

Review

INFERNO: A fire and emissions scheme for the Met Office's Unified Model
Mangeon et al.

This paper describes a simplified model that projects biomass burning activity, burnt area, and emissions globally. The model framework uses climatic and meteorological inputs and land cover characteristics to drive the emissions model. The ignition sources can be varied, and, for the purposes of the model evaluation presented, are prescribed three different ways in order to assess the sensitivity of the model to different ignition parameterizations. The land cover inputs are provided by the JULES model. The fire model is run for current conditions and compared with other fire model outputs (primarily GFED).

This paper is written extremely well, and the modeling tool described is a unique contribution. It uses different approaches than other available models that project fires in global climate models and will be a useful tool to be incorporated within the UK Met Office's Earth System Model. The assumptions made in the model parameterizations are reasonable and well justified throughout. The manuscript is very appropriate for *Geoscientific Model Development*, and I recommend publication after only minor comments that I provide here.

General Comments:

Section 2.2: How are the PFTs allocated within each grid cell? This is not explained thoroughly in Section 2.2, and the paper cited as a reference is still "*in prep*".

Section 2.3: Emissions from Akagi et al. (2011) have been updated and can be incorporated within future versions (see Section 3 at <http://bai.acom.ucar.edu/Data/fire/>).

Section 4: I was confused about the fact that there were two different versions of "GFEDv4" used to evaluate the INFERNO estimates. Can this be made more clearly? (i.e., better define and label the two different outputs)?

Lines 255 and following sentences: Please clarify which model (INFERNO v GFED) was higher/lower. For example, Line 255 can be re-written: "We notice that the burnt area predicted by INFERNO is higher in all regions other than Australia and New Zealand, and southern hemisphere Africa when compared to GFED4."

Paragraph starting at line 325: Is it possible to compare the fire indices calculated here with the real data for current conditions?

Figure 3: Why are not GFAS and FINN outputs compared in both panels of the figure?

Editorial Comments:

Title: The UK Met Office should be defined in the title.

Lines 59 and 60: The present tense should be applied (i.e., change "used" to "uses")

Line 67: Add a comma after (E_x)

Line 168: It may be useful to let the reader know that [C] will be described in the next section.

Line 180 (and elsewhere): When "which" is used, there should be a comma preceding it. In this case, there should be a comma after "(see Eq. 6.8)"

Line 182: Layers should be plural

Line 258: I recommend changing “observes” to “projects” (or something like that).

Line 328: condition should be plural

Line 365-6: Should this be “...presence of an *anthropogenic* ignition source.”

Line 375-376: a citation should be given.