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Supplement of

Brown carbon aerosols from burning of boreal peatlands: microphysical properties, emission factors, and implications for direct radiative forcing

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SUPPLEMENTARY INFORMATION

Fuel Collection and Preparation: The peats we used in this study were from two geographic sources: Siberia, Russia, and Alaska, USA. Alaskan peat samples used in this study were from the upper 10 cm of soils within black spruce (*Picea mariana*) forests, collected and stored as solid pedons to minimize disturbance to soil physical characteristics subsequent to collection. Alaska peat samples were stored below 0° C following collection and were insulated/refrigerated during transport and shipment. Siberian samples used in this study were collected from the upper 10 cm of soil in bogs dominated by *Sphagnum* and cottongrass (*Eriophorum*). Following collection, Siberian samples were dried to constant weight at 105° C for transport to the Desert Research Institute per USDA Animal and Plant Health Inspection Service (APHIS) permit requirements. Alaskan samples were dried to constant weight at 100° C prior to preparation for combustion. Then, each peat sample was individually rewetted using deionized water to a moisture content of 25% by mass, then stored in vapor-tight containers at 4° C until approximately one day prior to combustion, when samples were removed from refrigeration and allowed to equilibrate with ambient temperature before being placed in the combustion vessel and ignited.

Fuel-based emission factor calculation. Fuel-based emission factor (EF) is the mass of a compound released per mass of fuel consumed, and is related to the amount of carbon in the fuel as:

\[
EF_j = \frac{M_j}{M_{fuel}} = \frac{M_j}{C_{ash} + \sum C_i} x_{c,fuel} = \frac{M_j}{\sum C_i} \left( \frac{\sum C_i}{C_{ash} + \sum C_i} \right) x_{c,fuel} = \frac{M_j}{\sum C_i} \left( x_{c,fuel} - \frac{M_{ash}}{M_{fuel}} x_{c,ash} \right)
\]

*EF*$_j$: emission factor of species *j*

*M*$_{fuel}$: mass of the fuel burned

*M*$_j$: mass of the species *j* emitted

*C*$_{ash}$: carbon mass in ash

*C*$_i$: carbon mass in every combustion product *i* (CO$_2$, CO, etc., including species *j*)

*x*$_{c,fuel}$ and *x*$_{c,ash}$: carbon mass fraction in fuel and ash, respectively