

Session title: HUMAN IMPACT ON LOWLAND, UPLANDS AND MOUNTAINS GEOSYSTEMS- SIMILARITIES AND DIFFERENCES II

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Time: Saturday morning

Room:

Session abstract:

The first session on the “Human Impact on Lowland, Uplands and Mountains Geosystems: Similarities and Differences” at the annual meeting of the EAA in 2006 in Cracow was very successful. The papers presented there are collected in two volumes and they will be published in 2008/2009. The main topic of the past and present sessions is the relationship between human activities and lowland, upland and mountain geosystems.

Zonality and vertical zonality of the environment are the main features of global diversity of the Earth. However, the relief induced significant differences in the structure and dynamics between lowland, upland and mountain geosystems within the same geographical zone. The good example of this differentiation is Central Europe: glaciated areas of European lowlands with favourable relief and climatic conditions but with pure soils etc; limestone uplands with loess cover and best soils etc; Hercynian and Alpine mountains with intensive morphogenetic processes and vertical zonality. This geobiodiversity of the European environment caused diachronic processes of human activity and joint geosystems to converge.

The aim of this session will be to compare lowland, upland and mountain geosystems under anthropogenic stress, in particular to explore:

- 1) The differences and similarities between human activities in the lowland, upland and mountain geosystems
- 2) The relation between settlement pattern and geosystems on regional and local scale
- 3) Time (delay) and force of reaction of geosystems to human impact

Paper abstracts:

CHANGES OF VEGETATION AND PALAEOENVIRONMENTS UNDER EARLY FARMING IN THE WESTERN PART OF THE PRIPYAT POLESIE (BELARUS)

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The study area is located between the Bug and Pripyat rivers. According to archaeological data humans lived here since the Final Palaeolithic and Mesolithic. Several major stages of vegetation changes due to agricultural impact were revealed. The first stage (first appearance of cultural cereals) was detected by registration of single grains of *Cerealia* and *Triticum* in pollen spectra. The second stage (further development of primitive agriculture, appearance and expansion of rather developed cereal farming) was recognized by continuous rise of cultivated land indicators in pollen diagrams (*Cerealia*, *Triticum*, *Secale*), and by appearance of specific weeds. The third stage (developed arable agriculture) was revealed by the obvious evidence of vast forest clearance and by steady rise of curves of land cultivation pollen indicators, as well as by remarkable changes in lithological features of sediments.

Analysis of pollen data derived from various sedimentary archives enabled the recognition of the stages of appearance and expansion of cultural plants. Lacustrine deposits (Bobrovichskoe, Dvorishchanskoe, Seliahi, Peschanoe profiles) and bog deposits (Zditovo, Ivanisovka profiles) were investigated for this purpose. This research was carried out with financial support from the Belarusian State Foundation of Fundamental Researches (grant X03MC-007).

Stage I. The first grains of *Cerealia* and *Triticum* pollen are noted in the middle of the Atlantic period between 6.0 and 5.0 ka BP (at 6280 and 5000 yr BP in Dvorishchanskoe; at 6230 yr BP in Bobrovichskoe, Zditovo, Ivanisovka, Peschanoe). During this time interval corresponding to the early and middle Neolithic the region was inhabited by the bearers of the Niemen culture.

Stage II. Rise of *Cerealia* curve in pollen spectra, presence of *Triticum* and *Secale*, appearance of pollen of specific weeds indicating land cultivation are consistent with the period between 5.0 and 3.0 ka BP (at 4370 yr BP in Ivanisovka; at 3600 yr BP in Dvorishchanskoe; at 3450 yr BP in Bobrovichskoe). The stage corresponds to the late Neolithic (the Niemen culture) and to the beginning of the Bronze Age (the Trzciniac culture).

Stage III. Marked increase in the contents of pollen of weeds, *Betula*, pioneer shrubs and ruderal communities, as well as of pollen indicators of cultivated lands are noted in the Iron Age (the Velbar culture) approximately 2000 years ago (at 2200 yr BP in Ivanisovka; at 1900 yr BP in Dvorishchanskoe). In the Iron Age layers cultural pollen occurs in all the regions of the Pripyat Polesie.

