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Slope deposits as an indicator of anthropopressure in the light of research in Central Poland

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ABSTRACT

Results of research on Neo-Holocene slope covers uncovered at archaeological sites in Central Poland are described in this paper. Geoarchaeological investigations have been undertaken in the Ner River basin. Distinctive archaeological relicts of human activity document periods of intensive activity of human societies. Artefacts included within deposits play a very important role in correct recognition of the chronology of covers and ecofacts for reconstructions of environmental evolution. The origin and development of slope covers have been correlated with anthropogenic changes of the natural environment. Two main phases of acceleration of slope processes have been recognised, dated to the Middle Bronze Age and to the Late Roman Period. Slope deposits have been classified as deluvia (deluvial, slope wash deposits or colluvial deposits). Their features are most typical for "deluvial sands" and, if they contain more humic matter, for "soil deluvia". The deluvial covers have been deposited as an effect of moderately intensive slope wash processes. Accumulation of slope deposits has resulted from natural processes initiated by human impact during periods of intensive settlement and economic activity. The slope cover sediments are the source for recognition of intensity of human impact and of economic activity of ancient societies, and for distinct phases of hiatuses of settlement development. The possibility of archaeological and palaeogeographical interpretations based on research on slope covers at archaeological sites is presented.

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1. Introduction

Slope deposits are often uncovered during geological and geomorphological (e.g. Dylik, 1969; Wieczorkowska, 1976; Stochlak, 1978; Klatkowa, 1989; Twardy, 2000, 2004; Turkowska and Dzieduszyńska, 2011; Twardy and Forysiak, 2012) as well as archaeological research in Central Poland (e.g. Kittel and Twardy, 2003; Twardy et al., 2004; Dziubek and Twardy, 2007; Kittel et al., 2011; Twardy and Forysiak, 2011). Processes relevant to slope erosion were potentially working on the unvegetated slopes, because inclined surfaces devoid of plant cover are very sensitive to slope wash and mass movement processes. Deforestation results from natural, mainly climate, changes and from human (land-use) impact, and phases of activity of slope processes are connected with cold climate periods and with periods of increases of human economic activity. Slope wash processes seem to be particularly active in periods of reduced vegetation cover, resulted from climate changes (cooling of climate) and environmental changes connected with human activity, and in some periods both factors are in coincidence (see: Starkel, 2002, 2005, 2011; Sinkiewicz, 1998; Teisseyre, 1991; Stochlak, 1996; Schulte and Stumböck, 2000; Zolitschka et al., 2003; Smolska, 2005; Leopold and Völkel, 2007; Dotterweich, 2008, 2012; Twardy, 2008, 2011; Szwarczewski, 2009; Dreibrodt et al., 2010, 2010a). Phases of climatic origin of intensive slope processes have been correlated with the termination of the Late Weichselian and Early Holocene (Eo-Holocene) (e.g. Borówka, 1992; Andres et al., 2001; Leopold and Völkel, 2007; Dreibrodt et al., 2010a). Phases of human origin have been recognized for Middle and Late Holocene (Meso- and Neo-Holocene) and they are correlated with intensive settlement and economic activity since the Neolithic or the Bronze Age in Central Europe (e.g.: Stochlak, 1996; Sinkiewicz, 1998; Zolitschka et al., 2003; Dotterweich, 2008, 2012; Smolska, 2005; Starkel, 2005; Twardy, 2008, 2011; Dreibrodt et al., 2010, 2010a).

It is necessary to underline the problem of terminology and typology of slope processes and slope deposits. In Polish scientific literature, the slope sediments are divided into: "colluvia" as a result of mass movement, "deluvia" – deposits relative to slope wash processes, "proluvia" from gully erosion, and "tillage diamictons" as

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an effect of anthropogenic denudation (Stochlak, 1978, 1996; Starkel, 1987; Teisseyre, 1991, 1994; Twardy, 2003, 2008; Smolska, 2005). The term "deluvium" used in this paper was introduced by Pavlov (1888) and is common in Polish science. Deluvium is a synonym of "slope wash deposit" or "slope alluvium", "wash-out slope deposits" (Mycielska-Dowgiałło and Ludwikowska-Kędzia, 2011) but it is also called "colluvium" (Leopold and Völkel, 2007; Dotterweich, 2008; James, 2013), "colluvial sediments" (Leopold and Völkel, 2007), "colluvial deposits" (Zolitschka et al., 2003) or "colluvial layer" (Dreibrodt et al., 2010). The most typical textural and structural and as well some geochemical features of deluvial deposits have been characterized in detail by Stochlak (1978), Twardy (2008) and Smolska (2005, 2008) based on examples from Polish Lowlands.

In this paper, results of research on Neo-Holocene covers of slope deposits are described from the Lutomiersk-Koziówki, Kolonia Bechcice and Wierzbowa sites (Fig. 1) as an outcome of multidisciplinary geoarchaeological investigations undertaken in the Ner River basin during recent years. Geoarchaeological analyses as a part of environmental archaeology research have been put together during archaeological excavations at sites in the investigated basin (Dziubek and Twardy, 2007; Kittel et al., 2011; Kittel, 2012a). They have continued at a dozen archaeological sites constituted by remains of prehistoric settlements intensively occupied since the Bronze Age until the Roman Period or the Middle Ages. Discovered at most of the investigated sites, slope deposits cover moderately or even low inclined surfaces, which limited sites and previous settlements. The possibility of archaeological and palaeogeographical interpretations based on research on slope covers at archaeological sites will be presented.

