The Jan Kochanowski University in Kielce

Department of Geomorphology, Geoarchaeology and Environmental Managament

Institute of Geography

ABSTRACT OF Ph.D. THESIS

„ Environmental context of Subneolithis settlment in Biebrza Basin"

Author of dissertation: mgr Marcin Karol Frączek

Dissertation supervisor: dr hab. Tomasz Kalicki, prof. UJK

In relief of the north-eastern part of Poland, Biebrza Basin is an explicit and important macrodepression form with complex structure. The evolution of this form included several stages of transformation during the last two Pleistocene glaciations and two interglacial periods – Eemian and Holocene. The origin and age of Biebrza Basin was associated with erosional processes connected with Oder and Wartha (Saalian) ice sheet or Vistulian – Świecie stadial before LGM. However during the Vistulian ice-sheet advance until the Pomeranian phase of last glaciation (15,5-15,0 ka BP; 16.2 ka BP) outflow from Naroch-Wilia and Skidel the dam lakes and river waters of the upper Neman river followed Łososna river valley, its tributary Tatarka river breakthrough Pripilin-Nurki gap section to Biebrza and Narew river valleys. Therefore the Biebrza is underfit river with vast peat-bogs on its valley floor. The Pleistocene relief of the valley was transformed in small degree during the Late Glacial and Holocene. In this period controling factors of the evolution were climate and vegetation changesBiebrza Basin includes 5 basins. Many forms related with ice-melting (e.g moraine monadnocks, sandar-kemes plain, keme terraces and kemes) and composed with highly textural and structural diverse fluvioglacial and glacial deposits occur within it. Those monadnocks (erosional remnants) rise above the peat-bog in the valley bottom.

At Lipowo site (northern part of Biebrza Basin) a beginning of peat accumulation in the valley floor was radiocarbon dated at 8490±80 BP 7658-7347 cal. BC. At the similar time was cut off Biebrza river channel near a sandy elevation. Cone from the silty sands in the bottom of this abandoned channel was radiocarbon dated at 8330±120 BP 7577-7083 cal. BC (Fig. 1, 2). Both these occurrences, a rise of ground water level and channel change, could be connected with climatic changes - cool and humid phase at the beginning of Atlantic. This event is globally known as 8.2 ka event have been indicated also in Centraleuropean valleys

as a phase of an increase fluvial activity. Gyttja with water malacofauna was accumulated in oxbow lake during the Early Atlantic. Lake had disappeared about 6170±80 BP 5313-4911 cal. BC when started accumulation of peats and developed peat bog here (Fig. 1, 2).

