

Emission Factors and Optical Properties of Black and Brown Carbon Emitted at a Mixed-Conifer Forest Prescribed Burn

The authors presented results from their field measurements of both black carbon (BC) and brown carbon (BrC) emissions from prescribed burns at a mixed-conifer forest site in California. The measurement techniques and data analysis were presented succinctly in the manuscript. The main takeaway of the study was also stated clearly that: (1) modified combustion efficiency (MCE) is a poor indicator of BC emission factor; (2) there is a clear difference between the determined BC emission factor and the current modeling inventory; and (3) BrC plays an important role in tropospheric photochemistry and contributes >20% of total solar absorption by smoldering smoke in the atmosphere.

General comment:

The study was described and presented clearly via both equations and figures in both the main manuscript and the supporting information document. The implied significant contribution of brown carbon aerosols to tropospheric photochemistry and total solar absorption in the atmosphere suggests that there should be more field studies of prescribed burns especially at different ecosystems. In addition, the significant difference in BC emission factor between what is currently used in the national and California emission inventory and this study also suggests that we should perform more field measurements to make sure we are representing the fire emissions appropriately in the models.

Specific comments/questions:

L30: the authors should define 'MCE' in the Abstract like they did AAE.

L35: this may not be completely necessary, but it would be nice to include the **reference** for the delta-C method for readers unfamiliar with it.

L219: "...the filter became saturated at an ATN reached 100." – this part of the sentence reads weird and should be re-written.

L265: There is no Figure 1a. Figure 1?

L 269: similar magnitude "as" the average emissions

L349-350 (Figure 4 caption): should AAE-BrC = 6.26 as mentioned in the text (L333) and on Figure 4b instead of 3.43?

L373-375: did you mean 470,660 wavelength pair as being 11% greater than the 7-wavelength power fit of this work, since the averaged AAE of the former is 2.82 vs. 2.55 of the latter? Similarly, you mean the 470,880 wavelength pair as the 16% lesser value?

If the authors were to conduct additional field measurements of prescribed burns, what ecosystem would they focus on and why? Do the authors anticipate similar BC and BrC emission factors and AAE in a different ecosystem or different region (e.g., North East US)?