Supplement of

Diagnosing uncertainties in global biomass burning emission inventories and their impact on modeled air pollutants

Wenxuan Hua[1,2,] Sijia Lou[1,2,3*], Xin Huang[1,2,3], Lian Xue[1,2,3], Ke Ding[1,2,3] Zilin Wang[1,2], Aijun Ding[1,2,3]

[1] Joint International Research Laboratory of Atmospheric and Earth System Sciences, School of Atmospheric Sciences, Nanjing University, Nanjing 210023, China.

[2] Jiangsu Provincial Collaborative Innovation Center for Climate Change, Nanjing, China.

[3] Frontiers Science Center for Critical Earth Material Cycling, Nanjing University, Nanjing, China.

Corresponding author: Sijia Lou (lousijia@nju.edu.cn)

LCT		FINN1.5	GFED4s	QFED2.5	VFEI0
Tropical	Evergreen Broadleaf Forest	Tropical forest	Tropical forest	Tropical forest	Tropical forest
	Closed Shrublands	Tropical forest	Tropical forest	Tropical forest	Tropical savanna
	Open Shrublands	Savanna	Savanna	Savanna	Tropical savanna
	Woody Savanna	Tropical forest	Tropical forest	Tropical forest	Tropical savanna
	Savanna	Savanna	Savanna	Savanna	Tropical savanna
Temperate	Evergreen Needleleaf Forest	Boreal forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate forest
	Evergreen Broadleaf Forest	Tropical forest	Temperate forest	Temperate forest	Temperate forest
	Deciduous Needleleaf Forest	Boreal forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate forest
	Deciduous Broadleaf Forest	Temperate forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate forest
	Mixed Forest	Temperate forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate forest
	Closed Shrublands	Temperate forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate savanna
	Open Shrublands	Savanna	Savanna	Savanna	Temperate savanna
	Woody Savanna	Temperate forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Temperate savanna
	Savanna	Savanna	Savanna	Savanna	Temperate savanna
Boreal	Evergreen Needleleaf Forest	Boreal forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Boreal forest
	Deciduous Needleleaf Forest	Boreal forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Boreal forest
	Mixed Forest	Temperate forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Boreal forest
	Closed Shrublands	Boreal forest	Extratropical forest(50-70° N Boreal forest)	Extratropical forest	Boreal savanna
	Open Shrublands	Savanna	Savanna	Savanna	Boreal savanna
	Woody Savanna	Boreal forest	Extratropical forest	Extratropical forest	Boreal savanna
	Savanna	Savanna	Savanna	Savanna	Boreal savanna
	Grasss	Savanna	Grass	Grass	Grass
	Urban and Built-Up	bare	Grass	Grass	Grass
	Crops	Crop	Crop	Grass	Crop
	Crop/Natural Vegetation Mosaic	Grass	Crop	Grass	Crop
	Permanent Wetlands	Grass	Peatland	Grass	Peatland
	Snow and Ice	bare	Grass	Grass	Desertic areas
	Barren or Sparsely Vegetated	Grass	Grass	Grass	Desertic areas

Legend:
- Tropical forest
- Temperate forest
- Boreal forest
- Extratropical forest
- Savanna and Grass
- Crop
- Peatland