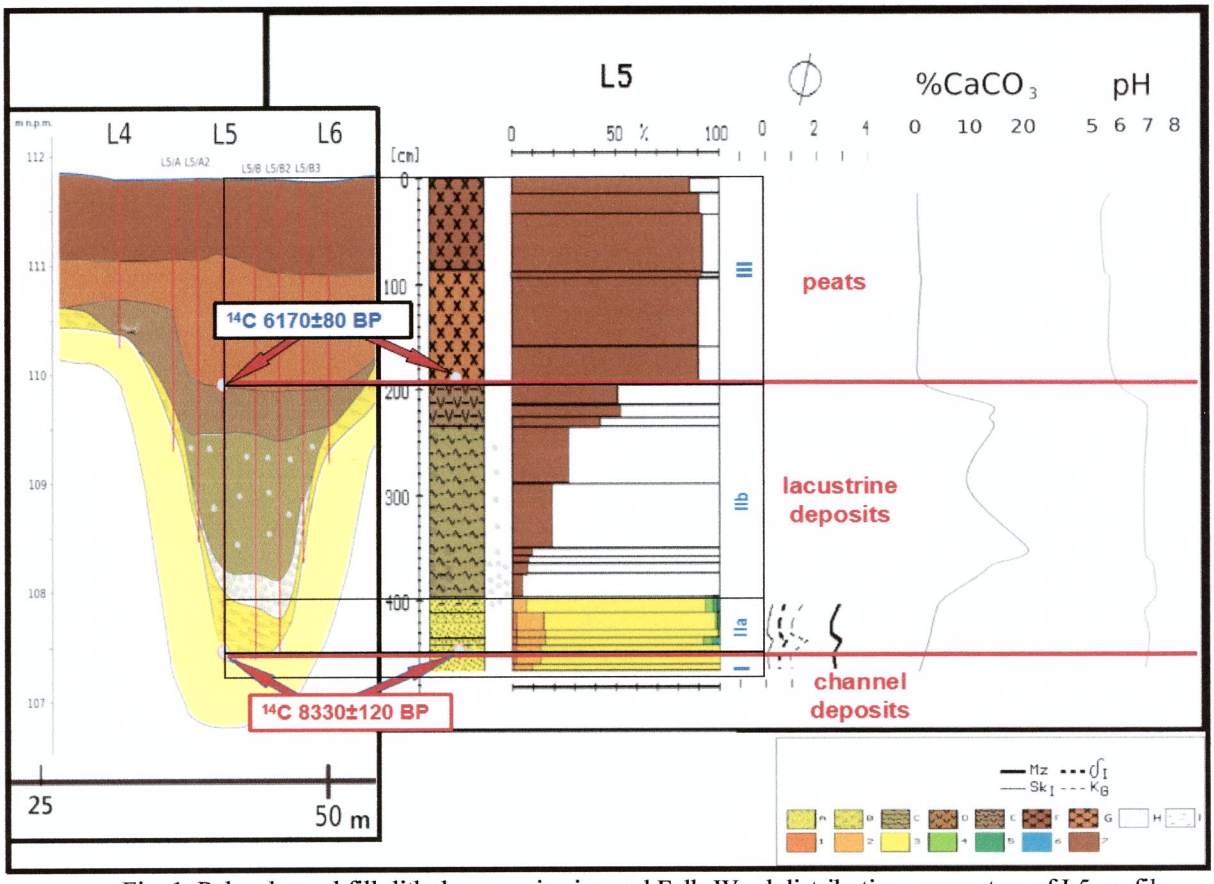

Fig. 1. Paleochannel fill, lithology, grain size and Falk-Ward distribution parameters of L5 profile
Lithology: A - fine-grained sands, B - silty sands, C - gyttja silts, D - peaty silts, E - silty peats, F- peats, G- peats (undecomposed), H - molluscs, I - subfosil wood; Fractions: 1 - coarse sand (-1 to 1ϕ), 2 – medium sand (1-2ϕ), 3 - fine sand (2-4ϕ), 4 - coarse and medium silt (4-6ϕ), 5 – fine silt (6-8ϕ), 6 - clay (above 8ϕ), 7 - organic matherial; Folk-Ward's distribution parameters: Mz - mean diameter, δ_I - standard deviation (storting), Sk_I - skeweness, K_G - kurtosis

At Lipowo site artefacts of the Niemen culture were found. Single flint artefacts remain in the analogous stratigraphic position as at Krasnoborki site. An trench 1 single flint artifacts and animal bones (profile E) occurred. An trench 2 (profile N) concentration of flint artifacts with cremated fish bones and animal bones (large mammal, probably moose) was found. However, at trench 4 on the top of the elevated form were also exposed single fragments of pottery. It may be linked to the settlement function of the Lipowo site.

