

Interactive comment on “Evaluation of vegetation fire smoke plume dynamics and aerosol load using UV scanning lidar and fire-atmosphere modelling during the Mediterranean Letia 2010 experiment” by V. Leroy-Cancellieri et al.

V. Leroy-Cancellieri et al.

vcancellieri@univ-corse.fr

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1. Major comments

(1) I think the word “vegetation” in the title should be changed to “wildland.” The term wildland will allow wildfire researchers to easily find the paper. This might be more of an American nomenclature, but should be considered by the authors.

Reply : The word “vegetation” has been replaced by “wildland”.

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(2) The lidar backscatter images in Figure 6 might be better supported by actual photographs of the smoke column. A group of photos presented with individual times indicated would also allow the plume behavior to be shown. This could be an additional figure with 4-6 panels.

Reply: An additional figure has been added representing actual photographs of the smoke plume at different steps of the burning experiment (figure 6 in the revised manuscript).

(3) One thing missing in the experimental design is the mention of the lidar system. The specifications are provided in section 3.1, but no mention of the manufacturer is presented. Also, what are the specs of the system in terms of range gates, etc.?

Reply: Additional informations about the lidar system have been added in section 3.1.

(4) I think Figure 2 could be improved. I would provide an overview map showing the terrain and then show a detailed schematic / map showing the instrument layout. Maybe just show the burn plot outline on the present Figure 2.

Reply: In order to take into account the reviewer comment, the burn plot outline has been added on figure 2 and the figure 1 has been deleted.

(5) Figure 7 doesn't show much information. How does it compare to observations? I think this figure could be improved to show more plume structure.

Reply: We do agree that figure 7 does not shows much information about the plume structure, as well as comparison with observations, these are done in figures 9 to 11. Also, we believe that such 3D picture is not the right kind of plot for comparison, but is very illustrative, the basic idea behind this image was to illustrate, give a clear idea, of the domain extents with the location of the Lidar, the terrain, surrounding vegetation, grid and subgrid resolution and a rough view of the typical plume structure. As such, this figure also intended to answer somehow bit of you concerns of your comment (4). We do also agree that the intent of figure 7 is not clear in the text, so we decided to

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keep it as it is, and clarify the text that corresponds to it at the beginning of section 5.2.

(6) I think the major limitation to this study is the use of only five scans for comparisons. More scans would allow better statistics to be compiled. This limitation in data is due to the fact that the experimental fire was so small and the scanning time of the lidar was long. It would have been better to have the lidar making vertical scans on the order of 10 s rather than two minutes, and to have the active burning period occur longer in duration. However, the data are well characterized and show that the ForeFire/MesoNH coupled model can reproduce the observed plume structure to some degree. Another reference that might be of use for this paper is: Charland, A. M. and C. B. Clements, 2013 Kinematic structure of a wildland fire plume observed by Doppler lidar, J. Geophysical Research-Atmospheres, 118, 113, doi:10.1002/jgrd.50308.

Reply: The reference, proposed by the reviewer, has been added in the introduction.

3. Minor comments

Pg. 3992, line 21, replace gaz with gas. Pg. 3992, line 26: I think the term real should be changed to wildland since even a prescribed fire or experimental fire is 'real.'

Reply: The corrections have been done.

Pg 3997, line 19: the authors state that the anemometer was placed at the downwind side of the burn plot to protect the instrument and measurements from being contaminated and influenced by smoke and the fire front. Do the authors mean located 'upwind' from the burn?

Reply: The anemometer has been placed at the foot of the slope, in the opposite direction of the propagation. There is a mistake on the wind direction in the manuscript which can mislead the reader. This right direction of the wind is NO (average on the burning time : 328°) and the anemometer is really at the downwind side of the burn plot.

Pg 3998, line 10: East should be east.

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Reply: The capital letter has been removed.

Pg 3998, line 10: "High temporal/spatial resolutions continuous monitoring is performed by successive vertical scans: : ." Again, what are the resolutions of the lidar? This is stated in line 15 and should be mentioned earlier when describing the lidar system. Also, vertical scans are referred to as Range Height Indicator (RHI).

