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Fire activity and Aerosol Optical Depth over PEEX area for the last two decades

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The Pan-Eurasian Experiment Program (PEEX) is an interdisciplinary scientific program bringing together ground-based in situ and remote sensing observations, satellite measurements and modeling tools aiming to improve the understanding of land-water-atmosphere interactions, feedback mechanisms and their effects on the ecosystem, climate and society in northern Eurasia, Russia and China. One of the pillars of the PEEX program is the ground-based observation system with new stations being established across the whole PEEX domain complementing existing infrastructure. However, in view of the large area covering thousands of kilometres, large gaps will remain where no or little observational information will be available. The gap can partly be filled by satellite remote sensing of relevant parameters as regards atmospheric composition, land and water surface properties including snow and ice, and vegetation.

Forest fires and corresponding emissions to the atmosphere dramatically change the atmospheric composition in case of long-lasting fire events, which might cover extended areas. In the burned areas, CO2 exchange, as well as emissions of different compounds are getting to higher levels, which might contribute to climate change by changing the radiative budget through the aerosol-cloud interaction and cloud formation. In the boreal forest, after CO2, CO and CH4, the largest emission factors for individual species were formaldehyde, followed by methanol and NO2 (Simpson et al., ACP, 2011). The emitted long-life components, e.g., black carbon, might further be transported to the distant areas and measured at the surface far from the burned areas.

During the last few decades, several burning episodes have been observed over PEEX area by satellites (as fire counts), specifically over Siberia and central Russia. Fire activity can also be seen in increasing Aerosol Optical depth (AOD) retrieved from satellites, as well as fire radiative power (FRP) calculated using the satellite data. In the current work, we study the time series of the fire activity, FRP and AOD over PEEX area and specifically over selected cities.