Figure S1. LULC classifications and seven generic land cover classes as assigned by four BB datasets.
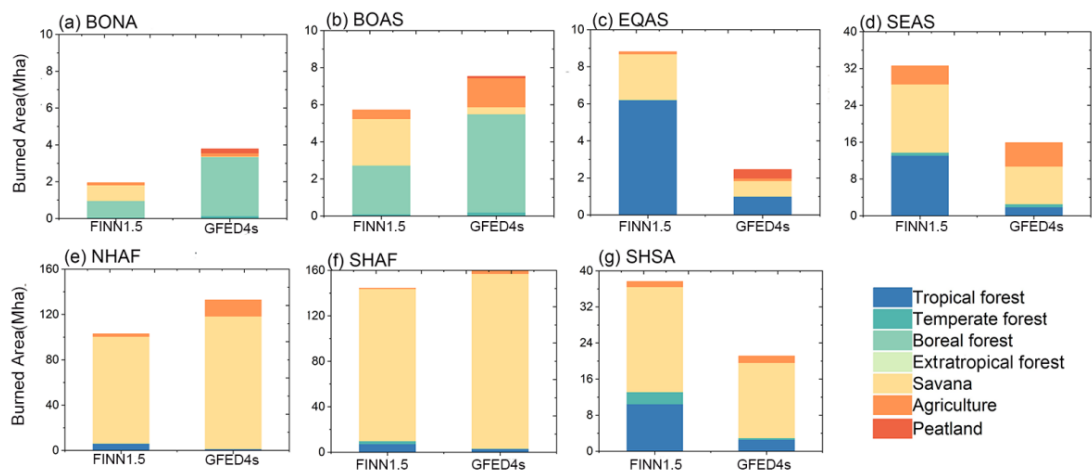
Figure S2. Burned area of two bottom-up datasets (namely FINN1.5 and GFED4s) across seven regions during 2013-2016.
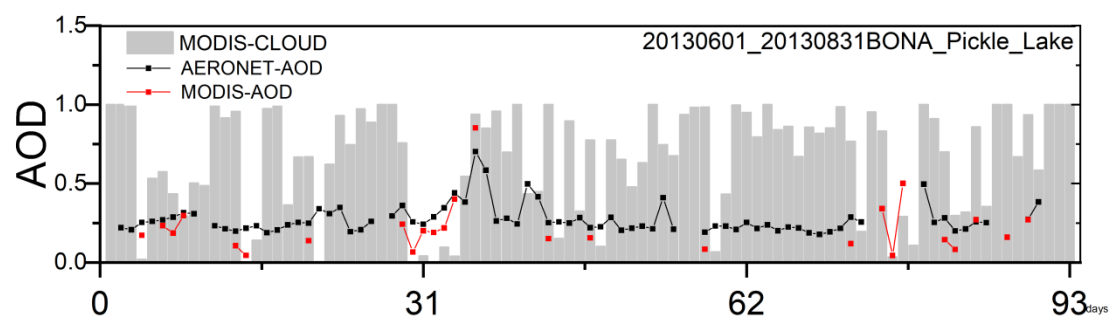
Figure S3. The time series of MODIS AOD, MODIS cloud fractions and AERONET ground-based