Reply: The lidar spatial resolution has been correctly mentioned earlier in 3.1 and Range Height Indicator has been added in 3.1 to refer as vertical scans.

Pg. 4000, line 15: "technics" should be "techniques". Pg. 4003, Line 9: "plan" should be "plane". Page 4009, Line 6: Aladin is repeated. Page 4010, line 8: "scan" should be "scans". Page 4010, line 25: "fully smoke plume" should be changed to "full smoke plume".

Reply: The corrections have been done.

Page 4011, Line 5: "During the scan 4, a transition phase between the rising smoke plume domination period and the smoke plume residual advection layer period seems to be perceptible. The smoke plume is decoupled (vertically) from the ground and the smoke injection height appears at about 200m and remains the same in the next scan (Fig. 6e)." This paragraph is awkward and needs to be rewritten. I am not clear on what the authors mean by residual advection layer? Are you referring to the residual layer in the boundary layer? If so, that isn't correct since that occurs during nighttime. Also, I am not sure "injection height" is the correct term to use. I think it is more just plume height or max plume height rather than injection height. This especially true since the I the next sentence you state that the plume is at 300 m AGL in the next scan.

Reply: The authors agree on this remark and replace on the manuscript smoke plume residual advection layer by max plume height.

Page 4011, Line 13: "(especially horizontally)" I have a problem with this description. It is hard to observe dispersion in the horizontal using vertical scans. Generally, dis-

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person in the horizontal is when the plume spreads out across (perpendicular) to the mean wind direction rather than just downwind. Since the plume is only 100 m thick, it might be safer to interpret this structure as weaker plume buoyancy due to entrainment of ambient air downwind. The plume doesn't rise anymore, but is just advected downwind.

Reply: The authors agree with the suggestions of the reviewer and delete the words 'especially horizontally'.

Page 4011, Line 19: hard to tell the difference in plume structure between the two domains. The simulated plume looks as one.

Reply: You are right, and the purpose of the image was badly explained as it was mainly to provide an overview of the simulation and domains, text has been modified and further comments can be found in response to Major Comment 5.

Page 4011, Line 22: "figure" should be changed to "determine" or better yet "estimate."
Page 4013: line 12: "ground flows" should be "surface winds" or "surface flows".

Reply: The corrections have been done.

Pg 4024: Table 2: Wind direction is labeled as degrees, but SEE is given. I would convert to degrees.

Reply: As said previously, there is a mistake on the wind direction in the manuscript. The right direction is NO with an average at 328° during the time of the burn. These data have been corrected in the text and the direction is done in degree in the table 2.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 3991, 2013.

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Fig. 1. New figure 1

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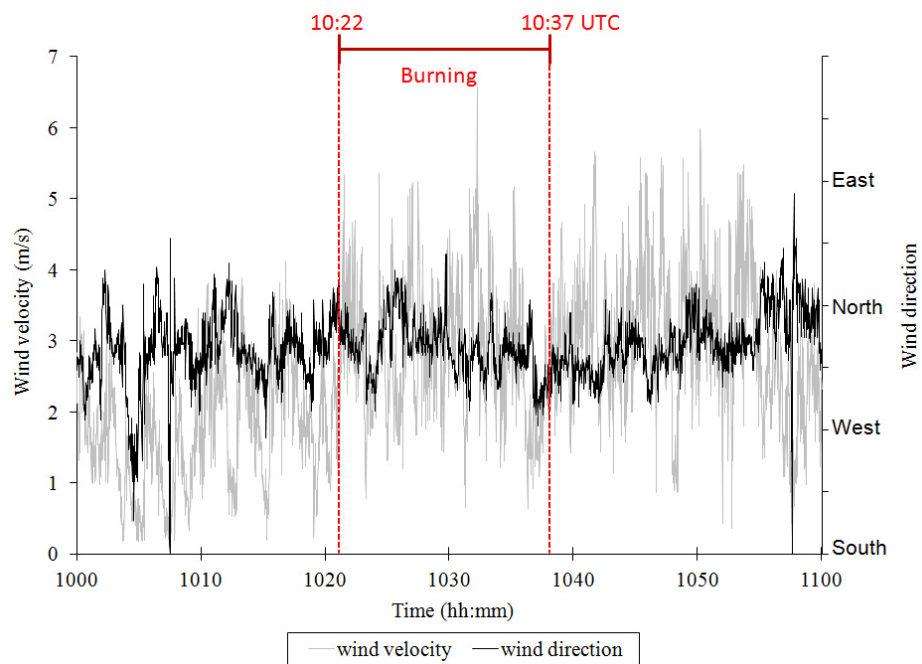


