The Arctic is especially sensitive to black carbon emissions from within the region

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Black carbon, also known as soot, emitted from combustion of fuels and biomass burning, absorbs solar radiation in the atmosphere and is one of the major causes of global warming, after carbon dioxide emissions. When black carbon is deposited on snow and ice, the soot-covered snow or ice absorbs more sunlight, leading to surface warming. Due to the large amount of snow and ice in the Arctic—which has warmed twice as fast as the global average over the past century—the region is likely to be especially sensitive to black carbon.

To investigate how sensitive the Arctic is to black carbon emissions from within the Arctic compared to those transported from mid-latitudes, Sand et al. conducted experiments using a climate model that includes simulation of the effects of black carbon deposited on snow.

They find that most of the Arctic warming effect from black carbon is due to black carbon deposited on snow and ice, rather than in the atmosphere. Black carbon emitted within the Arctic is more likely to stay at low altitudes and thus to be deposited on the snow and ice there, whereas black carbon transported into the Arctic from mid-latitudes is more likely to remain at higher altitudes. Because of this, the Arctic surface temperature is almost 5 times more sensitive to black carbon emitted from within the Arctic than to emissions from mid-latitudes, the authors find.

They note that although there are currently few sources of black carbon emissions within the Arctic (the most dominant ones are oil and gas

fields in northwestern Russia), that is likely to change as human activity in the region increases. Therefore, the authors believe there is a need to improve technologies for controlling black carbon emissions in the Arctic.

More information: Arctic surface temperature change to emissions of black carbon within Arctic or mid-latitudes, *Journal of Geophysical Research-Atmospheres*, DOI: 10.1002/jgrd.50613, 2013 onlinelibrary.wiley.com/doi/10 … /jgrd.50613/abstract

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