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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:

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

$EF_j$ : 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<sub>2</sub>, CO, etc., including species  $j$ )

$x_{c,fuel}$  and  $x_{c,ash}$ : carbon mass fraction in fuel and ash, respectively