**Reply to referee 1 (RC1), Joao Silva**

We thank Dr. Silva for his constructive comments; below we first repeat his comment and then show our response.

**Comment 1:**

In the Model Description section, model parametrization (e.g. light-use efficiency, turnover rates) is defined according to biome-specific values. However, in the Input Datasets section it is said that "The classification of biomes was based on the MODIS MCD12Q1 land cover type product". A biome and a land cover type have different meanings. I understand and agree with the approach of using an input of landcover type with a relatively high spatial resolution, instead of biomes. I just suggest to acknowledge in this part of the manuscript the difference between biome and landcover type.

**Response to comment 1:**
We changed:
Page 8, line 4-5: 'The classification of biomes was based on the MODIS MCD12Q1 land cover type product, collection 5.1 (Friedl et al., 2010).'

To:
Page 8, line 6-7: 'We delineated biomes in terms of land cover types based on the MODIS MCD12Q1 land cover type product, collection 5.1 (Friedl et al., 2010).'

This was done to stress that land cover types are used to demarcate biomes.

**Comment 2:**

"Fire return times", used several times in the manuscript, should be replaced with "fire return interval", the terminology usually followed when describing fire regimes.

**Response to comment 2:**
We agree and changed all occurrences of fire return time(s) to fire return interval(s).

**Comment 3:**

FireMIP should be defined and a reference added.

**Response to comment 3:**
Page 4, line 28: We have added the definition of the abbreviation 'FireMIP' and moved the reference to Rabin et al. (2017) following the abbrevation.

**Comment 4:**

In the Fire Emissions section, it is mentioned that “The spatial distribution of emissions was dictated by burned area (Fig. 4a).” It would be very useful to add a map of burned area in Africa to figure 4.

**Response to comment 4:**
For clarification we have added a map of average annual burned area in Africa to Figure 4.

**Reply to referee 2 (RC2), anonymous**

We thank the reviewer for a constructive review with helpful comments that strengthen the paper. Below we first repeat the comment and then show our response.

**Comment 1:**

Page 2, line 4-6, if not too much trouble, a short comment to explain the difference between Africa's share of burned area (70%) and fire carbon emissions (roughly half) would be welcome.

**Response to comment 1:**
We have added to the sentence:
Page 2, line 4-6: 'About 70% of global burned area occurs in Africa (Giglio et al., 2018), mostly due to surface fires with relatively low fuel consumption, leading to roughly half of the global fire carbon emissions (van der Werf et al., 2010).'

**Comment 2:**

Page 2, it would be desirable to link better paragraphs 2 and 3, maybe by harmonizing the terms used: is the "fuel load model" of paragraph 2 a component of the "fire emission model" of paragraph 3 (for the burned area approach)? This is clarified later at line 33, but maybe a clearer definition of "fire emission model" and of its components could be a good idea.

**Response to comment 2:**
We confirm that the 'biogeochemical model' or 'fuel load model' mentioned in paragraph 2 is indeed a component of the fire emission model in paragraph 3. To clarify this, we have changed Page 2, line 14-15 to:
'Two main satellite-based approaches to model fire emissions exist, based either on observed burned area in combination with a biogeochemical or fuel load model, …'

**Comment 3:**

Page 4, line 25, maybe emphasize that the work focused on the burned area approach (accounting for small fires using active fire). Some of the results can certainly be used for fire estimates based on active fires (I am thinking of the biome related error for example), but probably not all of them.

**Response to comment 3:**
To clarify that we focused on the burned area approach we modified the sentence to:
Page 4, line 29-30: 'To this end, we developed a fire emission model driven by burned area and capable of running at 500-meter spatial resolution, to produce a first emission estimate at this resolution for sub-Saharan Africa.'

**Comment 4:**

It would certainly help the reader to have a geographical map showing the different biomes in Africa as used in the fire emission model. This could either be a new plot, or be shown together with Figure 6, 8 or 9 for example.

**Response to comment 4:**
For clarification we have added a map of MODIS land cover types in Africa to Figure 4.

**Comment 5:**

The impact of the meteorological input was not discussed, understandably since no consistent dataset at a resolution finer than 0.25° exist for the period considered. The ECMWF high resolution now proposes meteorological output at 0.1° resolution, so maybe for later work the impact of meteorological input could be considered as well.

**Response to comment 5:**
In the discussion on Page 22, line 6-7 we have added a sentence:
'We aim to substitute all remaining coarse resolution input data with finer resolution data when available, e.g. by using data from ERA5 (Hersbach and Dee, 2016).

**Reply to the Executive editor (SC1), Astrid Kerkweg**

We have modified the title to: “Modelling biomass burning emissions and the effect of spatial resolution: a GFED-based case study for Africa “ and made the model code publicly available by uploading it as a supplement.