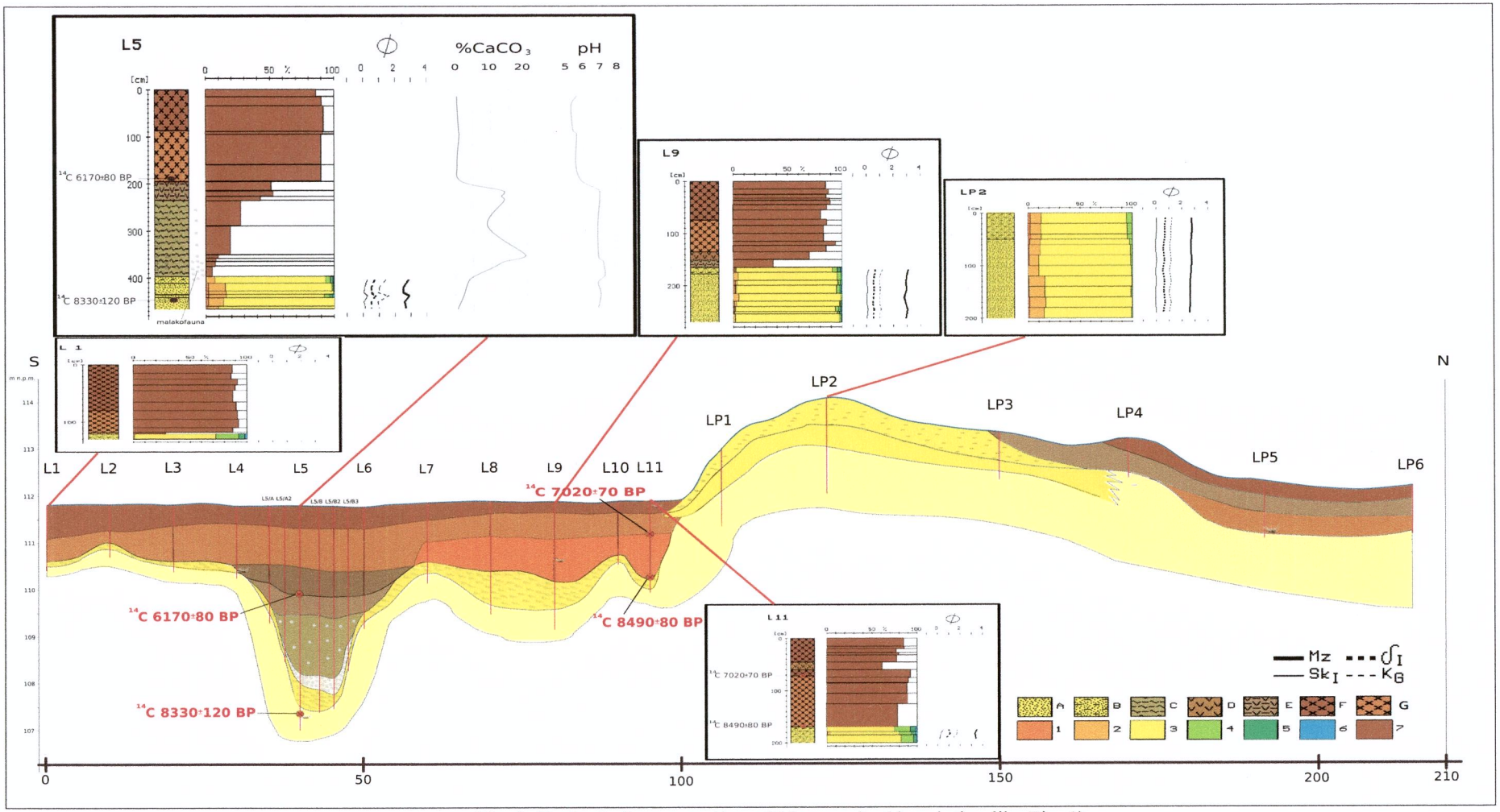

Fig. 2. Geological cross-section of Lipowo site (description like Fig. 1)

In the bottom of Wizna Basin (southern part of Niebrza Basin) could be distinguished two segments: first one - wide (2/3 width of the bottom) without traces of fluvial activity and the second one – narrow and fluvial body.

In the first segment the relief of biogenic deposits bottom indicate the occurrence of palaeolake filled with gyttja deposits. Origin of these depressions was degradation of permafrost and aeolian processes. At Wizna I profile the upper part (depth 5.42-5.35 m) of lake deposits (detritus-clayey gyttja) and sedge-moss peats in superposition (depth 5.35-5.25 m) were dated at 12 710±240 and 12 610±190 BP respectively. This type represent also present-day existing glacial lake Jezioro Maliszewskie with gyttja 22.5 m thick. The thin layer of moss peats (depth 4.81-4.73 m) accumulated on permafrost in coastal zone of this present-day lake was dated at 11 460±210 BP. Grzędy site is located within the non-fluvial segment and includes dune complex surrounded by peats whose thickness reaches 2 m and the bottom was ^{14}C dated at 10 135±90 BP (MKL 3129) 10143-9396 cal. BC. The surface under the peats was transformed by aeolian processes at the end of last glaciation and the Younger Dryas cooling resulted, in probably, that the complex of parabolic dunes was still active at the end of the Late Glacial and Early Holocene. After the climate warming in the Preboreal starts the accumulation of peats but with short-time an increase of aeolian processes activity in the beginning of the Atlantic - 8320±80 BP (MKL 3274) 7542-7141 cal. BC. It could be coincided with global cooling and more open vegetation on sand dunes. It is also not excluded impact of the Mesolithic cultures (single flint artefact was founded in dune sands).

