Supplementary Material

Reviews & Syntheses: Arctic Fire Regimes and Emissions in the 21st Century

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Supplemental Tables and Figures

Table S1: Key terms referenced in the manuscript.

Key Term	Definition used in this manuscript
Fire regime	Fire activity for a region or landscape defined by fire frequency, typical sizes of fires, annual burned area, severity, seasonality, fire type, and ignition source.
Fire risk	Likelihood of a fire occurring; no typical fire behavior or intensity is assumed.
Fire season	General time period that fires have occurred in the recent past (i.e., decade); in the boreal and Arctic this is often variable based on snow cover, depth, and melt as well as onset of winter weather.
Open biomass burning	All vegatative biomass burning across wildland and human-dominated landscapes, including wildfires, forest fires, agricultural open burning, and prescribed burning.

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Table S2. Black carbon emissions in teragrams (Tg) from reported statistics on burned area in the Arctic member states; sources for burned area from [a](Alaska Division of Forestry, 2020); [b](CIFFC, 2020) ; [c](Markuse, 2019); [d](DSB, 2020); [e](Betänkande av 2018 års skogsbrandsutredning, 2019); [f](Ketola, 2020); [g](ФБУ "АВИАЛЕСООХРАНА", 2019); fuel loadings and combustion completeness from Van Leeuwen et al. (2014) for boreal forests, with tundra values used for Greenland and temperate forests for the CONUS; emission factors for BC taken from GFEDv4s with 0.5 g/kg assigned to boreal forest ecosystems, 0.55 g/kg assigned to temperate forests, and 0.04 g/kg assigned to peat for Greenland.

Country/ Region	Year	Official Burned Area (km²)	Fuel Loading (kg/km²)	Black Carbon Emission Factor (g/kg)	Combustion Completeness (%)	Black Carbon Emission (Tg)
USA/ Alaska	2019	10,481[a]	1080	0.5	47	2.66E-06
Canada	2019	18,389[b]	1080	0.5	47	4.67E-06
Denmark/ Greenland	2019	8[c]	1650	0.04	24	1.27E-10
Norway	2019	0.03[d]	1080	0.5	47	7.61E-12
Sweden	2018	250[e]	1080	0.5	47	6.30E-08
Finland	2019	6[f]	1080	0.5	47	2.00E-09
Russia	2019	100,785[g]	1080	0.5	47	2.56E-05
USA/ CONUS	2019	18,876[h]	1610	0.55	61	1.02E-05