observations during the combustion at Pickle Lake station in BONA. It shows that there are more missing detections in MODIS (red dots), which directly demonstrates that clouds will block the observations of MODIS.
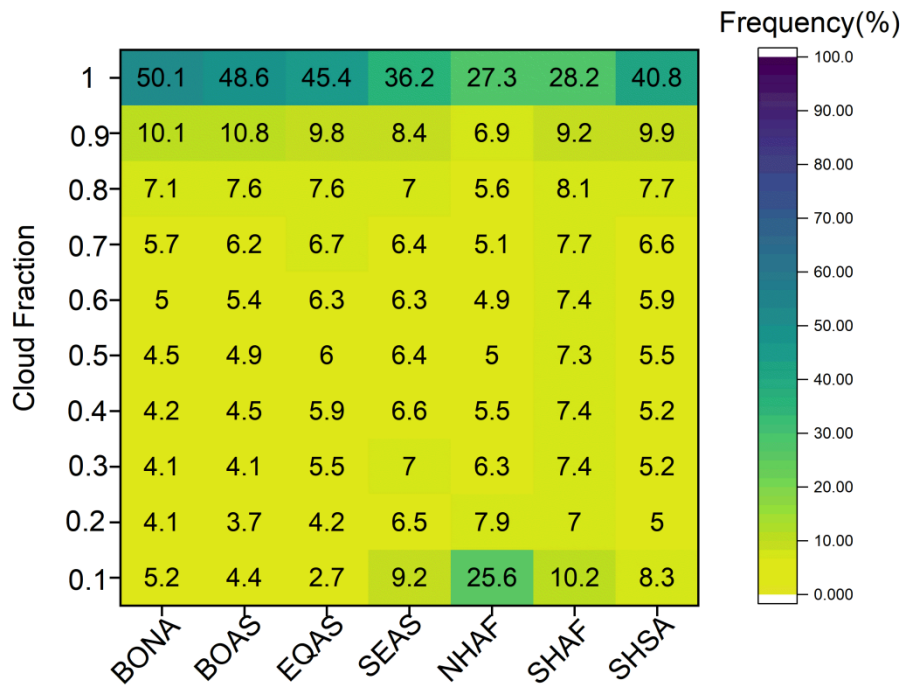
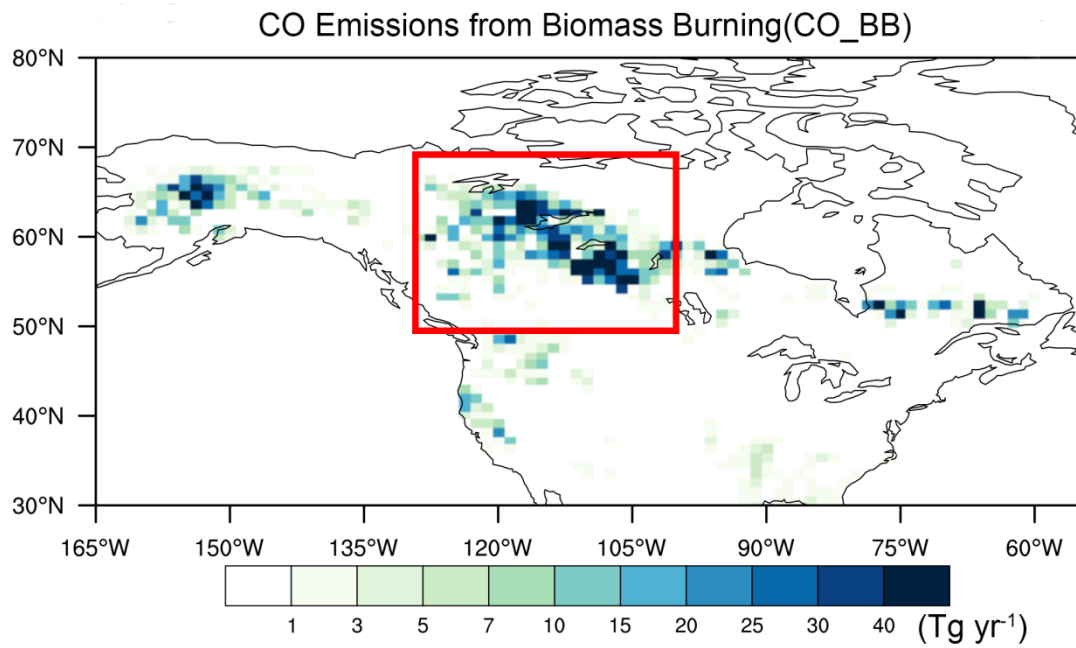Figure S4. Annual mean frequency of different cloud fractions across seven BB regions from 2013 to 2016.

