

Firebrand Generation and Transport During Forest Fires: Experimental Approach

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In recent years, the number of forest fires has been increasing in the world and in Russia, which is associated with both natural factors and the growth of anthropogenic load. The combination of these factors leads to a decrease in the area of forest territories, reduces the renewability of forest resources, which in the long term leads to a decrease in the production of timber, sawn timber, paper and other derivative products on the scale of the Russian Federation. In addition, it should be noted that as a result of natural fires a significant amount of combustion products, soot, smoke is emitted into the atmosphere, and in the case of fires in contaminated (radioactively or chemically contaminated) territories, substances dangerous to life and health of the population are released into the atmosphere at significant heights for spreading.

The sources of forest fires can be both thunderstorms and anthropogenic influence. Often the spread of the fire front is accompanied by the firebrand transport, which are intermediate condensed products of combustion. Firebrand transport is directly related to turbulent processes occurring above the hearth, and provides jump-like spread of the front, the occurrence of spot fires, which leads to an increase in the fire area and complicates its extinguishing. Investigations of firebrands and smoldering particles can be divided into three important areas: particle generation, particle transport, and particle ignition [1-2]. One of the important characteristics of firebrands generated during natural fires is the range of transfer, as well as their flight paths. The use of an infrared camera in conjunction with this installation made it possible to determine the range of transfer of burning particles and their temperature.

This paper deals with an experimental study to evaluate the firebrand generation produced by the combustion of typical forest fuels (pine needles, twigs, leaves) and the effect on a model fuel bed. Experiments on the characterization of firebrands are performed using the only generator of firebrands in Russia and the large aerosol chamber (A.E. Zuev Institute of Atmospheric Optics). The volume of the chamber is 2000 m³. This chamber illuminates the influence of side and frontal wind, which is inevitably present in field conditions and affects the characteristics of firebrands.

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References

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