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Fire and man - reconstructing Holocene biomass burning in the central European lowlands

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Fire is an important earth surface process that interacts with climate and vegetation and influences global biogeochemical cycles and carbon budget. Moreover, fire is tightly connected to the evolution and distributions of human beings. Especially in the humid vegetation zones that naturally do not inflame easily, fire has been the major tool to convert forests to arable land. In the central European lowlands, naturally dominated by broad-leaved forests, palaeofires were strongly related to human impact during at least the last 6000 years. Hence, the detection of past biomass burning in the sedimentological record points to human activity.
Charcoal (black carbon) is the classical and widely-used proxy to reconstruct past fire histories. Abundant sedimentary charcoal records exist around the globe, and many are included in the Global Charcoal Database (GCD, www.gpwg.org). Molecular fire markers, on the other hand, are now being developed as new proxies to detect past biomass burning. This study reviews classical and "new" fire-proxies in peat and lake sediments that allow to reconstruct the signals of human impact on a regional scale in the central European lowlands with high temporal resolution.
Furthermore, the charcoal records from the GCD and other sources covering the central European lowlands and adjacent areas were integrated in a spatial synthesis to document the current state-of-knowledge on regional Holocene fire history. We show preliminary charcoal data from the annually-laminated sediments of lakes Tiefer See (northeastern Germany) and Czechowskie (northern Poland). Links to reconstructed local and European-wide vegetation successions will be provided, as in times with dry climate and the dominance of a certain fire-prone vegetation cover (e.g., Pinus spec.), wildfires might have played a further important role. However, the interpretation of charcoal records is not always straightforward. Hence, we also discuss the potentials of other palaeofire proxies in lake sediments, i.e. molecular markers such as benzene polycarboxylic acids (BPCAs) and monosaccharide anhydrides such as levoglucosan.