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Monitoring of long-range transported smoke in polar regions with remote sensing instruments

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Long range transported aerosol from biomass burning affects polar regions, especially the Arctic. The frequency and intensity of bushfires in the context of a warming climate has been pointed out in the last report of the Intergovernmental Panel on Climate Change. In high latitudes, these events impact large areas through long-range transport of the smoke particles in the troposphere or even the stratosphere. The lifetime and radiative impact are related with the height of the plumes and the processes that modify particle size and absorptive properties during the transport. Several recent publications have shown the impact of the Australian smoke in the southern hemisphere, including Antarctica, in January-March 2020. The tools that were used to monitor that extraordinary event can be used in the Arctic to investigate similar effects in the frequent biomass burning events that generate smoke plumes in boreal regions. In this work, we present the results derived from ground-based instrumentation as well as satellite and model data. The change of the smoke properties after several days of transport is also provided, namely an increase in the fine mode particle size and the single scattering albedo, as well as a decrease in the coarse mode particle concentration. These features are relevant for radiative forcing calculations and therefore the impact of long range transported smoke in the radiative balance over polar regions.