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GEOLOGICAL AND GEOGRAPHICAL STUDIES OF POLISH AND UKRAINIAN SCIENTISTS IN THE TERRITORY OF VOLYN AND PODILLYA IN THE INTERWAR PERIOD (1918–1939)

Summary. Based on the study of literary sources, the article analyzes geological and geomorphological studies of Polish and Ukrainian scientists on the surface topography, stratigraphy and lithology of Quaternary deposits, loess strata, Quaternary continental glaciation and glacial deposits, modern physiographic processes in the territory of Volyn-Podillya during the interwar period (1918–1939). It has been established that large generalizing works of a monographic nature on the features of the geological and geomorphological structure, modern physiographic processes in the region during the interwar period did not appear. No systematic research has been conducted. The works were mostly sporadic, often determined by the initiative and interest of researchers. The studies were conducted with significant interruptions and concentrated mainly in areas already known deposits of fossil fuels, salts, phosphorites, etc. Among the geographical research dominated areas such as: study of Quaternary stratigraphy, the history of continental glaciations in the region and the lithology of glacial deposits, the composition and dismemberment of loess deposits, morphological features of the territory, karst processes, the formation of river valleys, marshiness, soil cover, etc. It is noted that the positive features of the ongoing research can be considered in particular the use of spore-pollen analysis for the dismemberment of glacial deposits; mechanical, chemical, mineralogical and petrographic analysis of loess; widespread use for stratigraphy of Quaternary paleontological remains and archaeological artifacts; use in the study of the relief of special geomorphological methods, cartographic material, etc.; a complex approach to the study of glacial deposits and land relief forms.

From the scientific results of this period it is possible to distinguish: the appearance of the first fairly well-founded schemes of geomorphological zoning of the Podillya in general and of Opillya in particular; the establishment of a clear conditionality of the morphological features of the relief of the territory by the geological structure, the latest tectonic processes and the continental anthropogenic glaciation; thorough studies of loess deposits, in particular, Yu Polyansky, Yu. Tokarsky, S. Biskupsky and others. (dismemberment of loess strata, mechanical, chemical, mineralogical, petrographic composition, genesis); conclusions on the role of glacial deposits in the formation of the Volyn-Podillya relief, frequency and boundaries of individual glaciers, climatic conditions of interglacial eras; significant progress in the study of the morphology and genesis of surface and subsurface karst forms in the sulphate sediments of Podillya and Pokuttia, the appearance of cartographic schemes of individual caves, preparing them for tourist excursion use, etc.

Keywords: geomorphological studies, Quaternary deposits, glacial deposits, stratigraphy, morphology, loess deposits.

**ГЕОЛОГО-ГЕОГРАФІЧНІ ДОСЛІДЖЕННЯ ПОЛЬСЬКИХ ТА УКРАЇНСЬКИХ
НАУКОВЦІВ НА ТЕРЕНАХ ВОЛИНИ Й ПОДІЛЛЯ У МІЖВОЄННИЙ ПЕРІОД
(1918–1939)**

Анотація. На основі вивчення літературних джерел в статті проаналізовано геолого-геоморфологічні дослідження польських та українських вчених рельєфу поверхні, стратиграфії та літології четвертинних відкладів, лесових товщ, четвертинного материкового зледеніння та льодовикових відкладів, сучасних фізико-географічних процесів на теренах Волино-Поділля у міжвоєнний період (1918–1939 рр.). Встановлено, що великих узагальнюючих робіт монографічного характеру про особливості геолого-геоморфологічної будови, сучасні фізико-географічні процеси в регіоні у міжвоєнному періоді не з'явились. Систематизованих досліджень загалом не проводилось, роботи носили в основному спорадичний характер, часто визначались власною ініціативою та зацікавленістю дослідників, проводились із значними перервами й зосереджувались переважно в районах уже відомих покладів горючих копалин, солей, фосфоритів тощо. Серед власне географічних досліджень домінували такі напрями як: вивчення стратиграфії четвертинних товщ, історії материкових зледеніння у регіоні та літології льодовикових відкладів, складу й розчленування лесових відкладів, морфологічні особливості території, карстові процеси, формування річкових долин, заболоченість, ґрунтовий покрив та ін. Відзначено, що позитивними рисами здійснених досліджень можна вважати зокрема застосування спорово-пилкового аналізу для розчленування льодовикових відкладів; механічного, хімічного, мінералогічного та петрографічного аналізу лесів; широке використання для стратиграфії четвертинних товщ палеонтологічних решток та археологічних артефактів; використання при вивченні рельєфу спеціальних геоморфологічних методів, картографічного матеріалу та ін.; комплексний підхід при вивченні льодовикових відкладів та форм рельєфу території.