Within the fluvial segment can be distinguished sandy terrace and muddy-boggy, with numerous oxbow lakes, floodplain of Narew river, which have four levels of different age. At the edge of the terraces there are preserved macromeanders whose cut off was ^{14}C dated at 11 780±100 BP (MKL 3130) 11 851-11 461 cal. BC (Włochówka site) and at 9900±90 BP (MKL 3135) 9762-9231 cal. BC (Ruś site). They represent two generations of large, Late Glacial meanders: older probably from Bölling and younger, probably from Alleröd (Ruś site). Macromeanders functioned in many lowland river valleys of Central Europe during the late Pleistocene. Also less meandering pattern of the older generation shows, that they was transitional system from braided to meandering river, similar like in Warta and Moza valleys. Palaeomeander Grądy Woniecko 2 undercuts from the north sand dune with archaeological site Grądy Woniecko and it was cut off before 3800±60 BP (MKL 3127) 2461-2043 cal. BC. High facial diversity of sediments filled the palaeomeander indicates distinct changes in sedimentation conditions in the Neoholocene, probably referring mainly to climate changes (frequency and magnitude of floods), and it is not connected with changes in location of

Narew river, because the river in the Neoholocene flowed probably stable along edge of Kolno Upland.

The archaeological site Grądy-Woniecko is located on the dune complex within fluvial valley bottom on the left bank of the floodplain, a few hundred meters from the present-day Narew riverbed. Below the complex of sands dune deposits there are fluvial sands dated OSL about 8,6±1,3 ka (UJK-OSL-71). Within aeolian sediments could be distinguished several members separated by buried soils (Fig. 3). Stratigraphy, number, depth and age of buried soils is strongly various in different parts of the dune complex, because at different periods they were activated only some parts of the dune field. The oldest phase of aeolian activity is OSL dated at 6,2±0,9 ka (UJK-OSL-66) and it ends with well-developed fossil soil with artefacts. This soil was fossilized in the early Subboreal, because aeolian sands covering it were OSL dated at 4,6±0,7 ka (UJK-OSL-65). These two phases of aeolian activity may be related with human activity of the Niemen culture on the area of dune field (Fig. 3). This is confirmed by radiocarbon AMS datings of human bones (5325±35 and 5100±35 BP) and charred organic remain in pottery (5035±35 and 4560±50 BP). The next phase of aeolian activity may already be connected with the Middle Ages and the Modern period. The first phase/phases? from this period can be dated to the early Middle Ages - aeolian sands were OSL dated at 1,2±0,18 ka (UJK-OSL-63) and 0,9±0,13 ka (UJK-OSL-67), and another refers with the Middle Ages (OSL date 0,54±0,08 ka - UJK-OSL-64). Period of the Medieval aeolian activity closes fossil soil dated AMS at 780±30 BP cal. 1210-1281 AD and 660±35 BP cal. 1275-1395 AD. Very intensive aeolian activity in the Modern period led to the destruction of local elders both aeolian series and buried soils, that is why the fossil soil radiocarbon dated at 165±50 BP (MKL 3128), which is the last 3 centuries (after 1657 AD) or AMS dated at 190±30 BP after cal. 1664 AD locally occurs on the Subboreal sands at depth. 150 cm, and elsewhere on the surface. Very intensive changes in the morphology of the area connected with the activities of aeolian processes in recent decades documents the comparison of the relief of the dune present day and from 1974 when were conducted archaeological excavations.

