PHASES OF ALLUVIATION AND COLLUVIATION IN THE EZOUSAS RIVER VALLEY (SW CYPRUS)

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Cyprus is located in the eastern part of the Mediterranean Sea This area is characterized by high neotectonic activity with the uplift rate of Paphos region about 0.35-0.39 mm/year during the Upper Pleistocene [10]. The study area covers the Ezousas river basin. The spring of the river is located in the Troodos Mountains and the estuary in the Mediterranean Sea, some kilometers eastward from the Paphos city. The river cross two main geological units ranging from igneous rocks in its upper section (Troodos Terrane) to sedimentary rocks in its middle and lower sections (Circum Troodos Sedimentary Succession) [3].

The aim of study was to investigate the age and sediments of terraces and floodplains in Ezousas river valley [1], [4], [5], [6], [7], [8]. The geologic and geomorphologic mapping of various terrace and flood plain levels were carried out along the Ezousas river valley from the sea to the spring. Dating of alluvium by TL method was conducted in the Scientific-Didactic Laboratory of the Institute of Geography and Environmental Sciences of Jan Kochanowski University in Kielce.

Depending on the section, different terrace and floodplain levels can be distinguished. Erosion-accumulative terrace about 30.0 m above river level (a.r.l.) and floodplain 0.3 m a.r.l. occur in the upper section. It had been dated to 53.3±8 ka and to 19.7±2.9 ka, respectively. Characteristic feature of alluvium in this section is large part (up to 24%) of none-rounded grains (colluviums) transported from the rockwalls and steep slopes of the valley. In the middle section accumulative levels occurred [7]. The highest level of 2.6 m a.r.l was described as Holocene alluvia (Sequence EZG). The grading lower unit of this series with a sherd dated to 1300 AD was accumulated in 4 phases with variable velocity of the stream. The poorly sorted structure of the upper unit above was a result of a single flood event. After the flooding, the river deposited overbank sediments in the top of outcrop [2]. Colluvium 1.0 m a.r.l. has been dated to 63.2±9.5 ka. Alluvial plain 0.5 m a.r.l. has been dated to 13.6±2.0 ka. Subsequent four sites were situated on the same high 0.2 m a.r.l. and alluvium were dated to 63.1±9.5 ka, 42.6±6.4 ka, 37.0±5.6 ka and to 2.35±0.35 ka. Two dates occur from the lowest level about 0.1 m a.r.l. The remnant of older series exposed in the valley floor was dated to 406.0±61.0 ka [7]. The sample was under the boulder which fell down from the nearest rockwall probably during the earthquake was dating to 28.6±4.3 ka [6], [7], [8]. Alluvium in this section are finer almost without colluvium part [7]. In the lower section of the Ezousas river valley, the highest erosion–accumulative terrace on limestone monocline is 30.0 m a.r.l. Two alluvial series in superposition occurred here. The upper one, about 5 m thick, is dating to 18.9±2.8 ka very similar to landslide block at 25.0 m a.r.l. of this alluvium - 22.4±3.4 ka. The lower series at 26.5 m a.r.l. was dating to 57.4±8.6 ka. Next were located on accumulative levels. Terrace 11.0 m a.r.l. was dated to 57.9±8.7 ka and level about 2.5 m a.r.l. to 64.8±9.7 ka. Flood plain levels about 1.2 m a.r.l. and 0.2 m a.r.l. were dated to 22.3±3.3 ka and to 16.1±2.4 ka respectively. The thickness of the Pleistocene alluvium cut and fills is bigger than in the middle and upper reaches [7]. The. Holocene sediments (Sequence EZA) are also described in this section. Alluvium from the Roman period (1.5 m a.r.l.) were covered by Roman and Medieval colluvium 2.5 m thick [2].

In the Ezousas river valley there were very strong alluviation in the Pleistocene and small one in the Holocene [7]. Two main alluviation phases can be distinguish: 75-48 ka and

25-13 ka (Fig. 1). There is no geological data about increased neotectonic movements in these phases [10]. Therefore, an increased alluviation in Cyprus have been probably associated with climate change. Similar fact is also confirmed in the valleys of SE Poland [13]. In both phases the correctness of the increase in the number of dates along the course of the river occurred. This is caused by a clear intensification of the erosion process in the mountain section of the river, where few alluvial covers have been preserved and a distinct alluviation (accumulation) in the middle and lower sections.