З наукових напрацювань цього періоду можна виокремити: появу перших достатньо обґрунтованих схем геоморфологічного районування Поділля загалом та Опілля зокрема; установлення чіткої зумовленості морфологічних особливостей рельєфу території геологічною будовою, новітніми тектонічними процесами та материковими зледеніннями антропогену; ґрунтовні дослідження лесових відкладів, виконані, зокрема, Ю. Полянським, Ю. Токарським, С. Біскупським та ін. (розчленування лесових товщ, механічний, хімічний, мінералогічний, петрографічний склад, генезис); висновки про роль льодовикових відкладів у формуванні рельєфу Волино-Поділля, періодичність та межі окремих льодовиків, кліматичні умови міжльодовикових епох; значний прогрес у вивченні морфології та генезису поверхневих і підземних карстових форм у сульфатних відкладах Поділля й Покуття, появу картографічних схем окремих печер, підготовку їх до туристсько-екскурсійного використання та ін.

Ключові слова: геоморфологічні дослідження, четвертинні відклади, льодовикові відклади, стратиграфія, морфологія, лесові відклади.

Geological and geographical studies in Western Ukraine during the interwar period were not systematically, not evenly and intermittently conducted. Moreover, the largest volumes of exploration and scientific research were carried out in territories that were of practical interest at that time, taking into account the presence of already known deposits of valuable minerals, primarily oil and gas, salt deposits, mineral waters, etc. These were primarily the Carpathians and the Precarpathian fore deep. Western Podillya and Volyn (within the current Ternopil, Rivne and Volyn regions) were studied less intensively and the concepts of their geological structure and surface morphology were rather schematic and presented mainly by numerous, but small in volume, scientific reports and articles. At that time, large monographic generalizations about the features of the geological and geomorphological structure of the region were not made.

The subject of this article is an attempt to analyze and summarize the studies of these territories in the field of Quaternary geology and geomorphology. It should also be noted that publications from the listed sections of physical geography are found quite sporadically and in much smaller numbers than articles from purely geological disciplines – mineralogy, petrography, lithology, tectonics, etc.

The works of Polish and Ukrainian geologists and geographers from Quaternary geology and geomorphology in the interwar period focused on the following problems: 1) stratigraphic dismemberment of quaternary strata; 2) the study of traces of continental glaciation in the studied areas, the characteristics of glacial deposits and

forms of glacial relief; 3) study of loess deposits; 4) study of the relief of the territory, karst processes, modern peatlands and soil cover.

Stratigraphic dismemberment of Quaternary deposits. Fundamental works on this issue on the study area are virtually absent. However, it is worth noting that at that time there is a growing interest in the use of spore-pollen analysis for the dismemberment of quaternary deposits, the anthropogenic flora and fauna are studied, archaeological artifacts such as tools of labor and life of the ancient settlers of the region, etc. are used. So, S. Kulczynski (Krygowski, 1934; Kulczyński, 1930), who studied the swamps and peatlands of Polissya in 1923–1940, examined the types of peatlands and their genesis, gave a detailed description of the geological conditions, hydrographics of Polissya, and paid considerable attention to the peatland stratigraphy. So, in Polissya by the method of Post, he distinguished two stratigraphic peatlands horizons: junior, covered with a mixed forest and ancient, covered with pine-birch forest. The first of them corresponds to the Litorino-Sub Atlantic, the second to the Anulovo-Valdievy horizons. Under the layers of the first horizon in Ivanychi and near Kovel, ancient interglacial deposits are recorded, which correspond to Wurm I and Wurm II. Peatlands of the Litorina age are common in Polissya in the river valleys; ancient alluvial and deluvial peatlands are grouped in ancient terraces and watersheds (Krygowski, 1934).

