

Referee #2

Paragraph 2, "Overall the methodology is not defined in detail".

Response: We have added a sentence to the introduction to emphasize that the details of the methodology are carefully established in the 1984 paper by Marland and Rotty. The core of the computer code and half of the author team are unchanged after 30 years.

Line 86: added "but are difficult due to fluxes of natural sourced CO₂."

Section 2.1. "The paper should probably also discuss..."

Response: The Hoesly paper is a new (2018) contribution that contributes by providing consistent inventories across multiple species, but it does not provide annual updates and does not meet ours, or Robbie Andrew's, definition of a primary dataset. It is nonetheless a valuable contribution and we have added a citation in section 2.1.

Line 170.

Response: no action, this is consistent with our mention of carbonate decomposition and our treatment of solid fuels (see Marland and Rotty, p. 248).

Lines 205-210.

Response. We add another reference to Marland and Rotty 1984 to emphasize that this is dealt with in detail in the earlier paper. It is also dealt with in the following paragraph.

Text line beginning "it would be useful..."

Response: No action. We hate to dwell on the 1984 paper by Marland and Rotty but it is clear that Referee #2 is not familiar with this paper and it is clear that the early portion of our current paper does not adequately convey the importance of Marland and Rotty in establishing the methodology that is preserved in this paper (and was very influential in the evolution of the IPCC methodologies). To this point we have added additional citations to Marland and Rotty and we have tried to better establish its role in describing our methodologies.

Line 215.

Response. No action, this is also dealt with in detail in the Marland and Rotty 1984 paper, pg. 249. 0.8 % of solids fuels are assumed to be incomplete combustion, and 1 % are assumed to be for non-energy uses $FO = 0.982$. This is included in multiple other places as well. For gases, it's 1% and 1% so $FO = 0.98$. We treat only liquid fuels differently at the global (6.7% nonenergy uses) and national level (subtract out all nonenergy use codes). Hope that helps in your understanding.

Line 412.

Response: The UN uses a code 104 to describe natural gas flaring. The global uncertainty for these estimates is described in Andres et al. 2014 (25 % 2 sigma uncertainty for combined uncertainty). We do not use any remote sensing data because we strive to maintain some consistency from the original CDIAC estimates from Marland and Rotty 1984.

Section 3.3

Response: Phrasing has been added to say “GDP is gross domestic product (Purchasing power parity (PPP), current international dollars)” in section 2.2.5. We have added a second sentence to emphasize that the factors of the Kaya decomposition are taken as simple representatives of complex concepts. We agree with the statement on Saudi Arabia but believe that our representation of the Kaya identity is clear in context.

Figure 3 and accompanying discussion

Response: “Our goal here is to demonstrate a general accord that includes the reinvigorated CDIAC-FF.”

As cited in the text this difficult task has been attempted by Andres et al. and by Andrew and is beyond the intent of this paper. Our purpose here is to demonstrate that we haven’t really changed much of our methodology in the transition from CDIAC (Marland and Rotty 1984) to CDIAC-FF, and not to reproduce Andrew 2020’s work in his comparison of emissions; just show that they are in general agreement. Dotted lines have been added, and each of the versions used are cited in section 2.1. Text has been added into the figure description about the exact versions of the data products used, and some comparisons with regards to what is included in these data products is described in section 3.2.

Line 527.

Response: sentence has been removed.

Table 2.

Response: The ORNL-CDIAC data set ends with data for 2014.