2. Regional setting

All sites and micro-regions are located in Central Poland in the northwestern part of the Łódź region (Turkowska, 2006). The last ice sheet was present in the study area during the Saalian Stage glaciations, i.e. Odranian Glaciation, the Wartanian Cold Stage in Polish stratigraphy after Marks (2011) and Lindner and Marks (2012). The closest position of the Weichselian ice sheet front existed about 20 km to the north during the Last Glacial Maximum (LGM) (Turkowska, 2006; Roman, 2010). Intensive transformation of river valleys took place in the Weichselian periglacial environment. Two or three terraces have been documented in river valleys in the Łódź region (Turkowska, 1988, 2006; Petera, 2002; Wachecka-Kotkowska, 2004; Forysiak, 2005; Turkowska and Dzieduszyńska, 2011). The "sandy landscape" as a part of the so-called by Zeeberg (1998) European sand belt is characterised by sandy terraces, which are exposed not only to aeolian, but to slope processes as well. These river terraces have been recognized as a most suitable landscape component for location of prehistoric and early historic settlements in Central Poland (Kurnatowski, 1966; Bartkowski, 1978; Goździk, 1982; Kobyliński, 1988; Kamiński, 1993; Kittel and Skowron, 2009; Makarowicz, 2010; Kittel et al., 2011; Kittel, 2012a).

The micro-region of Bechcice–Lutomiersk is situated ~10 km west of Łódź at the Łask Plateau (Kondracki, 2002) and in the Ner River valley (tributary of Warta River) near Lutomiersk. In this part of the Ner River valley, a dozen archaeological sites have been discovered (Muzolf, 2012a). The research has been focused on two interesting archaeological complexes and their environment: Lutomiersk-Koziówki site no. 3a–c and Kolonia Bechcice site no. 1.

The site at Lutomiersk-Koziówki (N 51°45′15″, E 19°13′31″, 153.5–159.0 m a.s.l.) is situated in the southern part of the Ner River valley, near the mouth of the small stream Zalewka (Wrząca) River. The site has been established on the surface and slightly inclined (less than 3°) side slope of a fragment of the high terrace (Fig. 2: site no. 1). The alluvium of high terrace, as well as basal substratum geology of the site, is formed mainly by clastic medium- and coarse-grained sands. These sediments have been accumulated as an alluvial fan of the Zalewka River in the Pleniglacial of the Weichselian (Plenivistulian), documented by appropriate thermoluminescence (TL) dates between 23.3 and 22.9 ka (Kittel, 2012b, 2012c). The high terrace was cut by large meanders of the Ner River in the Late Weichselian (Turkowska, 1988).

The site is located on a terrace bordered from the eastern side by the valley floor of the Zalewka River and from the western side by an artificial valley floor of the second branch of the same stream. In the northwest part, the terrace remnant is cut by large

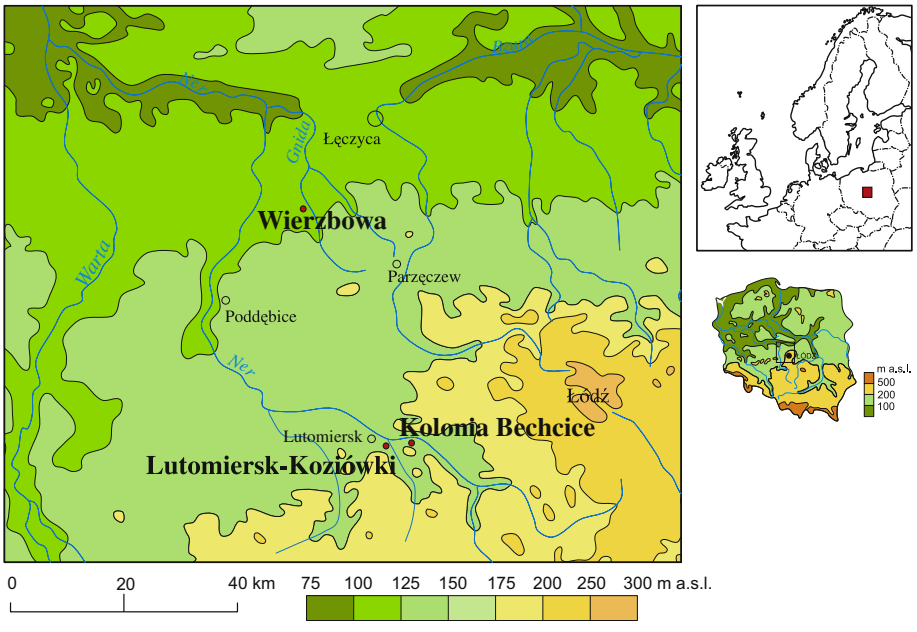

Fig. 1. Location of sites.

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