H. Gams, who studied flora and fauna from Staruny (Ivano-Frankivsk region), in his work (Gams, 1935) made an attempt to synchronize glaciation according to literary sources, gave the results of spore-pollen analyzes, as well as paleogeographic maps of glaciation and interglacial eras. Conclusions were also made regarding the territories of Volyn.

J. Polanski studied the flora and fauna of Lviv region, stratigraphy of Quaternary deposits, the structure of the river terraces Podillya, central Polissya and Paleolithic sites Podillya and Bessarabia (Polański, 1938; Polański, 1935). Summarizing the data obtained during the discovery of new Paleolithic sites and his own field observations, he carried out a reconstruction of the medium of the early Paleolithic, submitted a detailed description of the geographical position of the Podillsk-Bessarabian province, its geological structure, the position of the sites relative to rivers, hypsometry, etc. The author refers to Wurm, described by him near Rudok Dryas flora and tundra flora, mollusks and mammals from the river Sian (Lviv region). Loess, river alluvium (6 terraces) and travertines are described for the Yagilnytsya-Chernelytsia district (Ternopil region). Three types of loess of different ages are singled out. Travertines are dated Pleistocene and Holocene.

As a conclusion, it should be noted that the individual reports on the determination of the age of the Quaternary strata were poorly synchronized with each other and a reliable, generally accepted scale, the dismemberment of these sediments during this period was not agreed.

The study of the continental glaciation, in contrast to the previous problem, was the focus of attention of many researchers throughout the entire period. So, one of the first fundamental articles was the publication by J. Czyzewski in 1929 in Krakow about the role of glacial waters in the formation of the Podillya relief (Czyżewski, 1928). The morphological removal of the middle part of the Dniester in the Opillia region has established the last 4 phases of its development. The granite pebbles found on one of the terraces, typical of the Atlantic magmatic province, provided grounds for asserting the participation of glacial waters in the Podillya relief. Earlier, the studies by E. Romer found that glacial waters drained the valleys of the Blazhivka and Dniester rivers into the Black Sea. The vertical position of the pebble found indicates that the glacial waters in the Opillia region flowed 25–40 m above the current level. This value shows the amplitude of the erosion slice from the moment of maximum glaciation of the territory to the deposition of loess.

In 1932, on the basis of a study of glacial and fluvioglacial deposits south of Lviv, W. Przepiorski concluded that melt glacial waters moved along the western and northeastern borders of Podillya (Przepiorski, 1932). Later, in 1938 W. Przepiorski (Przepiorski, 1938) concluded that the Hyrivsko-Lviv Plateau was covered with a powerful glacial tongue, which in the Sambor region reached its extreme southern position. Melted glacial waters flowed along numerous depressions in the main European watershed and the valleys of the Vereshchin, Stavchanka, and Shcherek rivers. The modern valleys were filled with alluvial material, and then they deepened by the waters of the glacier retreating and streamflows. The conclusions were made on the basis of studies of the northwestern part of the Pre-Carpathian region and until 1965 almost did not undergo significant criticism, and the main points are shared by many researchers even now. The positions of the glaciation boundary and some others are discussed in particular. Of the publications that examine the glacial deposits of West Polissya and Volyn, one can single out the message of E. Rühle, S. Pawlowski, S. Wollosowicz, C. Gagel and J. Korn, R. Krygowski and J. Lilpop.

E. Rühle studied the morphology and geology of hills and glacial deposits in the upper Pripyat basin [Rühle, 1933; Rühle, 1936; Rühle, 1937]. Polemizing with P. Tutkovsky, he argues that the hills in the northwestern part of Polissya are remnants of the Pre-Quaternary surface, and not the final moraines, as P. Tutkovsky asserted. Describing the composition of the moraine in the quarries of brick factories near the Volodymyr-Volynsky and Ustylug cities, he defines her age as Ryss.

S. Pawlowski, studying the composition of the moraine deposits of the southern Polissya, defines them as a bottom moraine, and also allows for the existence of two glaciation phases in a given area (Pawlowski, 1930).

S. Wollosowicz gives a description of glacial deposits and the boundaries of the maximum distribution of I and II glaciations in the basin of the upper and middle Western Bug (Wollosowicz, 1922. T. 1.), establishes the position of the advanced moraines of Southern Polissya, concludes moving to the south and east of the glaciers L₃ and L₄ (Wollosowicz, 1924).

