

Interactive comment on “Daily black carbon emissions from fires in Northern Eurasia from 2002 to 2013” by Wei Min Hao et al.

Anonymous Referee #1

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Comments to “Daily black carbon emissions from fires in Northern Eurasia from 2002 to 2013 ” by Hao et al.

Hao et al. presented a new data set of black carbon emissions from open biomass burning for northern Eurasia based on a burned area algorithm using MODIS data as input. The spatial (500m) and temporal (daily) resolutions of this data set are high enough to make it useful for regional and global atmospheric studies thus it represents a valuable contribution. They also examined the seasonal patterns for fire activity and BC emissions for different land cover types and shed insights on the interactions of forest fire, spring snow dynamics and arctic ice dynamics. I find generally the manuscript well prepared and easy to follow with all methods and data sets used being clearly described.

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Where possible, the derived burned area and BC emissions are compared with other data sets (such as MCD45 and GFED4). The authors found significantly higher burned area and BC emissions than GFED4, which is now widely used in the fire and atmospheric studies. The central objective of this study is to present the new BC emissions data set derived using a bottom-up approach. It's important that validation information of burned area, comparison with other data sets regarding derived biomass consumption in fires, and uncertainty information of BC emissions should be sufficiently discussed. These points are detailed in the general comments as below. I recommend the manuscript being accepted after the authors adequately address these points.

General comments:

- The burned areas derived by the authors are in close agreement with MCD45 data, this is very good. I believe more details regarding validation of the algorithms for burned area used in the study could be useful, for example the error characterization process and the error information (commission and omission errors) obtained when validating burned area with high-resolution reference BA data. So far only one reference is (Hao et al. 2014) however this one is not found in the reference list.
- In section 4.1 the BC emissions are compared with GFED data. The BC emissions derived in this study much higher than GFED4. However here mainly simple comparisons are presented. The BA from all land cover types in this study is roughly twice that of GFED4, however total BC emissions are 3.5 times higher if I understand well and so the ratio is much higher than BA. Is this because of the higher emission factors used or higher fuel consumption rates? It would be nice to present the typical fuel consumption rates in fire for different land cover types the authors have obtained before converting to BC emissions. Then the readers might have better understanding how these differences arise.
- I understand it could be difficult to generate completely quantitative uncertainty information for BC emissions using error propagation because statistical distribution as-

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sumptions then have to be made regarding major input variables in the equation to calculate BC emission. However a general discussion on uncertainty of derived BC emissions is still useful to guide potential data users.

Technical comments:

P3-line 27: I don't find the Hao et al., 2014 in the reference list, this is a very important reference as burned area algorithm should be validated there.

Figure 2 – “forests and non-forests” are both explicitly included in the caption of this figure. I find this a little misleading because one may expect that burned area for forests is shown separately with that for non-forests from reading the title but this is not the case.

P6-line16-17: what is the trend for BC emissions over forest?

P6-line27-29: are these grassland fire emissions with bimodal temporal distributions are also spatially separated?

P7-line 9: The “Evangeliou et al., 10 this issue ” is missing in the reference list.

P7-line16-17: I don't fully understand here why BC emissions from agricultural fires are excluded when comparing GFED4 and GFED3. Comparison of BC emissions between GFED4 and GFED3 excluding agricultural fires is a little distracting here because all remaining parts in the same paragraph focus on the total emissions from all land cover types.

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