Polish Chronostratigraphy for the last 45 ka

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The Late Glacial and the Holocene - whole Poland

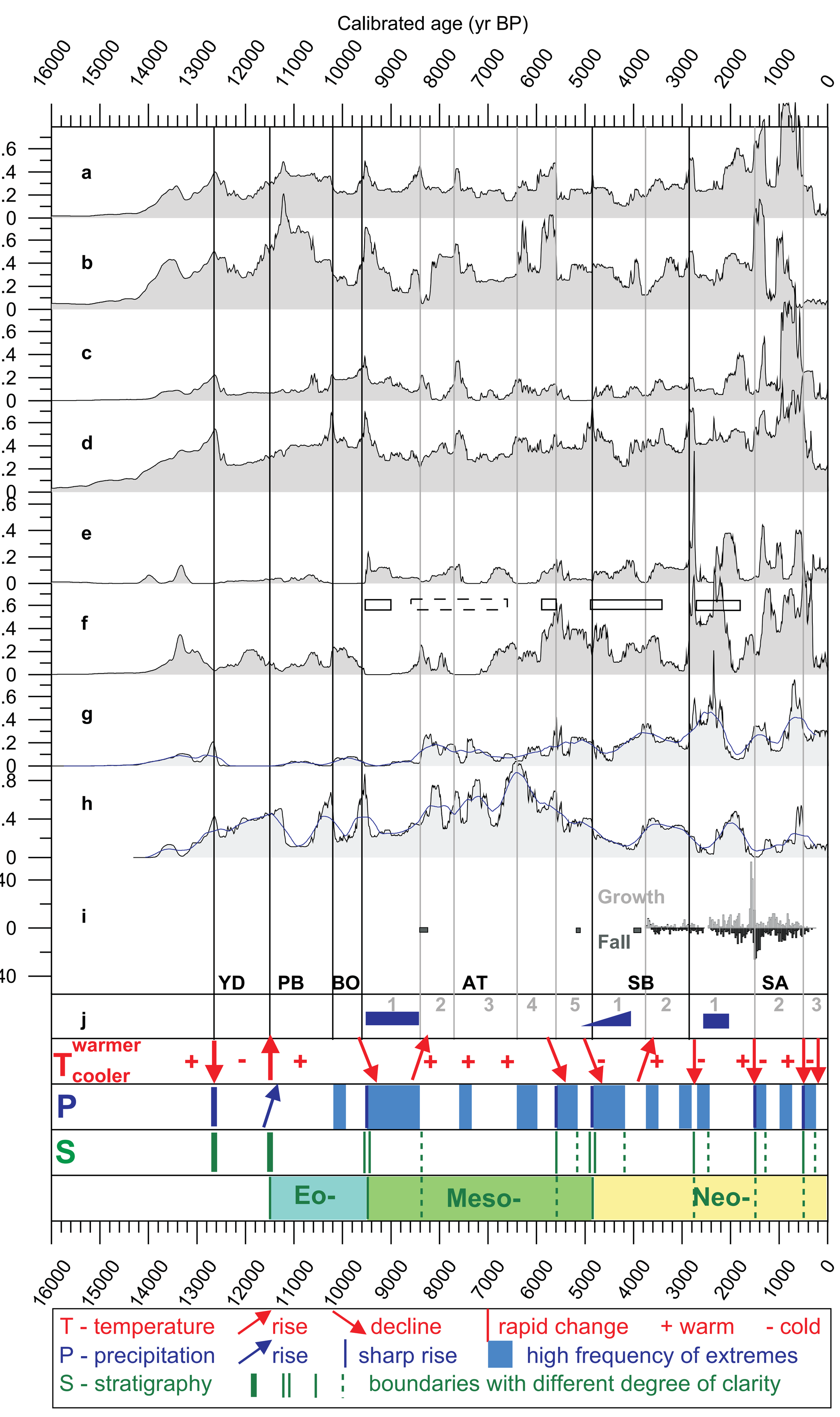

Fig. 1. The suggested, revised model of the Holocene climato-chronostratigraphy for Polish territory:
-The leading factor in Quaternary stratigraphy is the change in temperature, which build also the skeleton of the Holocene chronostratigraphy (Eo- Meso- and Neo-Holocene).
- The second order subdivision is connected with variations in humidity and frequency of extreme rainfalls. The wetter phases have usually very distinct start and then gradually the indicators of humidity become more equivocal.
Among the most discussed problems is the position of two boundaries:
- Eo-Mesoholocene and Meso-Neoholocene considering both temperature and humidity factors. The first chrono-climatostratigraphic boundary we put at 9600 cal BP, although in fact it has a two-fold character. At about 9600 cal BP together with a rapid melting of Laurentide ice sheet a freeway was created for westerlies and humid air masses expanded over Europe and Siberia, bringing heavy rains and floods. Simultaneously this change was accompanied by expansion of Atlantic forest species. However, the real start of warm period reflected in calcareous precipitation and reign of Quercetum mixtum followed one millennium later.
The border between Meso- and Neoholocene has also a complex character. In the present study it is placed at about 4850 cal BP. But even earlier, at about 5600 cal BP a first distinct cooling and wetter phase can be observed, reflected in avulsions of river channels, formation of new landslides – being synchronous with first post-optimum phase of glacial advances in the Alps. However several centuries later a general rebuilding of ecosystems initiated by rise of humidity and cooling has started, and was recorded in rise of groundwater level and transitional descend of Picea excelsa to lower elevations, later followed by expansion of Fagus and Abies.