Separate phases of aeolian activity on the Grądy Woniecko archaeological site have a high conformity with the general phases dune formation for Poland, and phases of activity and stabilization of the nearby dune field in Narew and Biebrza watershed (Kiślaki site). The second author distinguished phases of an increased aeolian activity climatically (Older and Younger Dryas) and anthropogenically (Subboreal - 4000-1600 BC; Subatlantic – 1200-1600 AD and after 1800 AD) conditioned.

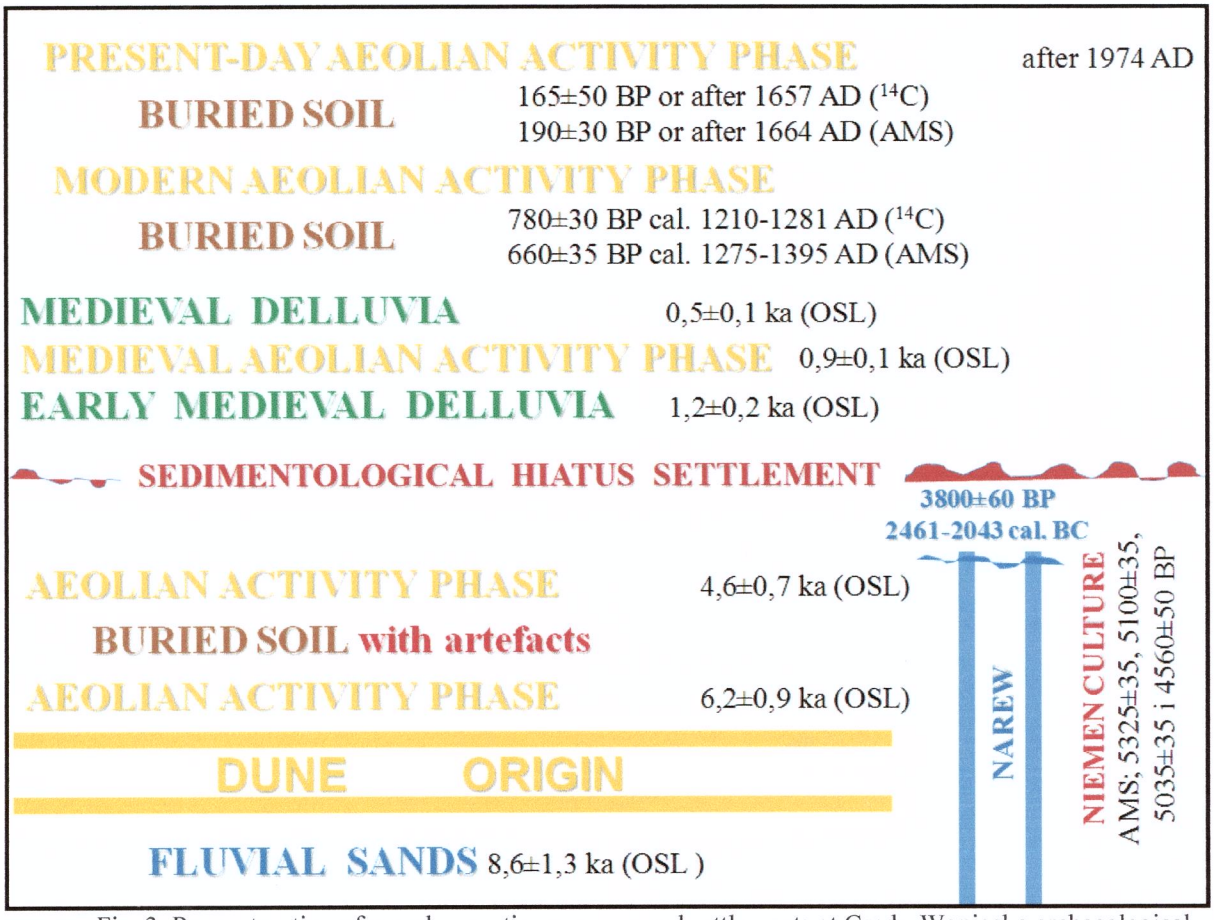

Fig. 3. Reconstruction of morphogenetic processes and settlements at Grądy-Woniecko archaeological site