Fig. 2. New figure 2

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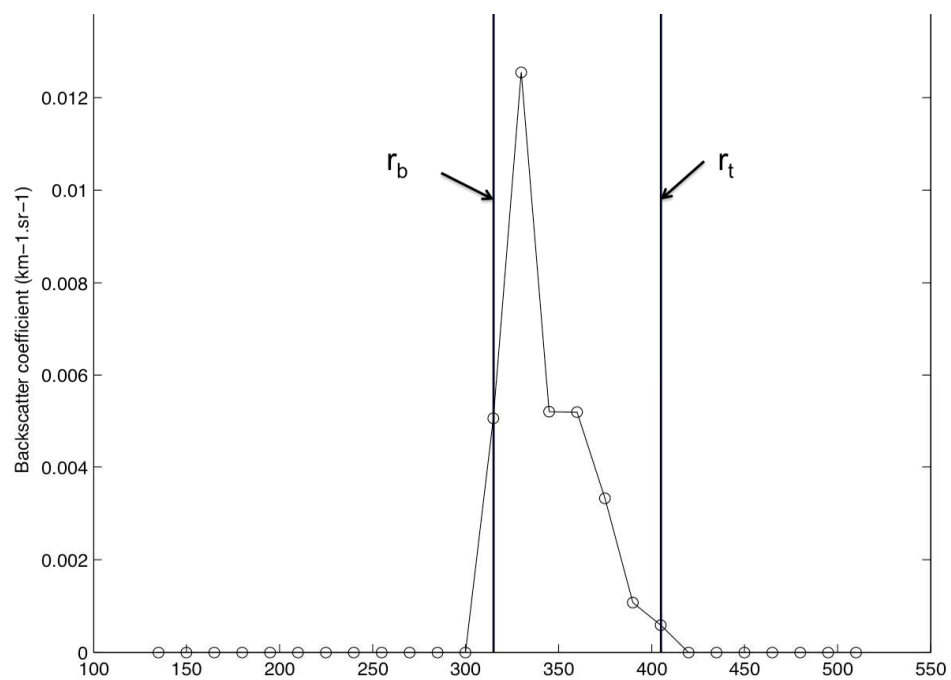


Fig. 3. New figure 3

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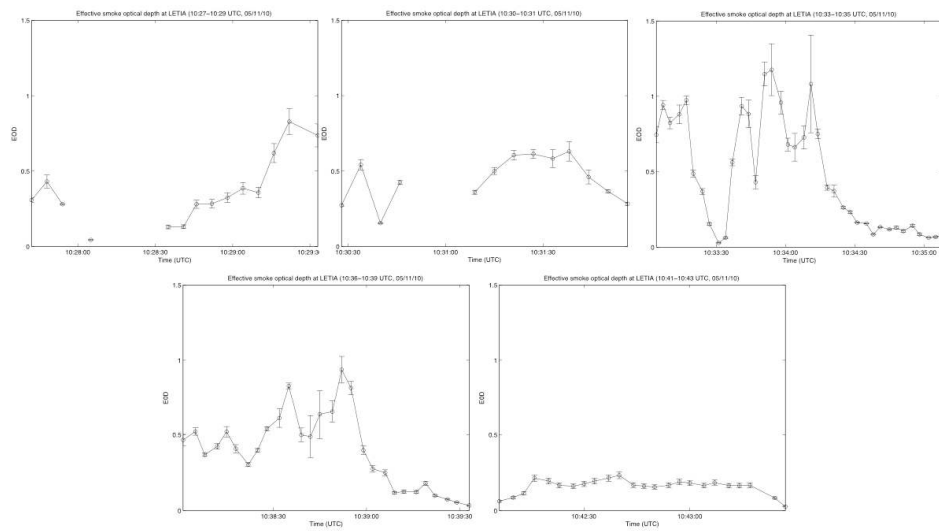


