into account. These results allowed to obtain new data about the structure of this part of the valley. Changes in sedimentation associated with natural processes as well as with the intensification of human activity in last centuries (metallurgical activity, flash floods) were captured.

Key words: Świślina river valley; analysis of sediments; Poland.

The site is located in the Świślina river valley at Doły Biskupie, downstream from the «Wióry» water reservoir (Świętokrzyskie voivodeship). It is the north-eastern part of the Mesozoic margin of the Holy Cross Mountains, where the Triassic sandstones and shell limestones, marls and clay mudstones are covered with a thick layer of the Pleistocene loess. The relief is dominated by a low-relief plain (Palaeogene peneplain) that cuts down the age-different structural elements – the Palaeozoic, steep Godów fold, and the highly disturbed Triassic and Jurassic rocks. It is deeply cut by river valleys with terraced bottom, i.e. Świślina river. In its basin, loess areas developed a dense network of gullies and sunken lane (Fig. 1).

In the studied section, the valley has steep slopes, and two steps are marked at its bottom: a narrow 4.5–5.5 m high flood plain and a wider terrace raised 9–11 m above the river level (a.r.l) (Fig. 1). Both levels are build of fine-fraction sediments (anthropogenic muds), grain size similar to loess, in which numerous traces of metallurgical activity in the form of slags with a diameter of up to 25 cm were found. These traces indicate very young age and anthropogenic genesis of these sediments accumulation, related to the development of metallurgy [4].

In 2014 and 2020, a sediment study was undertaken on the site both within the left-bank of the flood plain and using specialist mountaineering equipment, in the five-meter exposure of loess on the right slope of the valley undercut by the river (Fig. 2). In addition to the standard grain size analysis by sieve and laser diffraction, the coarsest material was measured using the planimetric method. The geochemical analyzes of the flood plain alluvia were performed on the content of