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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Particulate emissions from large North American wildfires estimated using a new top-down method" *by* T. Nikonovas et al.

**Anonymous Referee #1**

Received and published: 31 August 2016

General Description of manuscript:

The authors use MODIS and AERONET AOD and HYSPLIT to estimate total particulate matter emissions from temperate and boreal fires and compare their estimates to values from biomass burning emission inventories.

General Comments:

Section 2.3 (Plume Dispersion Modelling) is not well described. Was the same particle number used for the two fire types (boreal and temperate)? Is this reasonable? Are there references to support this approach? What are the two different rates that are used for day and night emissions? Are there references to support different day/night



rates? When no fires were detected, why set the count to a minimum positive value instead of zero? Is this to account for undetected fires? What support is there for this approach? Please rewrite this section for clarity.

Water Content Retrieval. How do aerosol water fractions estimated in this work compare to aerosol water content that would be estimated using representative hygroscopic growth factors for representative relatively humidities?

The authors use "emission coefficients" in the text. Are these distinct from emission factors? If not, then rather use emission factors, as this is common terminology. If so, then please clarify the distinction in the text.

Specific Comments:

Abstract: FRP is used in the Abstract (and Introduction), but the acronym is only defined on page 10.

Abstract, line 20: Is "low bias" meant to be "negative bias"?

Page 2, line 19: Is the 3.4 correction factor applied to address an underestimate or overestimate in emissions? Please be specific.

Page 2, lines 32-34: This sentence is confusing. Please reword for clarity. Currently it reads that average EFs conceal the lack of spatial and temporal representativeness. Is this what the authors mean to say?

Page 3, lines 2-3: Isn't the approach in this study also susceptible to AOT retrieval errors and uncertainties in smoke particle properties?

Page 3, line 24: Please provide an appropriate reference or website for the MCD14ML data.

Page 4, lines 2-3: The approach used to identify fires is confusing. Are the "any pixels" pixels that include an active fire? Should there be consecutive active fire pixels within a 150 km radius? Please clarify in the text.

Page 5, lines 10-11: The change in resolution from nadir to the swath edges is true for the native resolution of the instrument, but the AOT product is at a nominal resolution of 10 km x 10 km.

Page 5, line 12: More appropriate is the MODIS AOT uncertainty for scenes with aerosols from boreal and temperate fires. Please either estimate the error by comparing MODIS and AERONET AOT or provide a value reported in the literature.

Figure 3: What is the mass concentration of individual aerosol components (inorganic, organic, black carbon) from boreal and temperate fires estimated in this study?

Page 6, lines 6-7: This sentence is unclear. Is this merely a scaling to convert AOT to fire-emitted particle number?

Table 1: Please change density to the Greek letter "rho" and enclose the units for density in square brackets for clarity.

Page 7, line 19: Why list both "organic carbon" and "organic matter"?

Page 8, lines 19-20: Incorrect in-text citation format for Ichoku and Ellison (2014). Please fix.

Page 10, lines 27-28: How different is median FRP for the two fire classifications if normalized to burned area or mass of biome burned?

Page 10, line 33: Would smouldering fires be detected as part of the large wildfire events that are isolated in this work?

Page 11, line 15: What is "(4)" referring to? Is this Figure 4?

Page 11, line 17: Are the median water volume values fraction or percent? Fraction is stated, but the "%" symbol is used (page 12, line 1).

Figure 5: This figure is out of sequence in the text. It is referred to in the text before Figure 4. Please fix.



Page 14, line 17: Is 80% relative humidity?

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