C. Gagel i J. Korn (Gagel, Korn, 1918) give the results of the study of the moraine material of the lower Quaternary period of Volyn, which is related to the second glaciation and is no different from the North Germanic. A detailed study of the moraine lithology allowed the authors to determine the area of material drift. The research carried out allowed the southern boundary of the last glaciation not directly north of the Warsaw-Bug line and south of the Bialystok-Niemen line, but much north-western or north of the Kholm-Kovel line.

J. Lilpop, after studying the flora of interglacial deposits L₃ / L₄, reproduced the nature of the change of climatic conditions at that time, made a conclusion about the 3 epoch of glaciation on the middle Pobuzhya (Lilpop, 1925; Lilpop, 1925. R. III; Lilpop, 1928).

R. Krygowski (Czyżewski, 1927, Krygowski, 1934) described the geological structure of glacial hills (kame) in the Pripyat basin, considered the role of melt glacier flows in relief formation processes in the Styr basin.

The study of loess. Among the few studies on the loess cover of Volyn-Podillya, the works of Yu. Polyansky and Yu. Tokarsky are especially attractive. It should be noted that the work on the study of loess is important, considering: a) their almost universal distribution in the territories described; b) the value for the stratigraphic division of the Pleistocene; c) debatable genesis and d) wide use for the production of bricks and tiles. Yu. Polyansky, a famous Ukrainian geologist, geomorphologist, archaeologist, worked in Podilsky Transnistria. His work "Podilsky etudes. Terraces, loess and morphology of the Galician Podillya on the Dniester" (the first part of the monograph "Podilsky etudes") was published in the publishing house Shevchenko Scientific Society in 1929 (Polańskij, 1938). Being a supporter of the aeolian

hypothesis of the formation of loess, formulated by V.Obruchev and P.Tutkovsky, Yu.Polyansky shows the heterogeneity loess thickness and divides it into three horizons, which are equivalent to three separate glaciations: from below is older loess (Ryss), further are younger loess (Wurm I) and younger loess (Wurm II). These were new ideas about the Pleistocene Podillya stratigraphy.

In addition, Yu. Polyansky identified six uneven-aged river terraces in Podnistrovye: the first is the Holocene, without loess; the second is river alluvium passes into the younger loess (Wurm II); the third is river alluvium passes into the younger loess (Wurm I). The last three terraces lie above the ravines. The fourth is alluvium and loess of dubious age, erosion; the fifth is the alluvium passing in the older loess (Ryss), and the sixth is the river Pliocene alluvium of coverings by the older and younger loess. In the Pleistocene, on the Podillya, two tectonic movements took place, which resulted in two erosion cycles. In the first Pleistocene cycle (Pre-Ryss), relief forms formed above the first terrace. The second, Later Pleistocene orogenic cycle (Ryss-Wurm) determined the formation of young ravine relief forms below the fifth terrace. Yu.Polyansky his made conclusions on the basis of the study of the malacofauna, the remains of vertebrates and the labor tools of ancient people found in loess strata. The main postulates of his works (Polański, 1927; Polański, 1927. N. VII; Polański, 1938; Polański, 1932; Polański, 1935) are relevant now.

The study of the mechanical, chemical and mineralogical composition of loess Lviv, Carpathians and Podillya by Yu. Tokarski led him to conclude that the formation of loess strata (according to the Aeolian hypothesis) could occur due to the winding of dust first from the northwest, then from the west from the areas of glacial deposits of the continental glaciation. In the studied loess profiles, the author distinguishes four loose covers corresponding to four glaciations [Tokarski, 1935; Tokarski, 1936; Tokarski, 1936; Tokarski, 1936. R. 16; Tokarski, 1937].

S. Biskupski analyzed the petrographic composition of a loess profile from the precincts of Kremenets city. It has been established, in particular, that the relative size of grains (according to the diameter of quartz grains) of individual horizons of this profile is not the same; it shows two culminations. The first is well align with the first culmination of the size of the grains of loess Podillya the whole, the the second is somewhat different from the second Podilsk. In order to establish the marking of horizons in loess, for the first time for Podillya, the method of loess mineral separation in heavy liquids was used (Biskupski, 1937).

