

Interactive comment on “Coupling field and laboratory measurements to estimate the emission factors of identified and unidentified trace gases for prescribed fires” by R. J. Yokelson et al.

Anonymous Referee #2

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General Comments

This discussion paper gathers a large data set of biomass burning studies, in the laboratory and at the field with prescribed burnings, and calculates from those studies emission factors (EF) for a large number of identified and tentatively identified or unidentified compounds, for controlled field fires. The authors, with basis on comparison of various burning and environmental parameters, translate the results from controlled laboratory experiments to the estimation of EFs for hundreds of organic compounds (mostly in the gaseous phase) in real field fires, using measured campaigns of prescribed burning as

C8174

testing experiments to adapt laboratory estimated values to external field emissions.

The manuscript provides a very large data set, mostly of it already published in previous papers, and by using state of the art mass spectrometers, capable of identifying, tentatively identifying or through detection of unknowns, are able of demonstrating that there is an enormous amount of organic compounds, most of them previously (or still) unknown, that are emitted from field fires. These compounds being oxygenated, semi volatile, etc., presumably have an important role in photochemical and gas to particle conversion processes in the regional and global atmosphere impacted by transport from emission sources.

The authors discuss and show that emission rates and composition are highly dependent, not only from the fuel type, but also from burning conditions. Therefore they have to adapt estimated EFs from laboratory experiments to field conditions by using the results from prescribed fire campaigns as calibration examples. However it is necessary to account for the fact that prescribed fires are always done in periods of the year (season) and weather conditions that, although permitting the progress of burning, are impeditive of uncontrolled fire behaviour. Therefore I have doubts that emission factors adapted to prescribed fire conditions are representative of wild fire emissions. Of course that the authors always refer to emission factors estimation for prescribed fires, not wild fires; but then I would like to have in the paper a discussion about the representativeness of prescribed fire emissions by comparison with wild fires and, or, the importance of prescribed fires as sources of pollutants in the regional/global atmosphere.

The paper is somehow too long with some repetitions and, with some effort, it could be pruned and made more linear and easy to read. Some of the discussions (see for example section 3.6) direct the reader to Tables in the annexed section, in order to fully understand the paper presentation. In my opinion this is not correct; supplementary material should only be provided as complementary information for other uses.

C8175

Specific comments:

Page 21524, line 10 – Substitute “for modeling; we employ” with “for modeling, we employ”

Page 21525, line 8 – Akagi et al.(2012b) is a paper in preparation- what does that mean? Is it already submitted?

Page 21528, lines 10-11 – Hosseini et al. (2012)- another paper in “preparation”

Page 21531 and following, Section 2.2 - Data reduction approach - The section deals mostly with emission factors and or emission ratios for CH₃OH and HCOOH and there is an important discussion in relation to CH₃OH; but there is no discussion in relation to HCOOH! In this section it is also discussed the conversion of signals for unknown compounds detected into total VOC mass ; using of a simple total VOC analyzer based of FID detection could not help in the job?

Page 21534, equation 1 – too many significant digits?

Page 2154, lines 6-136 - HCN is introduced as a flaming compound but from the discussion comes out as a smouldering compound – please rephrase.

Subtitle of Fig 2 and 3 – describe RSC (Residual Smoldering Combustion); in the text, page 21540, some discussion could be introduced about the quite different EF values for RSC in Figures 2 and 3

Page 21542, line 22- there is no reference for Veres et al., (2011)

Page 21543, lines 24-26 – Coherence in the presentation of numbers (as digits or with letters)

Page 21547, lines 26-28 – There are some other published results concerning OC and EC, at least for south Europe (see for example Alves C.A., Gonçalves C., Pio C.A., Mirante F., Caseiro A., Tarelho L., Freitas M.C., Viegas D.X. (2010) Smoke emissions from biomass burning in a Mediterranean shrubland. *Atmospheric Environment*. 44,

C8176

3024-3033. <http://dx.doi.org/10.1016/j.atmosenv.2010.05.010>)

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C8177