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Towards a better understanding of Siberian wildfires: linking paleoenvironmental fire reconstructions with an individual-based spatially explicit fire-vegetation model

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Wildfires are an essential ecological process, located at the interface between atmosphere, biosphere, and geosphere. Climate-related changes in their appearance and frequency will shape the boreal forest of tomorrow, the largest terrestrial biome responsible for numerous important ecosystem functions. Changing fire regimes could also increase pressure on fire management and become a threat for humans living in Siberia. However, a lack of long-term fire reconstructions complicates the understanding of the main drivers in the larch-dominated forests of eastern Siberia. At the same time, this lack of long-term understanding also aggravates the validation of fire-vegetation models, and thus predictions of future changes of fire regimes in this vital region.

Here, we present a new fire module being built for the individual-based, spatially explicit vegetation model LAVESI (*Larix* Vegetation Simulator). LAVESI is able to simulate fine-scale interactions in individual tree's life stages and detailed population dynamics, now expanded by the ability of wildfires igniting and damaging biomass. Fire-vegetation simulations were computed around the catchment of Lake Khamra (SW Yakutia), which experienced forest fires in the years 2007 and 2014 according to remote sensing imagery. From the lake, we previously contributed a new, sedimentary charcoal-based fire reconstruction of the late Holocene. Testing the fire module at a current study site, where modern and historic data has already been collected, allows us to improve it, and look into ways in which the fire reconstruction might help inform the model, before eventually scaling it up to cover larger regions. This represents a first step towards a reliable fire-vegetation model, able to predict future impacts of fires on both the forests of eastern Siberia, as well as the humans living there.