High-latitude Flaring Black Carbon and Arctic Climates

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Flaring is a common method to constantly combust of gaseous and liquid hydrocarbons that are potentially explosive at oil/gas production and processing sites. It accompanies producing black carbon as a particulate matter, which does not take into account the IPCC AR5. However, in high-latitudes, the black carbon is potentially an important aerosol when it is deposited in white snow or ice. In this study, we conducted modeling sensitivity experiments to quantitatively evaluate the effect of flaring black carbon emissions of the 2000's Arctic climate. We prescribed realistic black carbon emission by the gas flaring over high-latitude in the model simulation. As a result, although the emission of black carbon by flaring is constant throughout the year, its impact on climate is different by season. The impact was great in spring and winter. In spring, the albedo reduction effect caused by the surface deposition of black carbon was the largest, resulting in a warming effect. Changes in the circulation field and the Arctic sea-ice caused by the flaring black carbon in the winter increased the Arctic temperature.