Evaluation of Calendar Values of the Climatostratigraphic Borders on the Base of Large Sets of ^{14}C Dates

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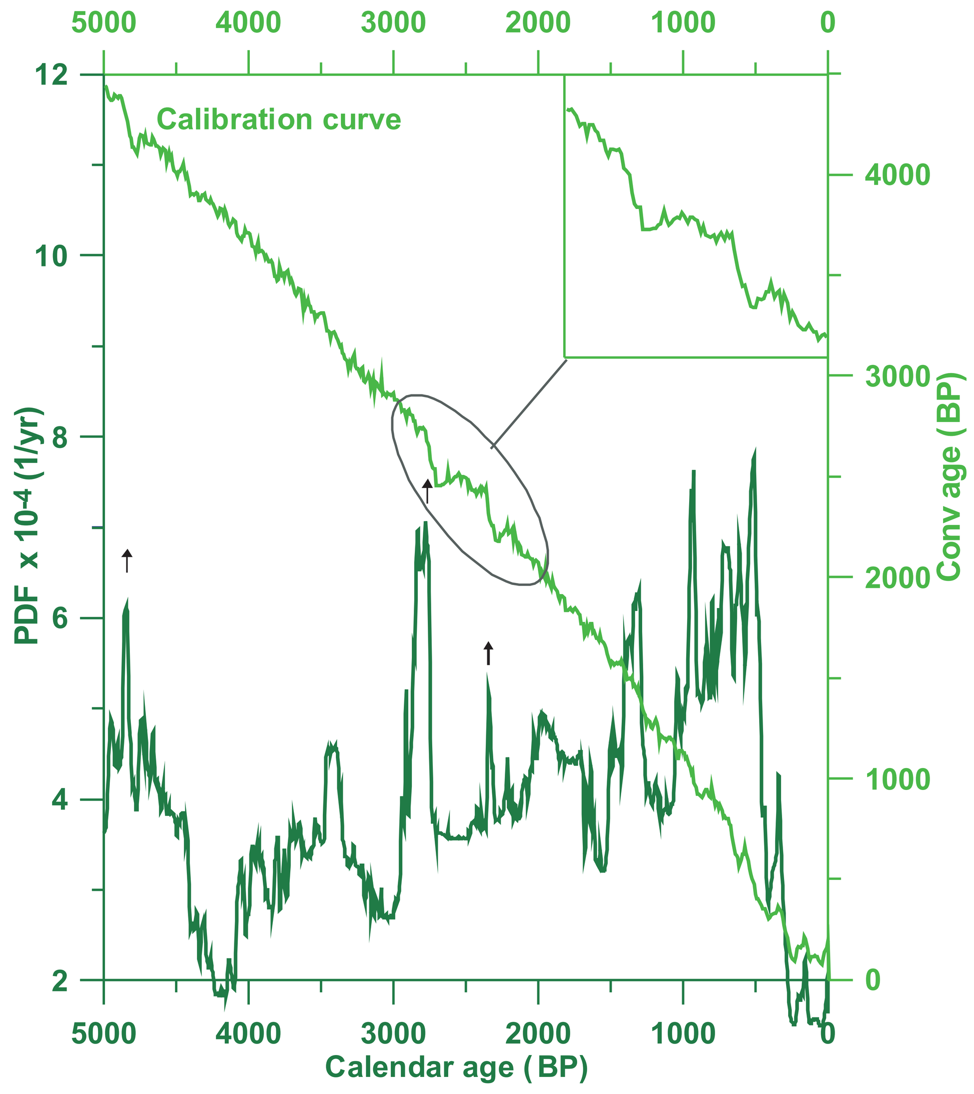
Assumptions:

1. Changes of the environment are recorded in the radiocarbon calibration curve
2. Changes of the environment are indirectly recorded in the frequency of the radiocarbon dates (the general rule of taking samples from places of visible sedimentation changes may be the reason that samples from the border of the Late Quaternary climatostratigraphic subdivisions are collected preferentially more frequently).

Hypothesis:

One can expect high narow peaks of the overall probability density function constructed for the big sets of radiocarbon dates near the climatostratigraphic borders.