Results of studies on Lipowo and other sites (in comparision to other sites in Biebrza valley floor) indicates some periods of climatic changes and an increase of morphogenetic processes. The oldest phase of cool and humid climate was dated at beginning of Atlantic (growth of peat bogs in valley floor, river channel cut off). Next humid period in the end of the Atlantic indicated subfossil trees (trees couldn't growth on a peat-bog in the valley bottom). The youngest humid period and beginning of peat accumulation on Subboreal colluvia (delluvia) occured about 3200-3100 BP (comparison with the Krasnoborki site).

Climate fluctuations correlate very well with phases distinguished in Centraleuropean river valleys (Fig. 4). Traces of the Subboreal soil erosion and colluvial (delluvial) covers formation occurred on the slope elevation (Krasnoborki). Artefacts at Lipowo were found in the same type of sediments.

Conclusions

Geoarchaeological researches in Biebrza Basin confirmed common of settlement points of hunter-gatherer communities from the middle and late stone age.

We can decline two types of encampments: first of hunter character (Krasnoborki, Lipowo), and second much more complicated and multifunctional site (Grądy-Woniecko).

Both of this encampment have similar location origins. Both types of camps had a similar location. The Subneolithis population inhabited dry elevations in the bottom of the river valley and over the water reservoir. Encampments were established in places with the highest biodiversity at the boundary between flooded and non-flooded, forested and non-forested areas.

Hunting encampment, such as Krasnoborka, have a defined spatial layout. The dwelling house area with vascular ceramics was located in the highest part of the elevation, while in the marginal zone, a significant part of the economic activity (flint artefacts) was concentrated on the slopes of the elevation (nowadays covered by peats).

Environmental changes did not significantly affect subneolitic settlement. Also the impact of this population on the environment was negligible, which was related to the type of assimilated economy based on hunting and gathering. Subneolitic populations have started the aeolian processes and the dunes have been transformed, while the colluvial (delluvial) cover at the slope of the sandy elevations is likely to be younger than the period of functioning of the Niemen culture.

Investigations of subneolitic sites on sandy elevations surrounded by organic sediments allow to capture homogenous groups of artifacts of the Niemen culture. Organic layers with well-preserved ecodesigns make an opportunity to determine the economical and food characteristics of the societies surveyed, which in the case of "classic" sandy sites is unreachable.

Well-preserved organic remains allows to determine the environmental conditions of settlement and, above all, give the opportunity to obtain the absolute chronology thanks to ^{14}C dating.

Part of the research was carried out in cooperation with the projects: „Preservation of wetland habitats in the upper Biebrza Valley" LIFE11/NAT/PL/422, and "Pomiędzy Wschodem a Zachodem. Osadnictwo z epoki kamienia i prologu epoki brązu w Grądach-Woniecko, woj. podlaskie" The Ministry of Culture and National Heritage RP No. 3222/16/FPK/NID.