Probability density functions (PDFs) constructed for different type of sediments from Polish territory. Curves were constructed with using the option "Sum" in OxCal programmenand calibration curve IntCal09:
a - fluvial data (334 14C dates),
b - fluvial data subset, selected dates represent abundance of paleochannels (151 14C dates),
c - fluvial data subset - dates of peat or soil covered by overbank facies (87 14C dates),
d – peat (709 14C dates),
e – deep landslides (69 - 14C dates from Polish Flysch Carpathians),
f – minerogenic horizons over landslides (98 14C dates, from Polish Flysch Carpathians), as rectangles are marked phases of debris flows in Tatra Mts; a dashed rectangle was used for period with rare minerogenic inserts within the sequences of lacustrine sediments.
g – speleothems (98 14C dates),
h – calcareus tufa (100 14C dates),
There are added 100-yr running averages for speleothems and tufa curves, because these data have got the highest uncertainty due to reservoir effect.
The curve of 400 subfossil oak trunks dated by dendrochronological method by M. Krąpiec is presented in diagram (i). Episodes of frequent floods indicated on the base of floating chronologies are marked in the same figure by grey rectangles
High water levels in Lake Gościąż are marked in figure (j) - phases 9500-8500 and 2500-2000 cal BP, as the most clear, are marked by rectangle; and phase 5000-4100 – by triangle as a less clear, especially at the beginning.
Below, information about changes in temperature, precipitation and stratigraphy, summarized on the base of stratigraphy for numerous investigated sites, palynological diagrams and palaeohydrological reconstructions, is presented.
The proposed boundaries are indicated by vertical lines. Used abbreviations: YD – Younger Dryas, PB – Preboreal, BO – Boreal, AT – Atlantic (divided into 5 sub-zones), SB – Subboreal (divided into 2 sub-zones), SA – Subatlantic (divided into 3 sub-zones).

Starkel L., Michczyńska D.J., Krąpiec M., Margielewski W., Nalepka D., Pazdur A., 2013. PROGRESS IN THE HOLOCENE CHRONO-CLIMATOSTRATIGRAPHY OF POLISH TERRITORY. Geochronometria 40(1): 1- 21.

