Assessing pyrogenic impact on Scots pine (*Pinus sylvestris L.*) stands after surface fires in Central Siberia

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In the face of increasing number of wildfires, there is no doubt about large uncertainties existing in their assessing which occur mostly on the stage of ground investigations. Whereas a lot of remote sensing data on fires are developed intensively, accurate *in situ* estimates of fire induced changes in ecosystems are still the most variable and sparse. A laser-based field instrumentation system supplemented by the other measurements (assessment of woody carbon pools, forest evaluation, vegetation and soil descriptions etc.) provides a powerful tool for comprehensive description of spatial development of wildfires within the study area. Such observations demonstrate the spatial heterogeneity of burns and how fire interacts with vegetation and topography. It permits analysis of relationships between spatial parameters and intensity of burning and thus providing estimations of fire damage of trees linked with many other related parameters within the area (such as undergrowth, slash, etc.).
Field investigations were performed on study plots established in the dominant ecosystems of Central Siberia (lichen pine, moss pine, mixed forest, dark forest and peat bog) after large-scale fires that occurred in 2012. Using a linear regressions analysis we have selected two main factors that are vital for Scots pine in survival during high-intensity ground fire: individual characteristics of a tree and spatial location (type of damages, stores of biomass available for combustion around the tree) (R = 0.81) and the diameter of root collars (R = 0.86). Surface location of root system has been found to be a reason of a strong drop in fire-resistance of Scots pine. Within the fast-moving surface fires we found out that dead trees with surface location of root system reached around 42% and after steady surface forest fire mortality could achieve up to 91%. Individual morphometric parameters of trees (big-butt, slope, and curvature of a stem) have been found to be a next influential factor of tree mortality. We found out that visible post-fire damages of stem were deadly significant for Scots pine mature trees if fire scars reached more than 2/3 of circumference (for damage of cambium layer). Such damages could be a reason of 89% mortality of Scots pine trees. In such cases if tree survived after the fire, it could be destroyed by the next fire due to increased pitch flow, which decreases fire-resistance of the tree. These results confirm that for mature pine stands surface forest fires are as dangerous as crown fires.
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