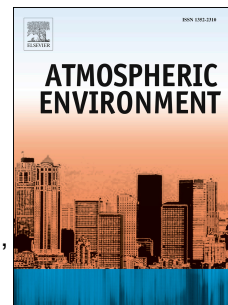


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Black carbon emissions in Russia: A critical review

Meredydd Evans, Nazar Kholod, Teresa Kuklinski, Artur Denysenko, Steven J. Smith, Aaron Staniszewski, Wei Min Hao, Liang Liu, Tami C. Bond



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1 **Black carbon emissions in Russia: a critical review**

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16 17 HIGHLIGHTS

- 18
19 • The paper reviews studies on Russia's black carbon emissions to present an updated inventory.
20 • The study also adds organic carbon and uncertainty estimates.
21 • Russia's black carbon emissions are estimated at 688 Gg.
22 • Russian policies on flaring and on-road transport appear to have significantly reduced black
23 carbon emissions in recent years.
24 • Using the new inventory, the study estimates Arctic forcing.

25 26 *Keywords:*

27 Black carbon

28 Organic carbon

29 Russia

30 Emission inventory

31 Radiative forcing

32 33 ABSTRACT

34 This study presents a comprehensive review of estimated black carbon (BC) emissions in Russia from a
35 range of studies. Russia has an important role regarding BC emissions given the extent of its territory
36 above the Arctic Circle, where BC emissions have a particularly pronounced effect on the climate. We
37 assess underlying methodologies and data sources for each major emissions source based on their level of
38 detail, accuracy and extent to which they represent current conditions. We then present reference values
39 for each major emissions source. In the case of flaring, the study presents new estimates drawing on data
40 on Russia's associated petroleum gas and the most recent satellite data on flaring. We also present
41 estimates of organic carbon (OC) for each source, either based on the reference studies or from our own
42 calculations. In addition, the study provides uncertainty estimates for each source. Total BC emissions are
43 estimated at 688 Gg in 2014, with an uncertainty range 401 Gg-1,453 Gg, while OC emissions are 9,224
44 Gg with uncertainty ranging between 5,596 Gg and 14,736 Gg. Wildfires dominated and contributed
45 about 83% of the total BC emissions: however, the effect on radiative forcing is mitigated in part by OC
46 emissions. We also present an adjusted estimate of Arctic forcing from Russia's BC and OC emissions. In
47 recent years, Russia has pursued policies to reduce flaring and limit particulate emissions from on-road
48 transport, both of which appear to significantly contribute to the lower emissions and forcing values found
49 in this study.

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