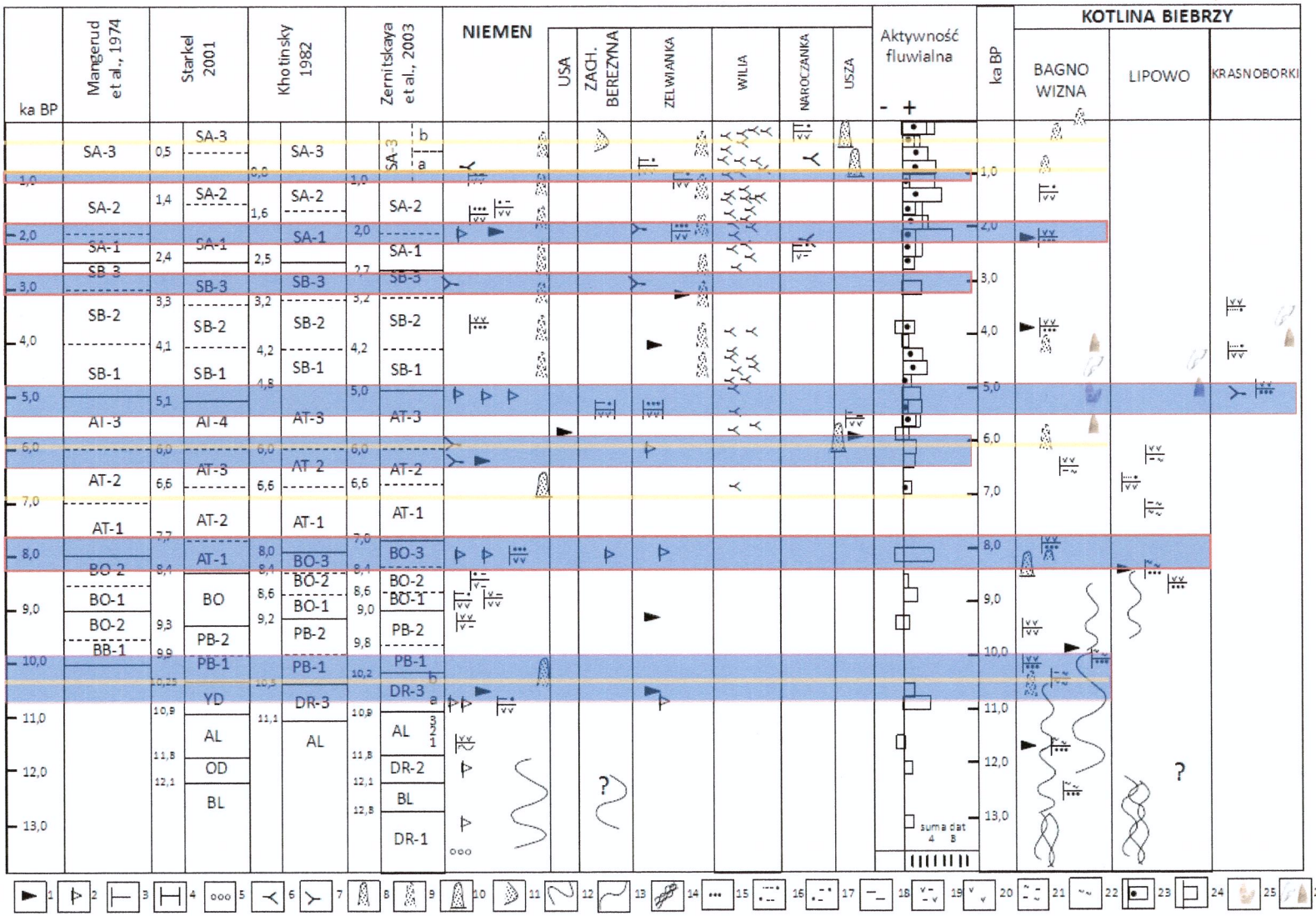

Fig. 4. Collection of radiocarbon datings from Niemen drainage basin in Belarus showed an increase (+) or stabilisation (-) of fluvial processes (blue one) and phases of dune formation (yellow one)(comp. T. Kalicki 2007) with comparition with Biebrza Valley
1 - river chanell cut off (^{14}C dating), 2 - river chanell cut off (paleobotanical dating), 3 - change of sedimentation type (^{14}C dating), 4 - change of sedimentation type (paleobotanical dating), 5 - channel member, 6 - subfossil trees in channel alluvia (^{14}C dating),
7 - subfossil trees in peats and peats in oxbow lakes (^{14}C and paleobotanil dating), 8 - phases of dune formation on terraces and flood plain (^{14}C dating), 9 - phases of dune formation on terraces and flood plain (other dating),
10 - buried soil covered with blow-wind sands (^{14}C dating), 11 - alluvial fan, 12 - large meanders, 13 - meanders, 14 - braided river, 15 - sands, 16 - colluvial deposits, 17 - sandy silts,
18 - silts and clayey silts, 19 - peaty silts, 20 - peats, 21 - gyttja silts, 22 - gyttja, 23 - dating from subfossil trees, 24 - other datings, 25 - parts of skull (Niemen culture, ^{14}C dating), 26 - artifacts (pottery, flints)