

Response to Reviewer 2 (Charles Ichoku)

I thank the reviewer for his positive and constructive comments. My responses are detailed below. (Reviewer comments in italics).

*Page 3, Line 15: I believe it is more conventional to refer to the FTIR technique as “spectroscopy” rather than “spectrometry”.*

There is a lot of discussion about this in the literature. I use the definition of the “IUPAC Gold Book”, the authoritative reference for chemists: “Spectroscopy: The study of physical systems by the electromagnetic radiation with which they interact or that they produce. Spectrometry is the measurement of such radiations as a means of obtaining information about the systems and their components.” (<http://goldbook.iupac.org/html/S/S05848.html>).

*Page 6, Line 9: Change “depending of” to “depending on”.*

Corrected.

*Page 9, Lines 5-10: My main concern here is the use of Fire Radiative Power (FRP) as the sole basis to distinguish “top-down” satellite BB emissions methods from “bottom-up”. All satellite BB emissions methods described in the article utilize satellite observations (fire-pixel counts, burned area, or FRP) as a way of estimating the biomass burning activity. The use of one or another parameter (FRP or not) does not make a method “top-down” or “bottom-up”. Since the driving variable for estimating BB emissions are the factors that convert the activity to emissions (e.g. emission factors, as eloquently discussed in the article), it is the spatio-temporal distribution/configuration of the original input emissions, which went into deriving these EFs that determine whether a method is “top-down” or “bottom-up”. If those input emissions were observed at a few locations and limited time periods, and then scaled up globally, the method is “bottom-up”. But, if the input emissions were observed globally and regularly, and then scaled down to their sources, it is “top-down”, as in the use of satellite-derived aerosol optical depths (AOD) of smoke-dominated aerosols to constrain the “emission coefficients” used to derive the emissions. Bearing this in mind, among the satellite methods described in this article, only QFED and FEER used globally-observed AOD to derive the coefficients that were then used to derive their final BB emission products, and thus may be categorized as “top-down”. The others (including GFAS, which is scaled to GFED emissions) used locally-observed BB-emitted constituents to derive emission factors that were then generalized for their global BB emission products, and thus may be categorized as “bottom-up”.*

Since the distinction between top-down and bottom-up satellite products is not really important to the discussion in this paper, I am limiting the use of “top-down” to inverse studies, where an emission is estimated from a concentration field. “Bottom-up” is now used only as a general term, where emissions are estimated based on a product of activity and emission factor estimates.

The satellite emission products are now referred to based on the quantity sensed (FRP, burned-area, etc.).

*Page 9, Line 17: I am concerned about the use of FAO (2015) as the primary reference for a quantitative value, as I am not sure whether FAO (2015) was peer-reviewed. I believe it would be better to find and cite the original (peer-reviewed) source of the 53 Tg/yr estimate reported in FAO (2015).*

The FAO studies are not based on a particular paper, but on reports from the individual UN member states to FAO regarding the amounts of agricultural and forestry activity in each country. As such, the FAO reports are only as good as the quality of reporting from each country, which of course varies considerably. Nevertheless, the FAO reports are generally considered to be an authoritative source on agricultural activity. FAO states: “Prior to publication, these reports are subject to quality control through a standardized peer-review mechanism that allows relevant stakeholders to provide valuable feedback on initial drafts of the reports.”