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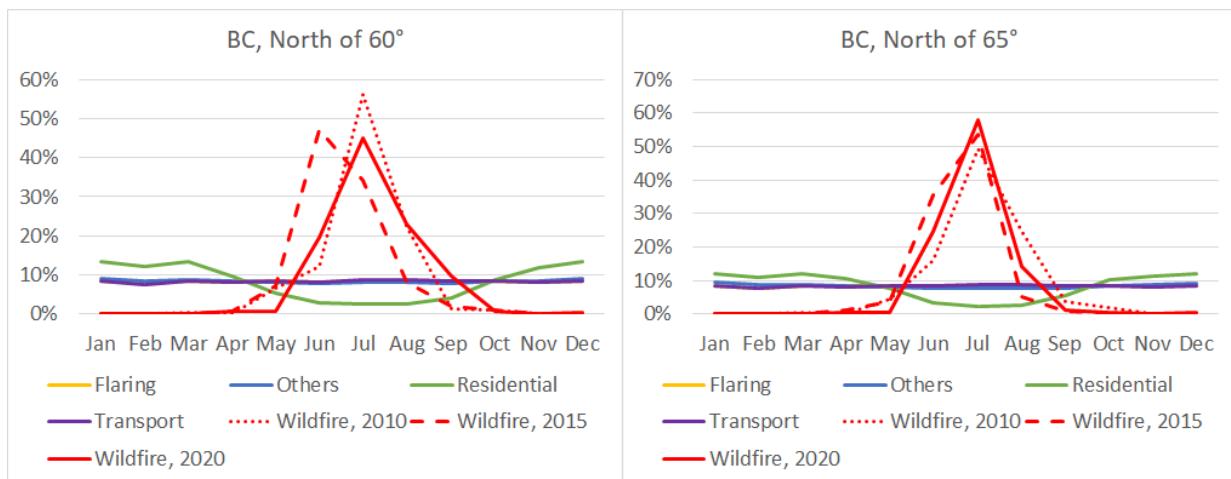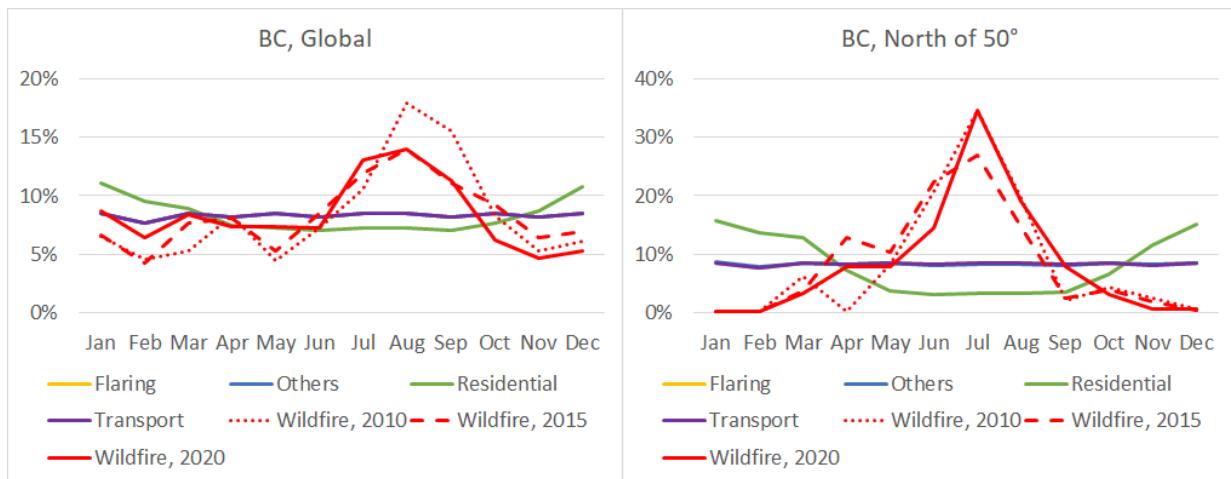
Figure S1. Percentage of monthly emissions of the annual total for each sector from 2015 GAINS anthropogenic sources and 2010, 2015, and 2020 GFAS wildfire estimates.

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42   **Table S3.** Sectoral black carbon emissions in kilotons above 60° N and 65° N for 2010, 2015, and 2020.

BC (kilotons)	Residential	Transport	Flaring	Others	Wildfire	Total
North of 60°	**22**	**32**	**141**	**6**	**315**	**516**
2010	9	14	56	2	84	165
2015	7	11	41	2	63	124
2020	6	8	44	2	168	227
North of 65°	**3**	**10**	**52**	**1**	**128**	**194**
2010	1	4	21	0	18	44
2015	1	3	15	0	17	37
2020	1	2	16	1	93	113

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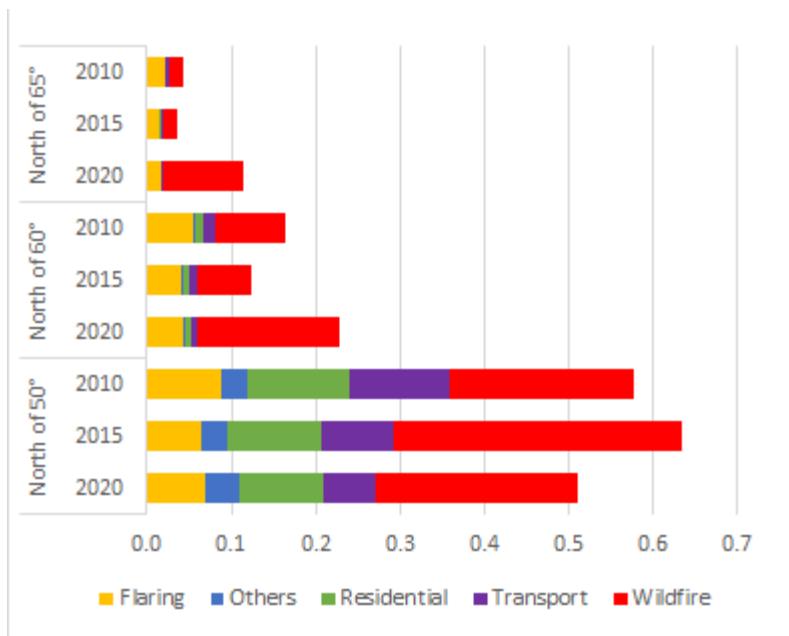
Figure S2. Sectoral black carbon emissions in Tg above 50°N, 60°N, and 65°N for 2010, 2015, and 2020.