L. Sawicki, who studied the loess stratigraphy in Volyn (Rivne region) and Lviv region, concludes that the solifluction of the loess horizons of the “younger” loess in the precincts of Rivne and its subaerial character on Podillya (Sawicki, 1928; Sawicki, 1932; Sawicki, 1934).

In a small article (Gagel, 1924), C. Gagel compares Volyn’s loess deposits with those in Germany. He notes that Volyn’s loess, which contains 52–72% of “loess grains” with a size of 0.05–0.01 mm, is identical in physical and chemical properties to Germany’s loess, but differs significantly from the chernozem regions of Russia. The bedding rock are represented by Senonsky chalk or intermediate loessoid sediments. There is a connection between the deposits of loess with the moraines located to the north.

It is worth mentioning the synthesis work of J.Semiradzki (Siemiradzki, 1924) “Glacial Epoch and Its Traces in Poland” (1929), in which it is noted that there were five glaciation periods in Central Europe, of which only the fourth reached the left bank of Pripyat River. The First Ice Age encompasses England, Northern France and Holland. The Second Ice Age encompasses (L₂) all of northern Germany and Pomerania to the outfall of the Vistula River. The Third Ice Age (L₃) covered the whole of Poland in Podillya. The Fourth Ice Age (L₄) reached only the Malopolsk

Upland and the left bank of the Pripyat River, and the Fifth Ice Age (L₅) did not reach beyond the Masurian lakefront.

D. Sobolev in 1926 published a well-grounded article “Polish-Ukrainian Periglacial Aeolian Formation”, where it indicates, among other things, the “extreme to the south of the Malopolsk-Polissya belt of hilly moraine landscape is accompanied from the outside by a zone of boulder and sandr sands, which in many places represent real sandy deserts” (Sobolev, 1925). From the south, this zone is bounded by the loess area. Traces of mechanical weathering are observed in sandy and loess areas.

In the study period, there were also individual reports of researchers who considered alternatives to the then dominant aeolian hypothesis views on the ways of loess formation – deluvial, fluvioglacial, eolifluction and alluvial, as it can be seen, for example, from the works of L.Sawicki and others.

Study of the relief and modern physiographic processes. These problems in the interwar period devoted the greatest amount of works. At the same time, along with purely descriptive publications, works appear where conclusions are based on the use of cartographic materials, which allowed researchers to identify fundamental patterns in the morphological features of the region.

So, one of the earliest works can be considered the work of S. Rudnytsky, published in 1924 in Lviv, “Foundations of the Earth Science of Ukraine”. “Physical Geography of Ukraine. Book of the First” (Rudnytskyj, 1924), in which two chapters are devoted to Podillya and Volyn. The author presents his own limits of the Podilsk Upland, which are interesting to quote with preservation of the original Ukrainian spelling of that time: *“Західну границю Подільської височини творить широка долина р. Верещиці, вкрита багнитими сіножатями й залита великими ставами. Від полудня й полудневого сходу обмежує Подільську височину зразу широка, а потім дуже глибока й тісна долина ріки Дністра. Між течіями Дністра й Бога Поділля понижується і поза лінією Бендери-Ольвіопіль незаметно переходить у Чорноморську низовину. Від північного сходу й півночі можна покласти для Поділля границю ріку Бог, а далі вододіл поміж Дністром та Дніпром, з джерелами рік Горині, Ікви, Стира. Недалеко кінця цього вододілу починається відомий крутий північний беріг Поділля, що йде від Бродів дугою під Львів та відділює надбужанський низ від Поділля”*. The author describes Opillya and Podillya, which divides into three parts: western, middle and eastern. The boundary between the western and middle (“seredushha”, according to the author) passes through Tovtry, and between the middle and eastern – along the valley of the Murafa River. The following is a general description of the surface of a region due to its geological structure. The main features of the region’s geomorphology, characterized by S.Rudnytsky, have not been debated by researchers up to now, with some exceptions (for example, the statement about the coral genesis of Tovtry ridge). From the standpoint of the connection of the geological structure and morphology, an extensive description of Volyn is also interpreted. It should be noted that already in the mid-20s of the last century, S. Rudnytsky quite thoroughly, colorfully, poetically and mainly from a strictly scientific position made a generalized geological and geomorphological description of the territories of Volyn- Podillya, as well as of Ukraine as a whole.