Example:
Figure 1. Correlation of the high narrow peaks of the PDF (probability density function) constructed for 785 ^{14}C dates of peat and steep slope fragments of the calibration curve



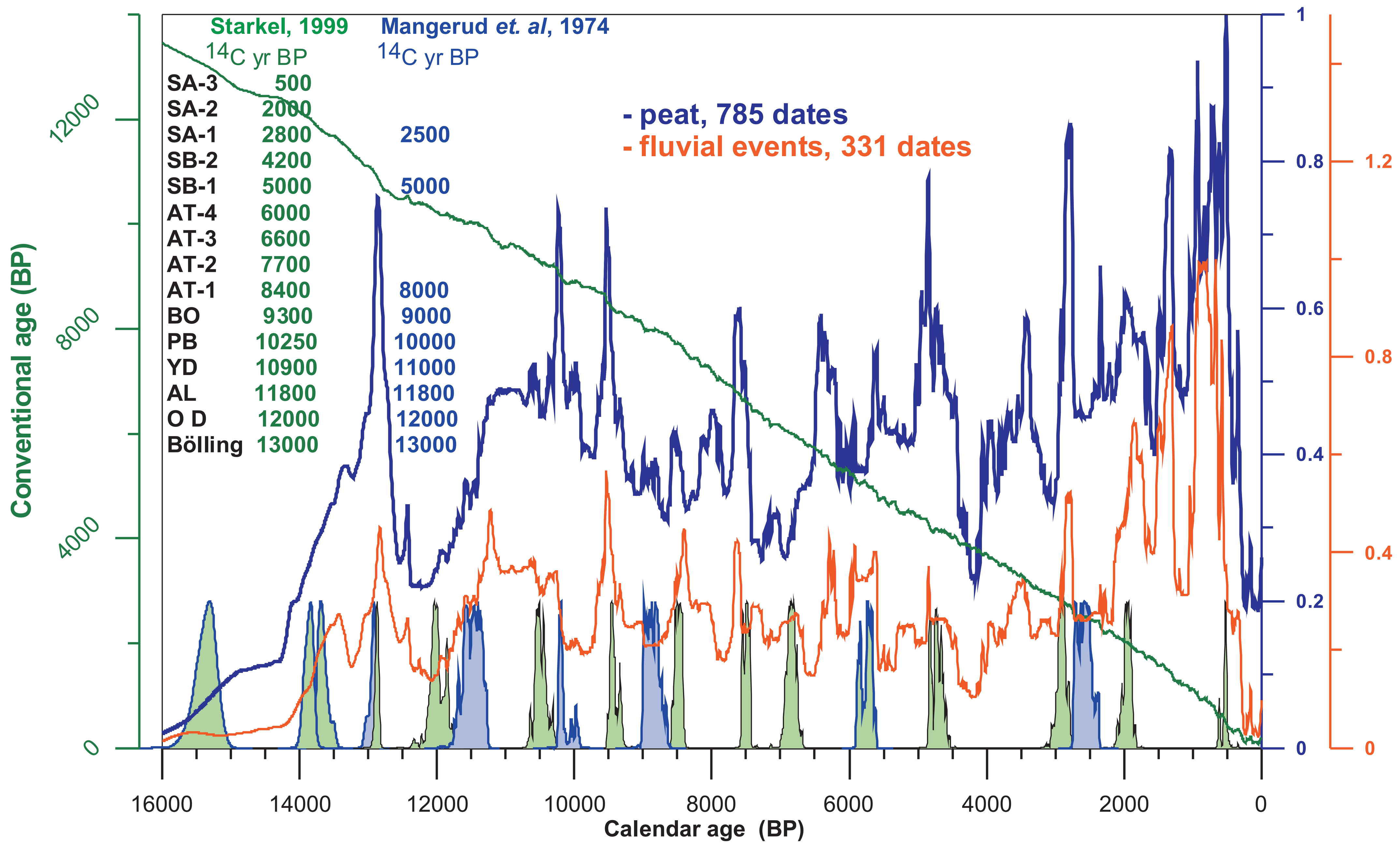
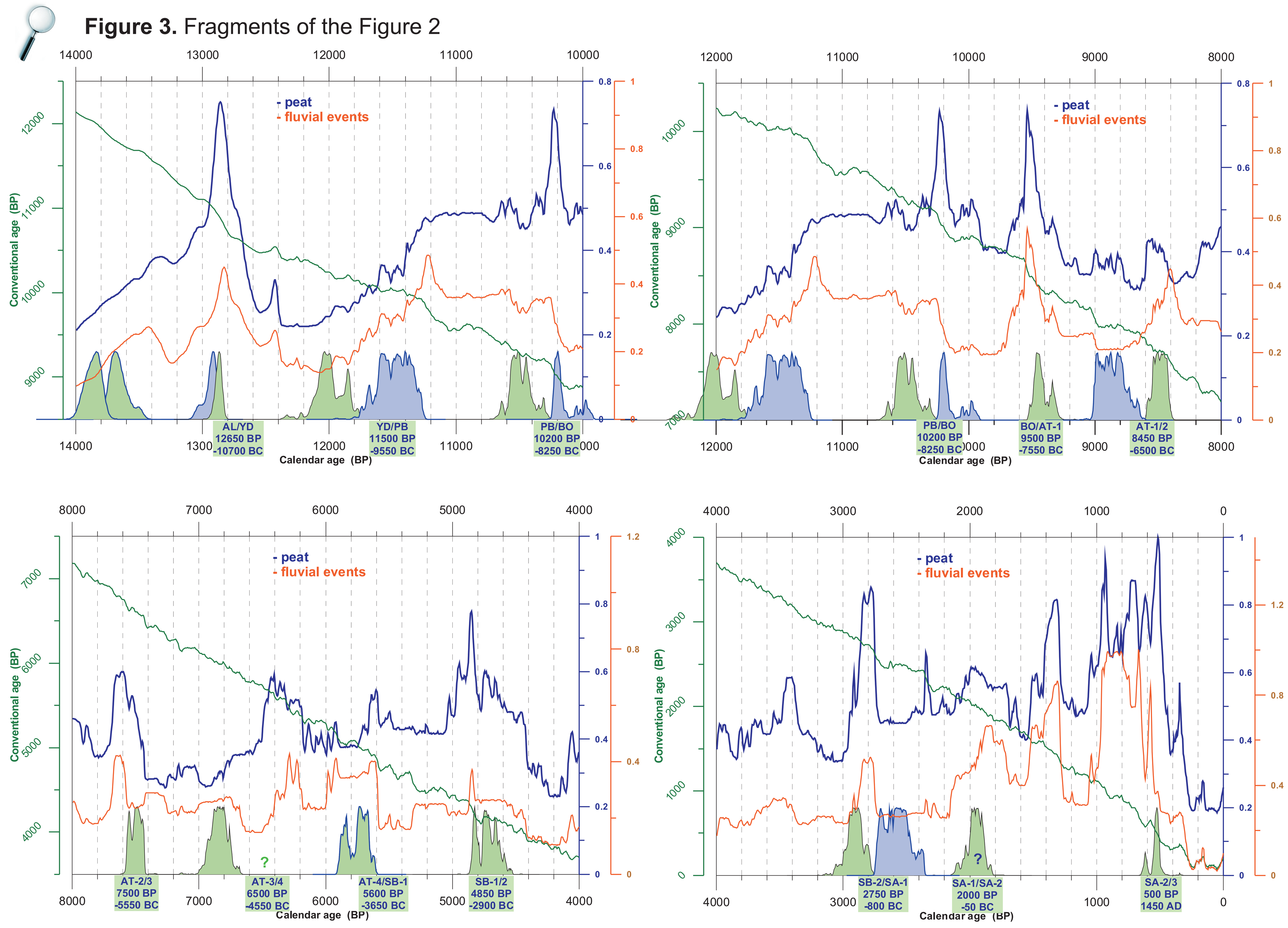