Figure S5. The spatial distribution of CO emissions in BONA, and the region with high BB emissions is marked with red box, namely Alberta and Saskatchewan in Canada within 50°E - 70°E and 100°W-130°W.
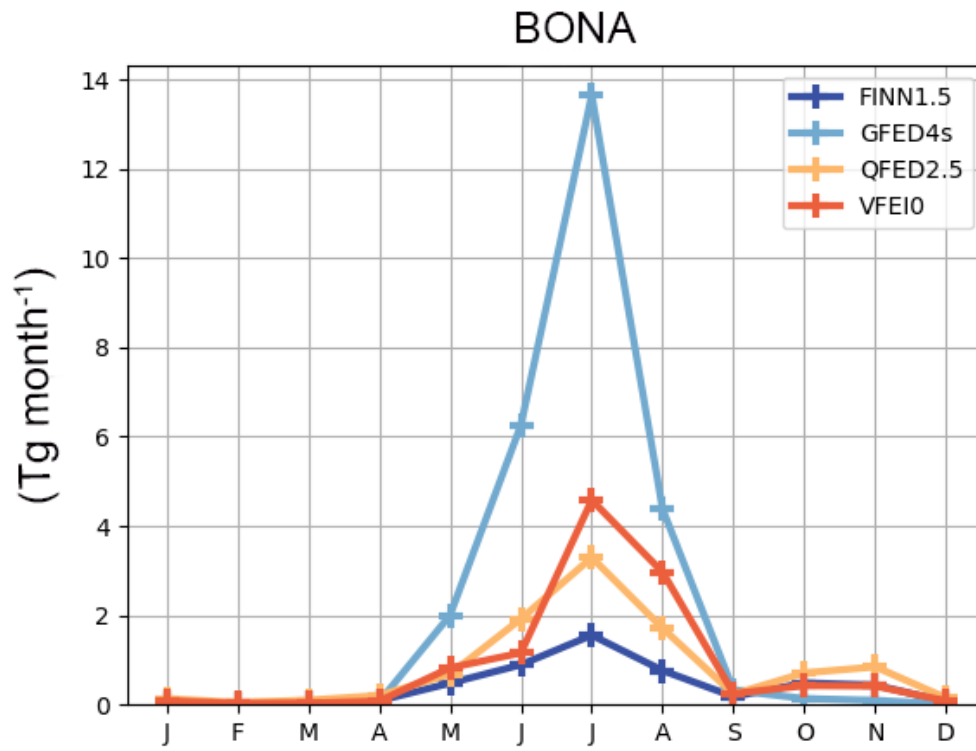
Figure S6. Monthly variation of CO biomass burning emissions in BONA among four BB datasets, mean values from 2013 to 2016 were used.
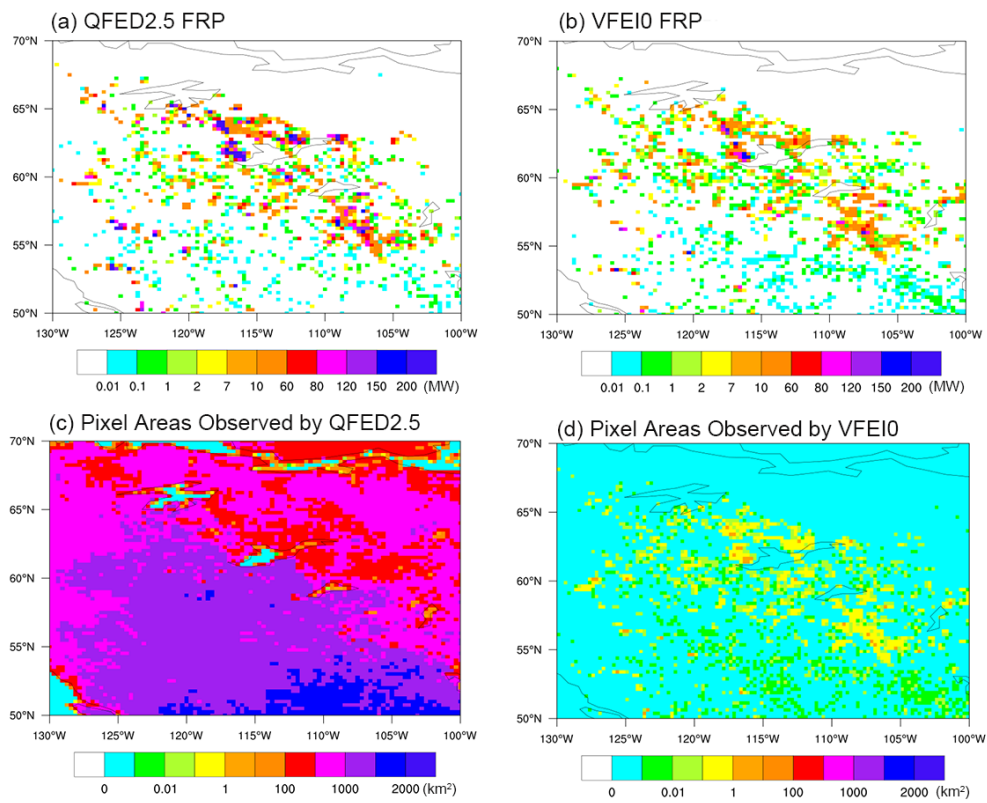
