Long-term boreal forest dynamics and disturbances: a multi-proxy approach

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The boreal forest provides a variety of ecosystem services that are threatened under the ongoing climate warming. Along with the climate, there are several factors (fire, human-impact, pathogens), which influence boreal forest dynamics. Combination of short and long-term studies allowing complex assessment of forest response to natural abiotic and biotic stress factors is necessary for sustainable management of the boreal forest now and in the future. The ongoing EBOR (Ecological history and long-term dynamics of the boreal forest ecosystem) project integrates forest ecological and palaeoecological approaches to study boreal forest dynamics and disturbances. Using pollen, non-pollen palynomorphs, micro- and macrocharcoal, tree rings and fire scars, we analysed forest dynamics at stand-scale by sampling small forest hollows (small paludified depressions) and the surrounding forest stands in Finland and western Russia.

Using charcoal data, we estimated a fire return interval of 320 years for the Russian sites, and, based on the fungi Neurospora that can grow on charred tree bark after a low-intensity fire, we were able to distinguish low- and high-intensity fire-events. In addition to the influence of fire events and/or fire regime changes, we further assessed potential relationships between tree species and herbivore presence and pathogens. As an example of such a relationship, our preliminary findings indicated a negative relationship between Picea and fungi Lasiosphaeria (caudata), which occurred during times of Picea decline.