Human impact on vegetation and environment in the Neolithic and Bronze Ages is detectable mainly within the areas of the most fertile soils. The most intensive influence, which is registered in pollen diagrams as well as in structural and textural features of sediments, was connected with active deforestation and vast expansion of

arable agriculture. This phase dates to the historical period (700 yr and 410 yr BP in Bobrovichskoe).

TRACES OF HUMAN ACTIVITY IN THE SEDIMENTS OF NAREW RIVER VALLEY BOTTOM IN THE VICINITY OF LOMŻA

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Narew river valley in the vicinity of Lomża is the gap part of the valley linking the Wizna Basin with Piątница one. The river valley bottom is located some 30-50 meters below the surrounding morainic plateaus and is filled with alluvial sediments. Both the valley bottom and surrounding slopes were very attractive for the prehistoric and historic settlers. The oldest traces of the human activity were dated for 9th millennium BC. In the vicinity of Drozdowo and Rakowo there are some findings dated to the 3rd century BC – they are located mainly on the edge of the river valley and are connected with the activity of the Neolithic cultures (generally in the beginning of agriculture development in this area). The other strong agriculture development is connected with the periods from 13th/12th century BC to 3rd century AD and from the 9th to the 13th centuries but it was usually on a local scale. The areas that were colonized by the settlers were separated by the unsettled ones. In the 14th century and especially from the 16th to the 18th centuries new colonization commences accompanied by intensive development of agriculture activity. The forest/timber industry also developed in these periods.

Geomorphological, sedimentological and pedological response to the human activity is connected with the erosion processes on the slopes in the vicinity of the Narew river valley. The main effect of the deforestation (at the very beginning local and later at advanced scale) were the development of the slope wash erosion in the edge part of the valley and formation of alluvial fans built of colluvial (deluvial/proluvial) sediments covering the Narew valley bottom. The madas, common in the valley bottom, are connected with the latter phases of the human activity and are mainly due to the agriculture development on the vast part of the middle Narew river basin. It is especially visible in the changes of textural features of the sediments (i.e. loss on ignition, mineral/organic matter content) and trace elements contents (i.e. last few centuries impact due to the industry development), reaching the background values in the bottom parts and clearly increasing in the top part of the analyzed exposures.

FOURTEEN CENTURIES OF ANTHROPOPRESSION NEAR STRONGHOLD NASIELSK AND ITS RECORD IN SEDIMENTS OF NASIELNA RIVER VALLEY

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In the valley of Nasielna river in Nasielsk (50 km north of Warsaw) there are remains of an Early Medieval stronghold. Written sources from the 11th to the 13th century inform that Nasielsk was a local administrative centre (castellani).

Detailed archaeological studies in the stronghold and its vicinity were carried out in 1967 and between 2001 and 2006. According to the results of the dendrochronological examinations of the wood samples from the oldest and the youngest phases of the rampart, the date of use of the stronghold can be defined as between the mid of the 9th century and the second half of the 13th. The stronghold and the neighbouring settlement were probably abandoned in the second half of the 13th century. In 1386 on the left bank of the river, the town of Nasielsk was founded.

The main aim of this study was to recognize the morphology and geology in the vicinity of the medieval stronghold and the relation of the textural features of the sediments with the human activity that took place in the past (from ca. 7th century to 21st century). Various, interdisciplinary methods were employed to solve these problems.

Facial differentiation of the organic sediments in the Nasielna valley bottom points out for repeating operation of mill ponds in this area. Geological drillings and sedimentological analyses proved functioning of at least five chronologically independent artificial ponds – two of the well expressed gythia levels has been radiocarbon dated giving the dates as follows 860±105 BP (990-1310 cal AD, 1360-1380 cal AD, IGSB-1264) and 1010±90 (822-838 cal AD, 868-1244 cal AD, IGSB-1263). The written sources indicate for the water mill ponds in this part of the river valley from the XIV century. Archival topographic map also document the presence of few water mill ponds from XV to XX century. In 2004 during excavations in the valley of Nasielna, the bridge to the water mill, and a mill stone were discovered. Dendrochronological dates of this remains, proves functioning of the water mill in 15th century. The palynological data prove human presence since the beginning of organic matter formation; it has started accordingly to received date some 1470±75 BP (822-838 cal AD, 868-1244 cal AD, IGSB-1262).