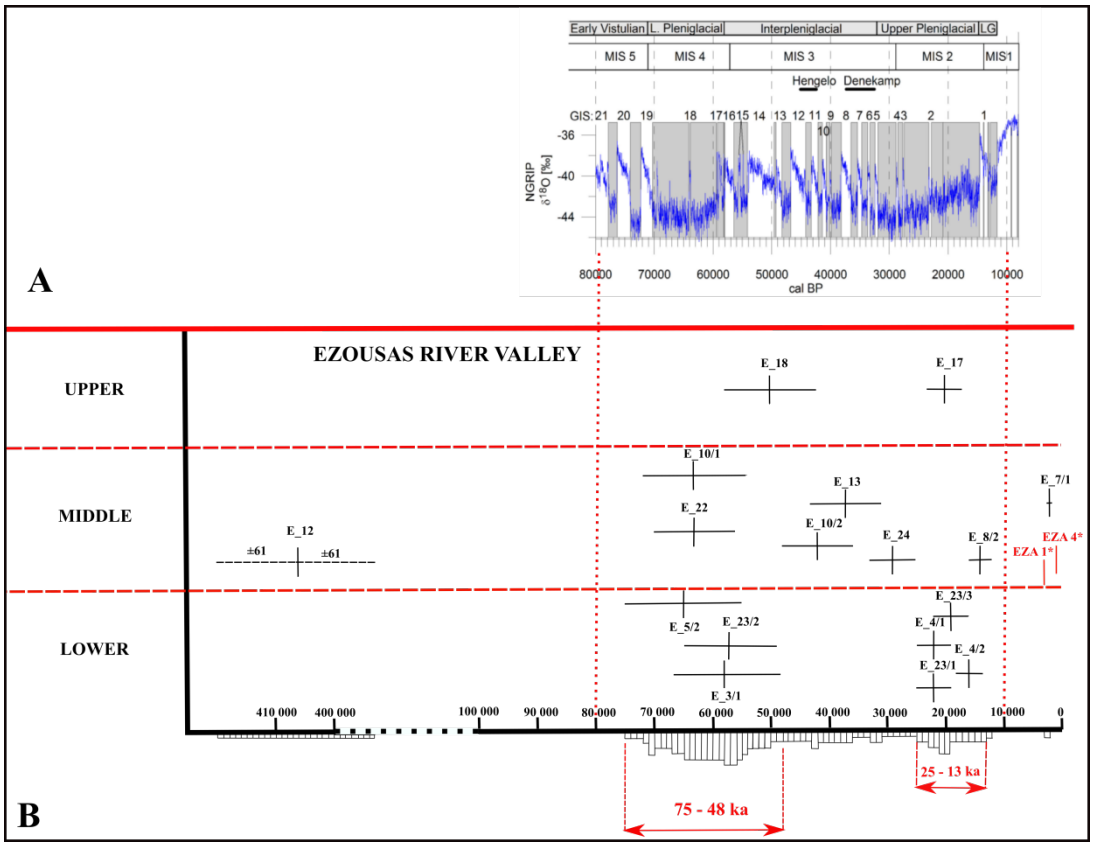

Figure 1. A: Greenland ice core records [9], **B:** TL records from Ezousas river valley

The results of mineralogical and petrographic analysis show compliance with the geological map units. Petrographic analysis of geological outcrops and gravels from alluvia made it possible to determine the place of alimentation of clusters in the riverbed [6], [7]. The maximum confirmed transport length in the Holocene was about 7 km. This confirms the small role of fluvial transport in the Holocene, which is consistent with data obtained from TL/OSL dating, hydrological data and measurements of present-day fluvial processes [4], [7]. Relief and the varied tectonic movements had a great impact on the Ezousas valley formation and alluvial features. The number of colluvium in alluvium decreases with the length of the river. The high rate of Cyprus uplift caused that in the upper, mountain section the rate of river incision in the period of 60-20 ka was about 30 m. However, in the wider, middle section located in front of the Troodos Mts. within the sedimentary margin of these mountains, the cut and fill of different age (400-2 ka) are located at almost one morphological level. Only the Medieval cut and fill is about 2 m higher, but the aggradation of this period probably did not cover the entire bottom of the valley, only a fragment of the alluvial braided plain. In the lower section, the river crosses the tectonic horst, which was uplifted about 30 m during the last 20 ka. Two alluvial series (57 ka and 22-19 ka) rest on it (Ezousas 23 site) in superposition. Uplift the lowest section of the valley crossing maritime terraces can be estimated at about 11 m during 60 ka. An accumulation of the great landslide in the dry

riverbed near Episkopi was probably triggered by earthquake, very frequent in Cyprus. It took place about 28.6 ka (Ezousas 24 site) [6], [7], [8].
Two phases of an increase of mass movement activity occurred [7]. First one, in the middle section was connected to the Interpleniglacial climate when the colluvium member was dated to 63.2 ka and was accumulated on alluvium. It is same period as older, alluviation phase. Second colluviation phase, only in the lower section was triggered by human impact and it was dated to the Roman period and Medieval time.

ACKNOWLEDGMENTS
The study is a part of Agora Paphos Project financed by The National Science Centre: grant NCN MAESTRO 2014/14/A/HS3/00283 "Agora oraz infrastruktura i aktywność gospodarcza Pafos, stolicy hellenistycznego i rzymskiego Cypru na podstawie badań interdyscyplinarnych"

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