# Introducing a VIIRS-based Fire Emission Inventory version 0 (VFEIv0)

Gonzalo A. Ferrada et al.
gonzalo-ferrada@uiowa.edu

**Response to RC2**

We thank the reviewer for their time invested in reviewing this manuscript. Your comments were very helpful, and we incorporated most of the suggestions in the revised version of the manuscript.

We responded to the specific comments in line and in blue.

Biomass burning emissions are one of the large sources of uncertainty in modeling atmospheric composition. This paper describes a new fire emissions inventory that is based on fire radiative power measured by a relatively new satellite instrument (VIIRS), with high spatial resolution. There is a very wide range in emissions estimated by available biomass burning inventories, and this new inventory generally falls in that range. This work is valuable for providing another global inventory at higher spatial resolution than some others. It also contributes to quantifying the uncertainty in fire emissions by using slightly different input data sets and procedures than other inventories.

The paper is clearly written, and the creation of the inventory is described well. The resulting emissions are available on a public website in netcdf files, so readily usable by the community.

The emissions are compared to other inventories in clear plots. Simulations with WRF-Chem using the new emissions, for a couple of regions (N.America, S. Africa) for short time periods, are evaluated with observations and show reasonable performance.

Listed below are a few technical corrections and suggestions for clarifying the text. There are a number of preposition errors (in/on/at) that I have not bothered to list, so additional proof-reading is recommmended.

l. 29: 'are used' -> 'are used for'

Done.

Lines 42 & 202 & Table 4: FINNv1.5 does not use MODIS Burned Area products. Fire locations are determined from MODIS Thermal Anomalies, and the size of the fire is determined by other means. See Wiedinmyer et al 2011 for details on how the area of each fire is determined.

We modified the description of FINN following Wiedinmyer et al. (2011).

l.119: mid-202 -- which year?

Mid-2021. We corrected this.

l.129: hotpots -> hotspots

Corrected.

l.168-171: This is not explained well; I do not understand how the factor 1.2 is found. The statement "using the same methodology described here" is unclear.

The factor 1.2 was found by using the MODIS active fire product (instead of VIIRS') and using it to generate emissions with it. This is, we applied the same methodology as described for VFEI (data filtering, aggregation, etc.). Globally, we found that the FRPs from MODIS were 20% higher than the ones from VIIRS. In the text we speculate that this may be due to the fact of having a double number of observations from MODIS (Terra and Aqua) when compared to the VIIRS onboard of Suomi-NPP. Hence, VIIRS may be missing the detection of some fires occurring at other times, among other possible causes.

In our first version of the manuscript, we did not explain this further, because these are basically the same findings of Li et al. (2018). The revised version includes a better explanation on how we found this factor and the limitations of this method.

l.199: 'other four' -> 'four other'

Done.

l.200: 'rely in' -> 'rely on'

Fixed.

Fig. S1: reference to Figure X.

Corrected. It now references to Figure 1.

l.418, 420: Figure 6d -> 5d; 4c -> 3c

Fixed. Thanks!

l.436: FINN also provides emissions for each 1-km fire.

Added to the list.

l.439: 'If VFEI would have' -> 'If VFEI had'

Corrected.

Section 5 and Fig. 13: I do not follow the reasoning that the fire emissions at 0.1 degree are necessarily represented in a 3-km grid as shown in Fig.13b. Some models (modelers) would use the 0.1-deg emissions in all the 3-km grid boxes that fall within that box (of course conserving mass). I do not dispute the value of having the finer resolution representation of fire emissions that VFEI provides, but I would guess that the step from panel (a) to panel (b) is not universally, or even generally, applied. The discussion should be qualified, or perhaps just leave out row (b) of Fig. 13.

We modified this section to reflect your reasoning. What you state is true: there are different ways to address this issue but the figure (as its caption indicates) and the purpose of this section is just to give an example. Distributing the emissions within all the grid boxes that fall within the coarser resolution inventory would not be much of a problem for the case shown in the example (the Williams Flats fire was a single large fire event that covered several grid boxes). However, applying this as a standard method for all fires could create unrealistic results for the case of small fires of -for instance- 1 hectare with no other fires around (e.g., agricultural fires in Europe).