HUMAN IMPACT ON TRANSFORMATION OF DUNES FROM NEOLITHIC AGES TO THE EARLY MEDIEVAL AGES - EXAMPLES FROM THE LOWER VISTULA RIVER VALLEY (NORTH POLAND)

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We present two examples of geoarchaeological study results of the human impact on the transformation of eolian relief in the Lower Vistula river valley. They focus on the evolution of dunes formed by the natural processes in the Late Glacial period. Later on, their transformation depended on the anthropogenic activities in the times from Neolithic Ages to the Early Medieval Ages.

The first case study shows changes of the dunes in Kępa Kujawska near Toruń based on sedimentological and luminescence dating research (Oczkowski et al. 2002). We established four phases of the dune transformation by the eolian processes courses by indirect human activity: (i) Atlantic Period - Globular Amphora Culture, (ii) Subboreal Period – Lusatian Culture, (iii) on the turn of Subboreal and Subatlantic Periods – Hallstatt, (iv) Subatlantic Period – Early Medieval Ages (IV phases). Eolian processes were caused by deforestation of the Toruń Basin and the Cujavian Lowland.

As the second example, we present the direct human impact on the dune alterations. Anthropogenic activities caused the rebuild of dunes in the early medieval settlement complex in Kałdus near Chełmno (Chruścinska et. al. 2004, Przegiętka et. al. 2005). We determined three phases of anthropogenic rebuild of the dune: (i) Atlantic Period - Globular Amphora Culture - erecting a small dike on the top of the dune, (ii) on the turn of Subboreal and Subatlantic Periods – building the defence dike with the settlement of the Lusatian-Pomeranian Culture, (iii) Subatlantic Period – building the St. Laurence Mountain in the Early Medieval Ages.

These two examples of the dunes transformation complement one another and represent the human influence on the eolian relief changes in the north of Poland. But they differ in the reasons of the alterations: the first one on the indirect human impact i.e. cutting the forest down, the second on the direct activity of humans. But in both cases the changes caused environmental transformations.

THE EXAMPLES OF BRONZE AGE HUMAN IMPACT ON NATURAL ENVIRONMENT ON TWO ARCHAEOLOGIC SITES IN CENTRAL POLAND

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The paper presents results of multidisciplinary research (project Nr I H01H 025 30 realized in 2006-2008) on the environment of two prehistoric settlements dated to the Bronze Age and Iron Age and located in Central Poland – Wierzbowa and Bechcice. The analysis includes: archaeological research, lithology of sediments, palaeobotanic (archaeobotanic – i.e. pollen, plant macrofossils and antracologic) and geochemistry

analysis. Some probes of organic sediments have been dated by radiocarbon method. A part of the deposited layers have been dated by archaeological method.

In archaeological excavations in Wierzbowa site we have uncovered, during archaeological excavations undertaken on a large scale, two or, in other places, three cultural layers. The cultural layers were deposited within the slopewash sediments accumulated close to the small stream valley. The higher cultural layer has been dated to the Latene Period and the Roman Period, and the lower cultural layer has been dated to the Bronze Age and Hallstatt Period. The beginning of accumulation of the lower cultural layer had been estimated on ca. 2000 BP. We have not observed any factors providing any important changes in sediment processes of slopewash sediments in prehistoric times. The elaborated slope in Wierzbowa was under prehistoric human impact almost from the Middle Bronze Age Period.