At about the same time (in 1925) Ya. Chizhevsky, on the basis of the medium-scale maps of relative heights Opillya built by him, draws conclusions about the boundaries of the geomorphological regions of Podillya (Czyżewski, 1925). Thus, the border between Opillya and Podillya is clearly fixed by a strip of relative heights of 40–60 m wide about 4 km. East of the latter there is a slightly dissected plain (relative heights of less than 60 m), to the west of the value of relative heights they reach 100 m and more. The morphological node between the Roztochchya and the Hologory-Kremenets ridge are the mountains of Gom and Kamula. The relative heights here are 120–160 m, sometimes reaching 220 m. Pobuzha is limited to the Roztochchya and the Hologory-

Kremenets ridge. The western border of Opillya is well fixed by relative heights and passes south of Nikolaev. The absolute height of Western Transnistria hardly exceeds 300 m, the relative heights vary from 40 to 60 m. Eastern Transnistria combines a strip of plains with relative heights at the Dniester to 60–80 m and more. Small Opillya is characterized by a more intensely dissected relief. The relative heights here are 80–100 and up to 120 m. Big Opillya is the most intensely dissected area. It is connected with the Hologory-Kremenets ridge by the headwaters of the Gnyla Lypa, and by the lower part of the Zolota Lypa it is connected with the Opillya of Nadnistriansky. Podilsk Opillya in the north is bounded by the Hologory-Kremenets ridge, in the south is bounded to the Big Opillya, and in the east is bounded actually by the Podillya. It is confined mainly to the headwaters of the Zolota Lypa (Czyżewski, 1925). Subsequent works of this author dealt with the analysis of the density of the river synodic on the Podillya (Czyżewski, 1927), and the history of the formation of the Dniester Valley within Opillya (near Zhuravny). Based on the study of river terraces and denudation levels, a conclusion was made about the time of the restructuring of the hydrographic synodic in anthropogen. The author notes that to the level of the 25-meter terrace, the Dniester flowed somewhat north of the current situation with the so-called “Novoselytsky podolom”. The deviation of the river to the south is associated with the lowering of the territory of the Pre-Carpathian Trough to the west of this area. A 1:100000 scale map has been added to the text (Czyżewski, 1928). In another work, jointly with A. Tsirgofer, Ya. Chizhevsky gives the morphological characteristic of the northern margin of Podillya, describes the Quaternary formations such as loess, fluvioglacial deposits, some karst phenomena and their influence on the formation of a hydrographic network. In particular, the morphological characteristics of the valley of the Ikva River are presented, conclusions about the time of the Quaternary formation of the territory are made. The authors note that the formation of the relief of the watershed of the Podillya and its northern margin took place in the Pliocene, and, possibly, at a later Quaternary time. This is evidenced by the distribution of loess deposits, covering both the upper and lower terraces. Materials on one of the tributary of the Styr River give the authors grounds to attribute the formation of this territory to the ice age. Cretaceous and Sarmatian sediments are prone to karst processes that have played a certain role in the formation of the modern relief of the Podillya northern side (Czyżewski, 1936).

The morphology of northern Podillya caused the interest of another researcher, namely A. Yan (1937). The author notes that one of the characteristic features of the Podillya northern ledge is the coincidence of its direction with the Main European watershed. The main relief forming factor of the territory is water. Considerable attention is paid to the processes of erosion, genesis of ravine, their connection with young tectonic movements; the characteristic of landslides and the reasons for their occurrence is given. The accumulative and denudation levels of the northern edge of Podillya are studied in detail, attention is focused on their paleogeographic sense, the main stages of the development of the territory is considered, this is fixed by accumulative and denudation terraced levels (Jahn, 1937).

A. Tsirhopher built a map of hypsographic curves on the chalk surface of the northern part of Podillya between Lviv and Kremenets. It has been established that under modern uplifts, the chalk cover rises, and decreases over the valleys. The relief of the modern surface is formed by Paleogene waters and tectonic movements in the early Paleogene. In the northern part of Podillya, the rivers of the northern basin of the Bug and Pripjat displace the tributaries of the Dniester from the general depressions in the chalk cover (Zierhoffer, 1926).

