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Hydroclimatic shifts recorded in peat archive from Rąbień mire (Central Poland) - better understanding of past climate changes using multidisciplinary approach

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Hydrological changes are main drivers of the processes occurring in the peatland ecosystem, e.g. organic matter accumulation and decomposition. Hydroclimatic changes in mires are caused by various non-climatic factors, such as hydroseral succession or land use changes. Central Europe, namely Poland, is characterized by a transitional climate with influence o both continental and Atlantic air masses, which makes a this region a very sensitive to climate change. Here we explore a potential of multidisciplinary approach in reconstruction of past climate change and particularly hydroclimatic conditions which control in Sphagnum peatland ecosystem. We reconstructed 3300 years (between 3,500 BC and 200 BC) history of development of Rąbień mire using several biotic proxies (pollen, plant macrofossils, testate amoebae, Cladocera, Chironomidae) and geochemistry. Study site - Rąbień mire (area 42 ha) is located in central Poland and it is protected nature reserve. The origin of the mire depression is connected with the development of the thermokarst basin isolated by dunes. Rąbień mire is limnogenic, i.e. formed by the process of terrestrialisation of a water body and thickness of biogenic deposits is 6.2 m (440 cm of lacustrine sediment and 180 cm of peat). Our results demonstrate the high potential of Rąbień peat record for reconstructing the palaeohydrological dynamics. The studied time interval is characterized by two pronounced dry periods: ∼2,500 to ∼1,700 cal. BC and ∼800 to ∼600 cal. BC, and two periods of significant increases in water table: ∼1,100 to ∼800 cal. BC and ∼600 to ∼250 cal. BC. The timing of the wet shift at 600 cal. BC corresponds to wet periods in different sites from Central and Eastern Europe. Our investigation reveals a complex pattern of proxies, what might be linked to the past atmospheric circulation patterns. Extreme hydroclimatic conditions most possibly had a direct impact on the functioning of peatland ecosystems. What has been observed in the within the peatland monitoring during the heat wave events in 2015 (Linje mire, Northern Poland). In our opinion, only reconstructions supported by the knowledge of current observations from peatland ecosystems may provide a better interpretation of past climate changes.
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