In Behcice, the settlement of Lusatian culture has been discovered - Behcice, site I - dated on 3rd - 5th Bronze Age Periods and Early Iron Age. The main aim of georchaological and archeobotanical research in Behcice site (near Lutomiersk) has been the fills of palaeochannels discovered in valley flood plain of Ner River. During the study the uncovered bedding and covering sediments of subfossil river palaeochannel have been undertaken. The beginning of the filling of the channel in Ner River we can correlate with the period about 1340-1150 BC and in the bottom of fillings deposits we have recognized fragments of pottery of Late Bronze Age Period and Hallstatt C Period. In the palaeochanel fillings we have undercover the archaeobotanic factors showing the broad range of deforestation in the close vicinity of site, probably connected with bronze metallurgy activity in those periods.

SIGNIFICANT LASTING FREQUENTATION SINCE ROMAN TIMES AT THE MEDIEVAL ZAWODZIE ARCHAEOLOGICAL SITE (KALISZ, GREAT POLAND): NEW EVIDENCE FROM RADIOCARBON DATING

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The ongoing research on the well known medieval stronghold of Zawodzie (southern outskirts of Kalisz, Great Poland) yielded new results of some concern for assessing both the chronology of the most ancient anthropic layers and the timing relationships between frequentation/settlement/expansion phases and the climatic pattern of the region. Concerning the first issue, based on the scant findings brought to light by systematic excavations (particularly worth of mention a *terra sigillata* potsherd) the Authors that half a century ago pioneered in the archaeology of the fortified settlement hinted that the first prolonged frequentation/occupation of the site could be backdated to the Roman times. The ¹⁴C reading of 250-410 cal AD, yielded by a wooden-pebbly structure found in the deepest anthropic layer of the site and referred to a relict of river embankment against flooding is a sound prove that the site has been enough stably occupied at the times of the Late Roman Empire. Furthermore, the wooden remnants uncovered in a distinct trench and referred to the first phase of the fortification of the

medieval settlement have been dated at 770-950 cal AD, in fair stratigraphic and archaeological coherence with the findings in the overlying layers. By considering the rich data set available, it resulted that the timing of both the occupation in Roman times and the first settlement fortification development is bracketed within large-scale, cold-dry, almost flooding-free climatic phases which have been recorded in Poland as well as throughout the Mediterranean area.

DELUVIAL SEDIMENTS AND ALLUVIAL CONES FORMATION AS THE EFFECT OF HUMAN ACTIVITY ON THE LOESS PLATEAU (AN EXAMPLE FROM THE CHROBERZ AREA, NIDA BASIN, LITTLE POLAND UPLAND)

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Widely conceived pressure caused by human activity usually interferes with natural transformations (e.g. climatic ones) and therefore the record indicating the existence of these two groups of factors in the natural environment has a hybrid character, and is troublesome and difficult to separate. The research in the area of Chroberz had an interdisciplinary character and comprised geomorphological, sedimentation and archaeological-historical problems. The main aim of the study was to identify geomorphologic response to changes in natural environment that took place in the area of the loess plateau (and its close vicinity) as a result of its settlement by man and of climate change.

At the outlet of eroded forms coming down the Wodzisław Hummock to the Nida river valley alluvial (alluvial-deluvial) cones were formed. Two of them are situated close to each other and the area of each exceeds 1 sq km. The first one (the northern one) located near the locality of Młodzawy, is formed at the outlet of a dry, large flat-bottomed valley. The other (the southern one) situated near the village of Mozgawa is connected with Nida's small right tributary, the Mozgawka. The alluvial cones-building material volume is many times smaller than the size of eroded forms which allows one to conclude that the valleys are older than the cones. Probably, at their initial formation stages part of the material may have been transported directly to the Nida river bed. In the very beginning of the Holocene the tiniest fractions of the sediments may have been transported in suspended matter at considerable distances and may have accumulated away from the 'today's' cones.

Slopefoot and alluvial cone areas were identified by a dense network of shallow (1-3 m) and deeper (to 11 m) probes and drillings. The age of organic sediments found below deluvia and aluvia, was determined by radiocarbon method (datings have been done in the Kiev Laboratory), and it enables the determination of primaeval and historic soil erosion and the rate of progradation of examined alluvial cones. The received radiocarbon age fits very much the archaeological data available for this area.