The Late Glacial and the Holocene - young-glacial relief

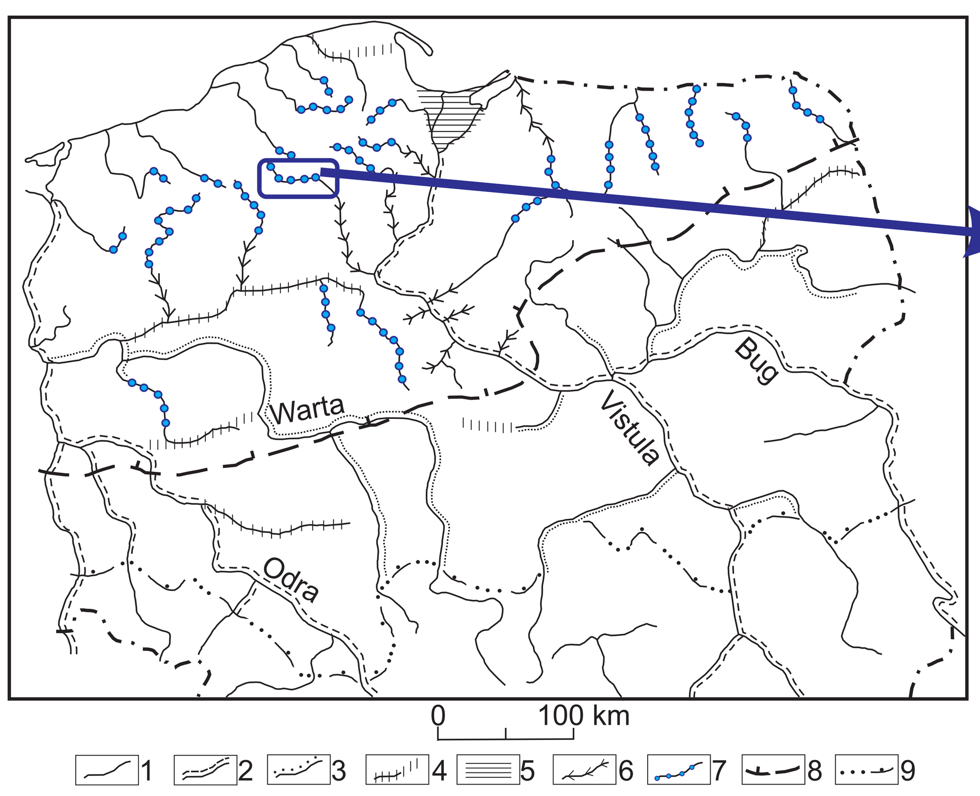

Fig. 2. River system and lakes in the Polish Lowland. There are marked types of valley floor reflecting the Holocene climatic changes (after Starkel 2008, changed). The area presented in Figure3 is marked by the rounded rectangle.
1 – rivers, 2 – valleys of the large transitional rivers, 3 – valleys of other large rivers with developed systems of fills and palaeochannels, 4 – inherited ice-marginal stream ways, 5 – deltaic and coastal plains, 6 – tributary river valleys incised or still not rejuvenated, 7 – system of young river valleys with transfluent lakes, 8 – extent of young postglacial landscape (extent of the ice sheet during the Last Glacial Maximum), 9 – boundary of lowland relief.

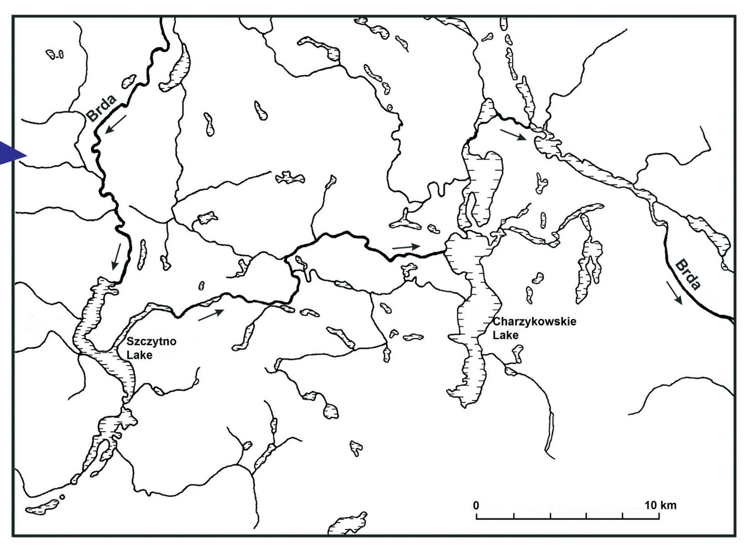

Fig. 3. Part of the upper Brda river catchment (Pomeranian Lakeland), with numerous transfluent lakes, as an example of a young river. Such a river gradually incorporates dead ice depressions, subglacial channels with lakes, outwash plains and the narrow gaps between them. Its presence is critical for the alternating phases of peat formation and lacustrine sedimentation. The phenomena observed in bogs, mires and the river network depend on each other.