Figure 2. Probability density functions for 2 large sets of ^{14}C dates (785 dates for peat and 331 dates for fluvial events) constructed by summing the probability distributions of individual radiocarbon dates after calibration. Results of calibration of the ages of climatostratigraphic borders proposed by Starkel (green) and by Mangerud (blue) are presented in the lower part of the figure.

Figure 3. Fragments of the Figure 2



Evaluation of calendar ages of the climatostratigraphic borders for the Poland teritory

STEPS OF OUR WORK:

1. Two large sets of radiocarbon dates (785 dates for peat samples and 331 dates for fluvial sediments) were used to establish calendar values of the climatostratigraphic borders for the last 16 ka. All samples were collected from the territory of Poland and dated in the Gliwice Radiocarbon Laboratory. For both sets Probability Density Functions (PDFs) were constructed by summing the probability distributions of individual ^{14}C dates after the calibration.
2. Climatostratigraphic borders proposed by Starkel (in green) and by Mangerud (in blue) were calibrated (uncertainty 50 yr were arbitrary assigned to each border). Results of calibration are presented in the lower part of Figure 2.
3. We were looking for simultaneity of steep slope of calibration curve and high narrow peaks of PDF for peat and fluvial samples near the borders proposed by Starkel or Mangerud.
4. Finally we propose the folliowing ages of the borders:

Border	Calendar yr BP	Calendar yr AD/-BC
SA 2/3	500	1450 AD
SA 1/2 (?)	2000 (?)	-50 BC (?)
SB 2/SA 1	2750	-800 BC
SB 1/SB 2	4850	-2900 BC
AT 4/SB 1	5600	-3650 BC
AT 3/4 (?)	6500 (?)	-4550 BC (?)
AT 2/3	7500	-5550 BC
AT 1/2	8450	-6500 BC
BO/AT 1	9500	-7550 BC
PB/BO	10200	-8250 BC
YD/PB	11500	-9550 BC
AL/YD	12650	-10700 BC

The question marks indicate that borders are not well defined.
SA - Subatlantic, SB - Subboreal, AT - Atlantic, BO - Boreal, PB - Preboreal, YD - Younger Dryas, AL - Allöred

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