ANTHROPOGENIC PHASES OF DUNE FORMATION IN HOLY CROSS MOUNTAINS (CENTRAL POLAND)

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Holy Cross Mountains (Góry Świętokrzyskie) are the only mountain region in Poland where numerous dunes were formed. Dunes were formed in river valleys on Pleistocene terraces, within plateaus; some of the dunes entered river valleys and by obstructing flow created dammed lakes or peat bogs.

In the dunes of this region no late Pleistocene fossil soils were discovered so far. It is probably due to fact that at such high altitude a.s.l. vegetation during Bölling and Alleröd interstadial warmings was too modest to stabilize dunes. The oldest dunes could have been formed throughout all Late Vistulian and early Preboreal. Improvement in climatic conditions in the Preboreal, with resulting expansion of forests, inhibited aeolian processes and development of soils on dunes.

The second period of dune formation fell in the Holocene. Charcoal, common in fossil soils, as well as artefacts observed in some soils, provide evidence that the Holocene phases of dune formation are related to human activity. Fire farming, commonly adopted at that time, caused local destruction of vegetation cover and momentary stimulation of aeolian processes. Such processes were not synchronous – in different dunes they started in different periods. Radiocarbon dating of the Holocene fossil soils indicate that anthropogenic phases of dune formation fell on the Preboreal, Atlantic, Subatlantic and historic times.

The oldest fossil soil containing charcoal encountered in the dune was dated 9910 ± 100 years BP, which provides evidence for the start of aeolian processes by fire in Preboreal. Another fossil soil containing charcoal was dated 5500 ± 490 years BP, which provides evidence for the start of aeolian processes due to human activities during the Atlantic. The most common buried soils found in dunes are soils from Subatlantic. Those soils indicate starting of aeolian processes in the consequence of human activities throughout various periods of the Subatlantic, up till modern times, which is evidenced by ^{14}C datings: 960 ± 50 , 660 ± 80 , 560 ± 100 and 250 ± 100 years BP.

ENVIRONMENTAL CONTEXT OF THE EARLY MEDIEVAL STRONGHOLDS NEAR PRZEMYŚL (E-POLAND)

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The historians who deal with early medieval Poland can rely on but a few laconic written references as regards the pre-10th century period; hence for the reconstruction of the history of that period examining remnants of strongholds seems to be of particular importance.

In south-eastern Poland, in the fork of the rivers San and Wiara a few strongholds have been preserved which can be linked to the Western Slavonic tribe of the Lędzianie (Lędzianie). In the 9th and 10th centuries these people lived in the areas of the upper Vistula drainage basin, reaching most probably as far eastwards as the springs of the rivers Bug and Dniester in Ukraine.

Considering the specific location of the several strongholds with the principal one in Przemyśl, founded in front of the geologically conditioned Brama Przemyska (Przemyśl Gate), on the basis of their position one can attempt to reconstruct the early medieval defense system on the edge of the Western Carpathians. It was based on a network of strongholds from the tribal phase, which controlled the important far-reaching trade route running from Byzantium and Arabia towards Western Europe.

CHANNEL CHANGES AND ACCUMULATION IN SMALL RIVER VALLEYS OF FORECARPATHIAN LOESS AREA: CASE STUDIES AT EARLY MEDIEVAL SITE IN BRZEZIE-20 NEAR KRAKOW (S-POLAND)

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Anna Tynieć, Archaeological Museum, Krakow, Poland

Early Medieval settlement in site 20 in Brzezine, Little Poland, (no AZP: 104/59/39) in the years 2004 - 2006 was excavated by the Krakow Team for Highway Research. The settlement is located on the slopes and the bottom of a small valley. The area of approximately 260 acres was excavated there, and over 600 archaeological structures were discovered (dwellings, a bath, wells, bloomery furnaces, hearths, ovens used for different purposes and storage pits). The majority of structures and archaeological artefacts is associated with the early medieval period. On the basis of the pottery material analysis they can be dated back to the 8th - 11th century (these assumptions were verified by the dates obtained from the discovered wooden elements, from the year 802 to the youngest from 1039).