Fig. 4. New figure 4

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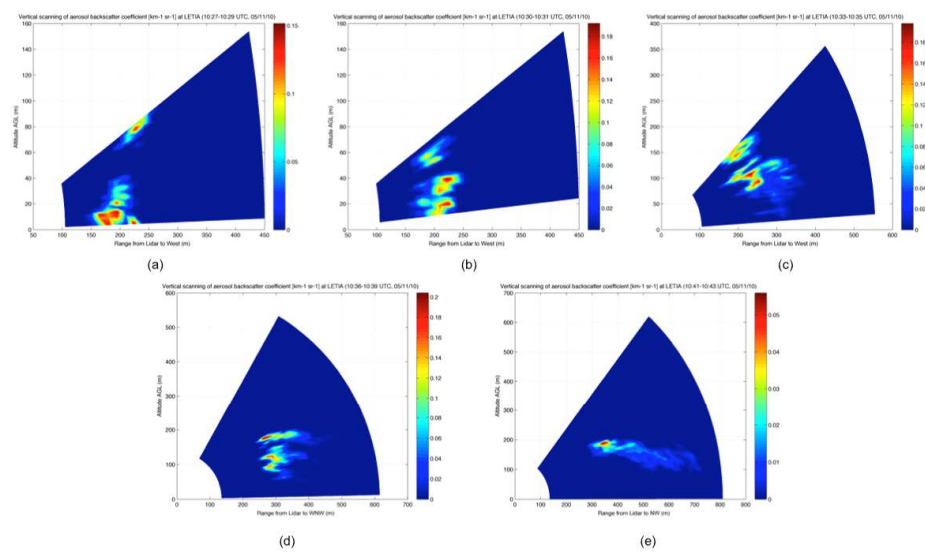


Fig. 5. New figure 5

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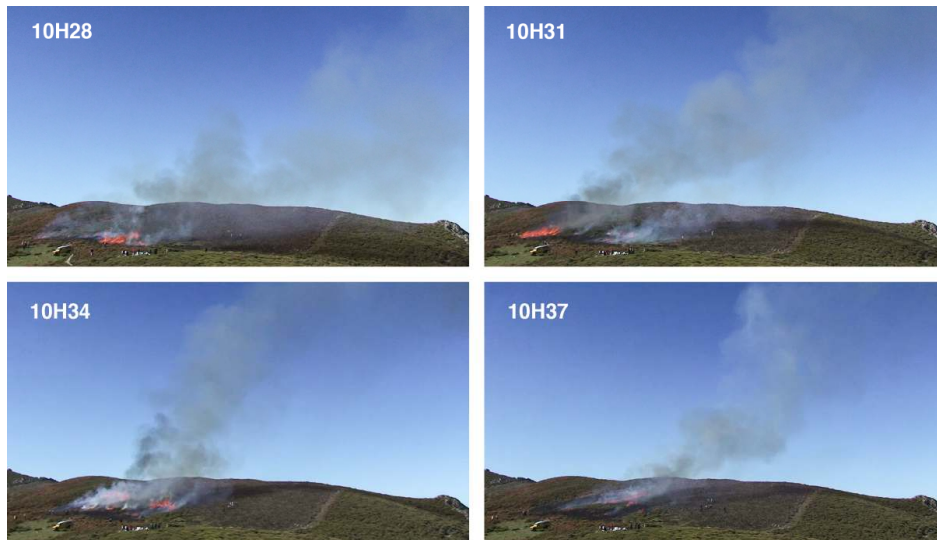


Fig. 6. New figure 6

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