A. Abankur (1925–1926) described the longitudinal profiles of the Dniester and its left tributary – Seret, Strip, Koropts, Gnizna. Profile analysis showed the effect of deep geological structure on the shape of longitudinal river profiles. This allowed the

morphological method to depict the Podillya tectonics, which in general terms coincides with the constructions of V. Teiseire (Abancourt, 1925; Abancourt, 1926; Abancourt, 1927).

A. Cehak (1933) studied the deformations of the longitudinal profiles of Pokuttia and Podillya rivers. He singled out two types of longitudinal profiles of the Pokuttia rivers: simple (undisturbed) and profiles of slopes broken by faults. The nature of the profile line is determined by the relief of the territory and its geological structure. Rivers with concave and convex longitudinal profiles are distinguished. The first are characteristic for the right-hand tributaries of the Dniester on the territory of Opillya, the second are characteristic for its left-hand tributaries in Podillya. The work presents images and descriptions of some of the characteristic river profiles of individual areas of Pokuttia, as well as maps of deformations and the magnitude of the deviation of the heights of these river profiles from the calculated ones (Cehak, 1933).

The generalizing work of D. Sobolev (1933) is devoted to questions of the morphogenesis (in particular, of the Quaternary) of Ukraine, Western Polissya and Podillya. The author notes that during the Tertiary period, two well-marked tectonic cycles were observed in the North-Ukrainian basin. The first is Paleogene, marine; the second is Neogene, continental. By the end of the Miocene and in the Pliocene, Ukraine had a significant change in the geomorphological situation, that is, along with the rise of the platform, especially significant in the west, the sea began to regress. By the beginning of the anthropogenic, the geomorphological reorganization was basically completed. The development of surface forms, due to epeirogenesis, is mainly associated with repeated continental glaciation. Since the beginning of glaciation and after it in the Mindel-Ryss interglacial era due to the lowering of the continental massifs and the increase of the erosion base, erosion in the valley system has changed by accumulation. The author notes that it is not entirely known how the Mindel glacier approached Ukraine. He admits that the glacier was advancing from the north by the Upper Dnipro way. The approaching Ryss glacier in Ukraine apparently took place in two ways: from the west along the Polissya trough and from the north by a Dnieper lowering. Submorainic fluvioglacial sands of the Polissya Terrace and the submorainic freshwater loams of the main Middle Dnieper terrace are stratigraphic terraced equivalents. The author connected the hydrographic network of the Dnieper glaciation area and the periglacial zone with the Ryss glacier and its retreat stages (Sobolev, 1933).

Much attention in the period under review was paid to studies of modern physico-geographical processes, in particular, blatt flaws, karst, erosion, waterlogging and, accordingly, the forms of the relief formed by these processes.

Karst processes that are mainly associated with Torton (Baden) gypsums on Podillya, and in the Polissya with chalk deposits, were thoroughly researched by A. Malysky (1938). According to the author, on the Pokutsk Podillya, which is the southern part of Podillya on the right bank of the Dniester, stands out among the tertiary sediments. The history of exploration and geological conditions of carstified territories is described. The structure of layered gypsum is characterized. It is noted that gypsum formations are characterized by horizontal and vertical fractures and cleavage cracks through which water circulates. As a result of the destructive effect of water, cracks turn into cavern and other karst forms. The description of the morphology and genesis of karst forms is made. It is noted that the karst of Pokutsk Podillya is at the primary stage of its development (Malicki, 1938). Another author's article (Malicki, 1937) describes doline as the main element of the karst landscape of Pokutsk Podillya.

Even earlier (1931), V. Nechai, on behalf of the Lviv State Committee for Nature Conservation and the Central Administration of the Podillya Tourist and Regional Studies Organization in Ternopil, investigated in detail gypsum caves in Kryvche in

Ternopil region (Nechaj, 1931; Nechaj, 1933). According to the author, numerous gypsum caves are known in the vicinity of Zalishchyky and Borshchiv, the largest of them in the area of the village of Kryvche Verkhnee. The thickness of gypsum deposits here is about 35 m. Their stratigraphic confinement is Tertiary deposits. The author investigated a number of caves (grottoes) located both in the gypsum layer and in the lithothamnium limestone occurring above the gypsum. The caves are described with sufficient detail: their indicated hypsometric level, presents data on the shape and size, structure, cave formations etc. On the daylight surface there are doline. According to the author, caves in limestone and gypsum formed as a result of erosion and removal of material by atmospheric waters, penetrating deep into rocks through cleavage cracks. An important role in this process was played by the melting of the ice of the last glaciation. The presented plan of the caves and the proposed names of many halls. Shortly after the completion of these works, the Kryvche Cave was organized and open to tourists.