A system of old river beds encompassing three meandered river beds from different time periods was discovered on the bottom of the valley occupied by the settlement. The youngest seems to coincide with the period when the early medieval settlement functioned there. In the layers filling the (stratigraphically) older river beds no movable artefacts were found. 150 m-long section of the old river beds was explored.

Exploration of the old river beds was conducted in stages. The shortest section examined in one time was 40 m long. Such approach allowed for conducting simultaneous observations of horizontal and vertical stratigraphy (at the edges of the digs full cross-section profiles of layers were obtained). In the banks of the river bed, besides pits dug out and used by man, some structures created as a result of flooding or washing away the banks were also distinguished. From the depth at which the old river beds boundaries were clearly marked in the 'calec' (the layer undisturbed by human

activity), the layers were plastically explored. The system of old river beds was the subject of specialist research. Strong post-Medieval accretion phase was documented.

RESULTS FROM AN INTERDISCIPLINARY PROJECT IN THE SOUTH NORWEGIAN MOUNTAINS

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Excavations at the high mountain plateau Hardangervidda, South Norway, have produced evidence for a mass-trapping of wild reindeer during the period AD 1250-1300. Reindeer herds were driven towards lakes through corridors of long rows of stone cairns and killed in the water. Four hunting stations with remains of an estimated number of at least 25,000 animals have been excavated.

Osteological analyses of the bone material show that, with the exception of antlers, bones from all parts of the carcasses are present. This indicates that the meat was cut off at the butchering sites, and transported down from the mountains together with hides and antlers.

At excavations in Norwegian medieval towns a large number of combs made of reindeer antler have been found, as well as waste material of reindeer antlers from the production of combs.

Even though medieval written sources give almost no information of the exploitation of the reindeer products, the Hardangervidda finds indicate that such products must have been of importance for the town populations, and it seems probable that the mass-trapping of reindeer was organized from the towns.

HOHOKAM SETTLEMENT IN THE MOUNTAINS AND RIVER VALLEYS OF THE AMERICAN SOUTHWEST

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The Hohokam Indians are well known for developing the largest and most complex irrigation system in the deserts of the New World. But this is only a part of the story. The Gila and Salt Rivers that the Hohokam tapped to supply their canals flow from high mountains, which reach over 3500 m and bound the deserts areas on the north and east. In the first millennium of their existence, the Hohokam exploited the deserts and these surrounding mountains. They built their canals and towns in the floodplains of the rivers together with smaller villages in the mountains, where they farmed along the tributaries of the Salt and Gila Rivers and hunted wild game. With very limited areas for traditional farming practices, the mountain Hohokam also developed new strategies for dry farming and developed new domesticates, most importantly a succulent known as agave that could be grown in thin, rocky mountain soils. The mountain Hohokam were closely tied to the desert Hohokam through a network of ceremonial exchange focused on ballcourts and a cremation mortuary complex. This close integration was necessary,

because of uncertainties in food production in both regions. Farming in the floodplains of the larger river valleys was often tenuous because of cycles of flood and drought, whereas mountain farmers did not have enough arable land to sustain themselves. Around 1,000 A.D., circumstances changed as a millennium of floodplain stability changed. The floodplains of the Salt and Gila River were eroded and downcut, destroying canals, fields, and riparian forests that provided fuel, building materials, and animal products. The desert Hohokam responded to these changing environmental circumstances by building new canals on higher terraces overlooking the floodplains. This response resulted in opening vast new acreage to agricultural production in areas that were much less prone to flooding and erosion. Hohokam population and house construction expanded tremendously in the major river valleys. At the same time, mountain settlements were abandoned and many of their residents moved to the valleys where they were incorporated into the growing settlements. They brought with them, however, the agave and dry-farming technologies they had developed in the mountains and built large dry-farming systems in the rocky hills surrounding valley towns. The old ballcourt system, which had integrated settlements throughout a vast region of the Southwest was replaced by a new socio-political system that focused on the large desert towns along the Salt and Gila Rivers. Able to sustain themselves entirely on the production of their expanded canal system and nearby dry-farming fields, the Hohokam cut their ties to the neighboring mountain areas, a gap into which poured independent and often hostile groups of people.