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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Airborne characterization of smoke marker ratios from prescribed burning" *by* A. P. Sullivan et al.

Anonymous Referee #3

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This manuscript reports on the application of a Particle-into-Liquid Sampler (PILS) system to aircraft based measurements of prescribed burning emissions in South Carolina. PILS was measuring total water-soluble organic carbon (WSOC) with a 3 sec resolution and was also equipped with the fraction collector which provided 2-min time-integrated samples for off-line laboratory measurements of carbohydrates that are considered as biomass smoke markers. The manuscript presents interesting data from the near real-time measurements, including relationships among widely-measured chemical markers, it is very well written and it merits publication. I have only a few comments: 1. The manuscript would benefit from including more information regarding the prescribed burns sampled from the airborne platform. For example, the authors say on p.11723 (lines 20-25) that the Δ levoglucosan/Δ WSOC ratio observed for flight RF09 suggests

that "...the vegetation may have been different at the two ends of the fire being sampled during RF09. In South Carolina it is very common for marshy bays to be mixed in with a forested area." This hypothesis could be easily verified, if more information regarding the fuel burned during this prescribed burn is presented. Also, the statement on p. 11724: "Similarities in smoke marker ratio values suggest that the Fort Jackson burns (RF01/RF02/RF03/RF05) were dominated by the burning of grasses, RF08 by leaves, RF09A by needles, and RF09B by marsh grasses" could be easily verified. 2. The authors say in the Introduction (p. 11717) that "...traditional methods used to measure smoke markers, such as gas chromatography-mass spectrometry (GC-MS), require a large amount of mass for analysis." "Large" is a relative term – do authors mean micrograms, mg, grams? Modern GC/MS instruments are very sensitive and usually require no more than a few tens of micrograms for polar species analysis. 3. The sentence on the bottom of p. 1171, starting with "Other measurements presented here..." is not clear, something is missing here. 4. Figure 2, the legend symbol for levoglucosan is not consistent with the graph. 5. Fig 4a is too busy and difficult to read. Could different colors be used for different fire locations? The same comment for Fig 5. 6. Page 11726, lines 5-12: the authors discuss a tight correlation between Δ m/z 60 vs. Δ OA concentrations shown on Fig 7. However, this correlation is mostly driven by flights RF03/RF05, which was dominated by the same type of fuel (grasses). 7. Fig 6 and discussion on p. 11726. There is a large spread in the Δ levoglucosan/Δ WSOC initial ratios for flights RF03, 08 and 09A. Not clear why the authors concluded that this ratio "is stable". Similarly, it is not apparent from Fig 6b that the Δ m/z 60/Δ OA concentration ratios are consistent "...across burns and fuel types..." and that this "...reinforces the quality of m/z 60 as a quantitative biomass burning source marker for use with AMS data sets."

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11715, 2014.