Figure S7. (a-b) Distribution of FRP and (c-d) satellite pixel area of QFED2.5 and VFEI0 in the region shown in Figs. 5 during each July from 2013 to 2016. In this study we use the mean FRP of MOD and MYD for QFED2.5 since the VFEI0 FRP is the average between day and nighttime observations.
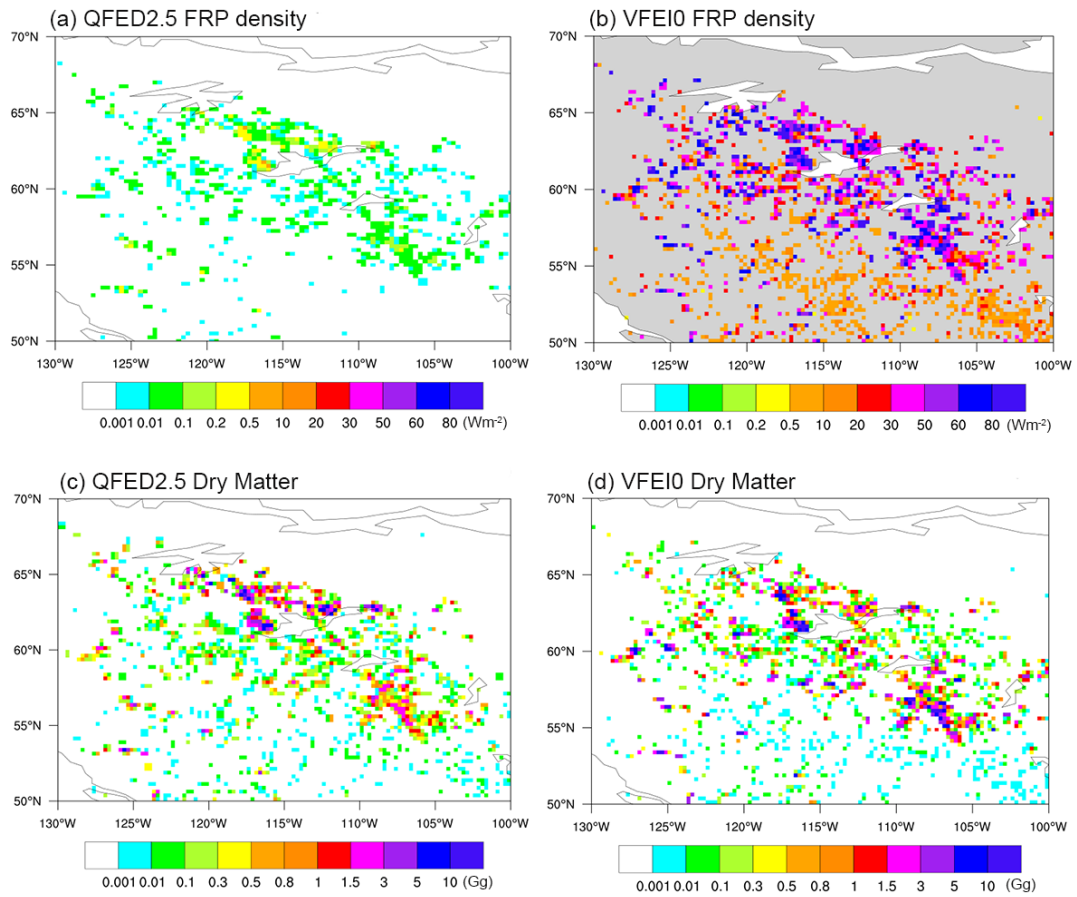
Figure S8. (a-b) Distribution of FRP density and (c-d) final DM in QFED2.5 and VFEI0 in the region shown in Figs. 5 during each July from 2013 to 2016.