

This paper uses lidar measurements to report/conclude 2 things:
Identifies/suggests the CCL as a parameter potentially useful, as opposed to a LCL, for diagnosing/estimating CAPE, cloud base, plume smoke injection heights;
identifies the negative impact of mid to upper-level wind shear on convective growth and plume height top, suggesting that fire plume models or parameterizations need to account for the effect of ambient wind shear on plume development in order to model accurate smoke injection heights.

I recommend publication with the following minor revisions.

Fig 2. The light green line drawn to indicate condensation level is very difficult to see. Please use a thicker, dotted or dashed line, in some other stronger color. Also the authors (29053, line 13) talks about “ring vortices.” Mark those as well (maybe with pointing arrows) because some readers (me) are not good at interpreting lidar scans.

Fig 3a. Again do not use a light green line.

Fig 4. The authors describe many features (e.g., 29053; lines 15 -20), but it is not easy to see where or what these are on Fig 4. So please mark these (pointing arrows). And show the active fire areas only (i.e., zoom in). And please supply a scale bar to indicate distance in kms on this figure. I want to know how large these plumes and their perimeters are.

Figs 5 and 11. I was not sure which line was which and which open circle was what. Sections 2.3 and 3.3 describe what is going on in these figures. Please redo all lines so that: (i) they are heavier and more distinct, even when photocopied in black and white, and (ii) they are in stronger colours, and (iii) they are marked so that the CBL depth, EL, LCL for the Most Unstable parcel (MU), LCL for the Mixed Layer parcel (ML), and CCL for the Convective Parcel (CP) are all clearly indicated. Please make the discussion in Section 2.3 clearer by using wording such as (lines 29-30) “. . . and the associated DRY adiabat (*dark red, dotted-dashed line in Fig Xb*) up to the CCL not . . .” And do this throughout Sections 2.3 and 3.3. And consider providing separate figures that zoom into the region of the Skew-T where most of the thermodynamic analysis is happening?

Figs 5, 8, and 11. In addition the authors should present a hodograph of the wind fields --- a clearer rendition of wind veer, shear, and magnitude than the wind arrows on the Skew Ts.

Fig 12c. Lines are hard to see and need to be redrawn (along with lines in Figs 5 and 11). The light green, etc, for lines on the Skew Ts; All lines look the same gray-green with fuzzy dots.

Lines 22 to 27, 29061. The authors recommend more complete observations of pyroconvective clouds but list features that are the result of physical processes that

cannot be easily observed or interpreted (e.g., cloud microphysical properties) by measurement alone. I recommend that authors write also that: measurement campaigns combined with research employing physical fluid dynamical models able to represent and/or explicitly simulate the observations are needed.

Typos:

(29058, Line 10) Change 'radar data is . . .' to radar data are . . .'

(29062, Line 1) Change 'extend' to 'extent.'