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Main dynamics and drivers of boreal forests fire regimes during the Holocene

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Forest fire is one of the most critical ecosystem processes in the boreal megabiome, and it is likely that its frequency, size and severity have had a primary role in vegetation dynamics since the Last Ice Age (Kasischke & Stocks 2000). Fire not only organizes the physical and biological attributes of boreal forests, but also affects biogeochemical cycling, particularly the carbon balance (Balshi et al. 2007). Due to their location at climatically sensitive northern latitudes, boreal forests are likely to be significantly affected by global warming with a consequent increase in biomass burning (Soja et al. 2007), a variation in vegetation structure and composition (Johnstone et al. 2004) and a rise in atmospheric carbon dioxide concentration (Bond-Lamberty et al. 2007). Even if the ecological role of wildfire in boreal forest is widely recognized, a clearer understanding of the environmental factors controlling fire dynamics and how variations in fire regimes impact forest ecosystems is essential in order to place modern fire processes in a meaningful context for projecting ecosystem behaviour in a changing environment (Kelly et al. 2013). Because fire return intervals and successional cycles in boreal forests occur over decadal to centennial timescales (Hu et al. 2006), palaeoecological research seems to be one of the most promising tool for elucidating ecosystem changes over a broad range of environmental conditions and temporal scales.
Within this context, our first aim is to reconstruct spatial and temporal patterns of boreal forests fire dynamics during the Holocene based on sedimentary charcoal records. As a second step, trends in biomass burning will be statistically analysed in order to disentangle between regional and local drivers. The use of European and north-American sites will give us the unique possibility to perform a large scale analysis on one of the broadest biome in the world and to underline the different patterns of fire in these two continents.

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