R. Flesharova (1933), describing the caves of Poland, characterizes the Podillya-Pokutsk and Volyn tectonic zones (Fleszarowa, 1933). E. Ryle, S. Pavlovsky and B. Krygovsky are explained by the karst processes of the origin of lakes, ravines, valleys in the west of Volyn Polissya (Krygowski, 1934; Pawlowski, 1930. T. VIII; Rühle, 1935).

The well-known Ukrainian-American geologist I. Oleksyshyn studied the surface karst phenomena in Podillya (Oleksyshyn, 1938). He notes that karst phenomena on the Podillya are developed mainly within the distribution of gypsum and are divided into two groups: 1) “vikna” are dolines, constantly filled with water and 2) saucer-shaped depressions, which are filled with water during heavy rains or melt water, and also extensive lowering of the territory, these are “poplavy”, often swamped, in which there are groups of dolines measuring 2–200 m in diameter. In addition, a decline is observed with many lakes, marshes and wet meadows. In the south of Podillya, where the thickness of gypsum reaches 40 m, karst phenomena are represented by caves, which are almost not distinguished in relief.

S. Malkovsky (Malkowski, 1930), who studied the Polissya marshiness, he concludes that it is caused by both general and local causes. The general character is due to the flat topography of the whole territory, the local one is due to the delay in the flow of surface water in some areas. In Polissya, drainless areas are located among the chains of dunes located parallel to the directions of most river valleys. This is of practical importance for solving problems of gradual amelioration regardless of river regulation.

In addition to the above characterized processes in the study period, there were also numerous publications of soil scientists, in which Quaternary sediments are considered as source rocks on which soils were formed, the dependence of the soil type on the lithology of the underlying rocks is established. The problems of the structure and genesis of the soils of Volyn and Podillya are, however, a separate subject of research and have not been considered in this article.

Conclusions. Even such a rather cursory consideration of the problems of geomorphological research and the study of the Quaternary deposits of Volyn- Podillya during the interwar period makes it possible to identify certain positive features of them, in particular:

- the appearance of works in which the first attempts are made to generalize and systematize the rich factual material accumulated by previous studies;
- application in the study of Quaternary sediments not only purely descriptive, visual methods, but also laboratory studies, spore-pollen analysis for the dismemberment of glacial deposits, chemical and mineralogical analysis of loess, etc.

- widespread use for stratigraphy of Quaternary paleontological remains and archaeological artifacts;
 - use in the study of the relief of special geomorphological methods, cartographic material, etc.;
- an integrated approach to the study of glacial deposits and land relief forms.

The disadvantages of geological and geomorphological studies carried out during the interwar period should apparently be considered as their inconsistency and fragmentation, lack of systemicity in the study of individual territories, the dominance of the morphometric method, and a certain underestimation of lithological and biostratigraphic studies of newest continental deposits.

From the scientific results of this period can be identified:

- the appearance of the first fairly well-founded schemes of geomorphological zoning of the Podillya in general and of Opillya in particular;
- the establishment of a clear conditionality of the morphological features of the relief of the territory by the geological structure, the latest tectonic processes and the continental anthropogenic glaciation;
- thorough studies of loess deposits, in particular, Yu Polyansky, Yu. Tokarsky, S. Biskupsky and others. (dismemberment of loess strata, mechanical, chemical, mineralogical, petrographic composition, genesis);
- conclusions on the role of glacial deposits in the formation of the Volyn-Podillya relief, frequency and boundaries of individual glaciers, climatic conditions of interglacial eras;
- significant progress in the study of the morphology and genesis of surface and subsurface karst forms in the sulphate sediments of Podillya and Pokutsk, the appearance of cartographic schemes of individual caves, preparing them for tourist excursion use, etc.

It should be noted, however, that the complex of geological and geomorphological studies of Polish and Ukrainian scientists carried out during the interwar period laid a solid and reliable basis for modern concepts of stratigraphy, lithology, paleontology of Quaternary deposits, and features of the surface relief of the Volyn – Podillya region.

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