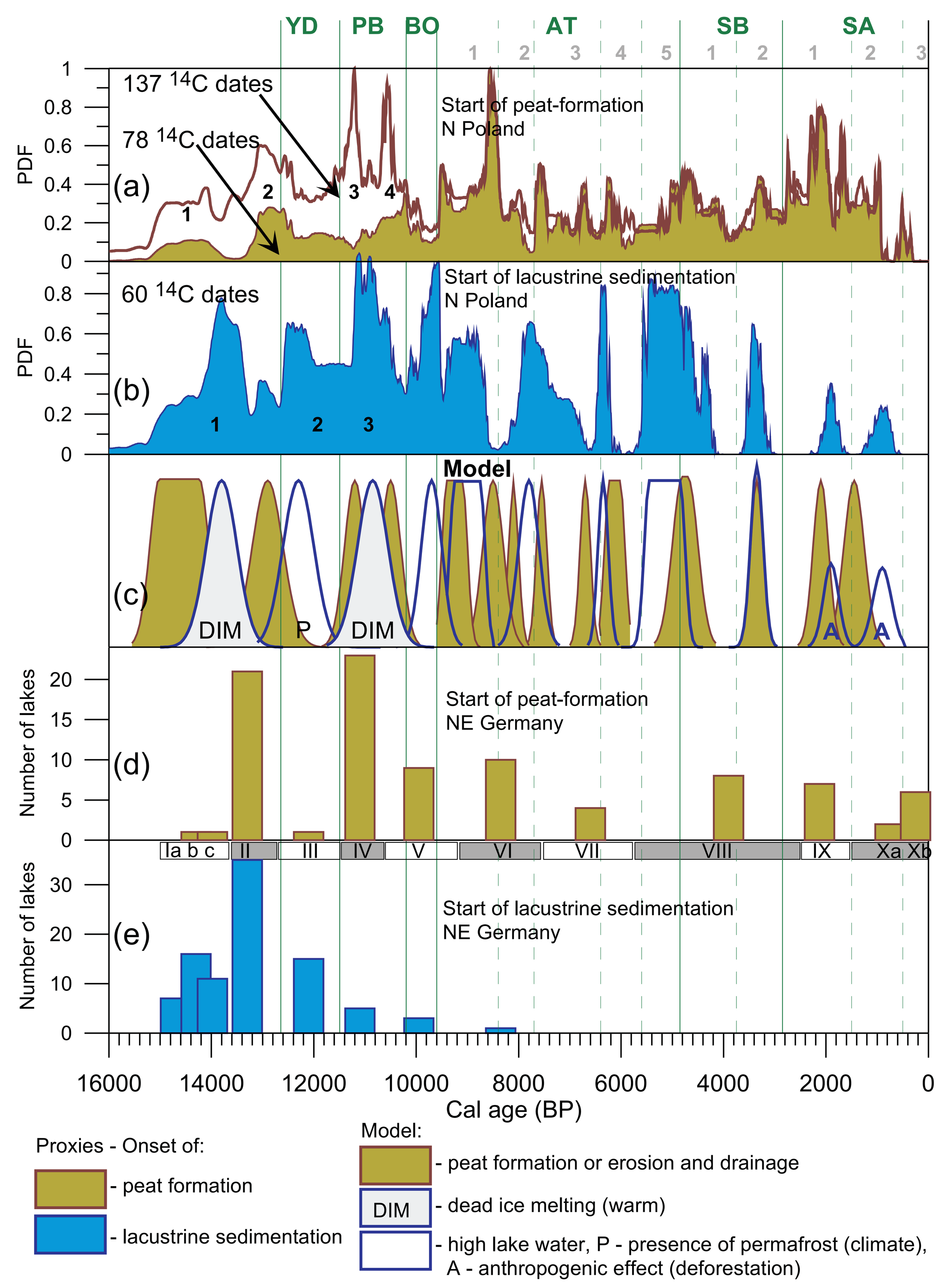

Fig. 4. Probability density function (PDF) obtained for peat samples above the lacustrine sediments, i.e. 78 14C dates. On the same graph is presented the total PDF for 137 14C dates representing the start of peat formation (78 dates for peat above lacustrine sediments and 59 dates for the bottommost peat in closed dead-ice depressions),
(b) PDF for dates of transition from peat formation into lacustrine sedimentation (60 dates),
(c) simplified model of hydrological changes in N Poland
(d) start of peat formation in NE Germany (after Kaiser et al. 2012, changed)
(e) start of lacustrine sedimentation in NE Germany (after Kaiser et al. 2012, changed)
The number of lakes had been determined for particular palynozones. The timing of the palynozones is marked by the line between figures (d) and (e).
The chronozone boundaries proposed by Starkel et al., 2013, are indicated by vertical lines.

Michczyńska D.J., Starkel L., Nalepka D., Radiocarbon, submitted

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