Geophysical Research Abstracts
Vol. 13, EGU2011-12461, 2011
EGU General Assembly 2011

Complex statistical model of the Lake Soppensee chronology

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This study presents new complex statistical model of the Lake Soppensee chronology, which joins together two types of accessible chronological information.
The first type of information is represented by the varve chronology constructed for laminated part of Soppensee sediment (depth 540 – 360 cm) and fitted to the IntCal09 radiocarbon calibration curve. The second type of information is represented by radiocarbon dates obtained for non-laminated or partially laminated parts of the sediment. These dates have been used for construction of age-depth model. This complex statistical model makes a supplement of our previous work published in Radiocarbon, where chronologies constructed on a base of these two types of information separately were compared.
The complex statistical model of the Lake Soppensee chronology has been constructed using OxCal 4.1 program. The model consists of three parts included in Sequence function. The main part is the varve chronology, which is fitted to the IntCal09 using OxCal wiggle-matching function D_Sequence on a base of 54 radiocarbon dates. Two remaining parts concern time periods before and after accumulation of laminated sediment. They are constructed using OxCal age-depth model function P_Sequence with k parameter, which describes a magnitude of random variation from a constant sedimentation rate, equal to 3 (1/cm). These three parts are separated by OxCal Boundary commands. Additional Boundary command is included inside P_Sequence function, which describes age-depth relationships for lower part of the sediment, and points a borderline between non-laminated and partially laminated part of the sediment.
Important element of this work is discussion of appropriate threshold value of the overall agreement index. Because in a model constructed using wiggle-matching function D_Sequence is only one independent parameter, the threshold value of the overall agreement index depends on a number of dates included in the model. The complex model, which includes both D_Sequence and P_Sequence functions, needs special estimation of the threshold value. In this case the threshold value of the overall agreement index should be lower than 60% or overall agreement index of the model should be appropriately recalculated.
Presented model confirms our previous conclusions that depositional conditions of the lake Soppensee were rather stable during the early Holocene and allows to make precise dating of chronological events.