

## ***Interactive comment on “Analysis of a strong wildfire event over Valencia (Spain) during Summer 2012 – Part 1: Aerosol microphysics and optical properties” by J. L. Gómez-Amo et al.***

**Anonymous Referee #1**

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General comments:

This paper presents measurements of aerosol microphysical and optical properties for the largest wildfire in Eastern Spain since 2004. Column-integrated, vertically resolved, and surface observations of biomass burning aerosols are described. The inversion method and Mie theory are used to retrieve aerosol microphysical and optical parameters. The results show high PM<sub>2.5</sub> concentration, aerosol optical depth, Angstrom exponent, and aerosol scattering of the fire plumes that can substantially contribute to the air pollution of the studied region. The measured and retrieved data are valuable to the biomass burning aerosol database. However, I am concerned of publishing this

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paper on ACP due to the following reasons:

Despite the extensive data, this paper lacks a clear focus. It is difficult to summarize the new scientific findings of the paper, i.e., besides reporting the data and showing that the values are high during the fire period, which is expected and not surprising, what can we learn from these measurements? In addition, the measured parameters are not synthesized but described individually. These points are reflected in the text and the figures: Only results are shown and the discussion section is absent; many figures merely show time series of different parameters. In-depth analysis is needed. I do find there are some interesting points to focus on, e.g., the co-existence of dusts and fire smokes, but the related discussion is scattered in the results so a distinguished point is not made. Another way to strengthen this paper is to extend it to include the quantitative radiative impact of the wildfire, which will address the highly uncertain climate forcing of wildfires.

The paper is not well organized. First, some result parts describe how the parameters are calculated. Such description should be moved to the method section. For example, the inversion strategies in section 4.4 can be discussed in the method section. See more in the specific comments. Second, sections 4.1, 4.5, 4.6 discuss column-integrated observation, while sections 4.2 and 4.3 discuss vertical structure and surface measurements, respectively, it is better to discuss column-integrated observation and then the rest or vice versa. Moreover, each sub-section of section 4 describes the day-by-day variation of certain parameters, resulting in a lot of repeated discussion and redundancy. It is also difficult to follow. I suggest organize the results and the discussion by the pollution events, i.e., aerosol classification in section 4.4, not by measured parameter. This way the measurements can be integrated and properties of each pollution period can be clearly addressed.

Specific comments:

1. The abstract typically contains no more than two paragraphs. Please follow the

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requirement of ACP: "The abstract should be intelligible to the general reader without reference to the text. After a brief introduction of the topic, the summary recapitulates the key points of the article and mentions possible directions for prospective research."

2. Meteorological situation: The fire is ~60 km from the sampling site, so wind direction will be more useful to identify the influence of fire plume on the sampling site. The back trajectory does not support the data analysis and is not discussed later in the text. The related discussion and Figure 1 are redundant.

3. P22649 "On 28 June, the effect of the dust layer reduces the surface contrast (Fig. 2a), while the magnitude of the wildfire can be clearly observed on 29 June (Fig. 2b)." The dust layer still existed on 29 June, so more explanation of the difference is needed.

4. P22649, "The AOD and AE values ranged between 0.14-0.16 and 1.1–1.15", the 0.14-0.16 is really not a range. The AE range is 1.5 not 1.15.

5. P22649, "indicating the presence of larger particles in the atmosphere", add a reference to this statement.

6. Section 4.2 the boundary layer dynamics can be move to meteorological conditions. And P22651, Line 19-26 describes the calculation of the boundary layer height and can be moved to the method section.

7. Section 4.2, the mixing layer height calculated from the HYSPLIT model is highly uncertain. Therefore, the HYSPLIT-derived mixing layer height should be justified by comparing with the mixing layer height from the Lidar measurements before being used.

8. Section 4.3, it is easier to show diurnal plots when discussing diurnal cycles.

9. Section 4.4 the first 2 paragraphs and the 4th paragraph are largely describing method, so they can be moved to the method section.

10. The retrieved size distribution (Figure 7) is problematic: It is surprising that the

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coarse mode of smoke (2-3  $\mu\text{m}$ ) is larger than the coarse mode (1-2  $\mu\text{m}$ ) of dust. Why is that?

Technical corrections:

1. P22640, Line 5, vertical resolved -> vertically resolved

2. P22640, Line 17, define AOD

3. P22641, Line 25, both on -> on both

4. P22641, Line 25, as -> and

5. P22641, Line 26, consists on -> consists of

6. P22642, Line 1, on -> of

7. P22642, Line 2, remove space in "10 %".

8. P22642, Line 17, in example -> for example

9. P22642, Line 19, Eck, 2001 -> Eck et al., 2001

10. P22642, Line 26, add "," after "areas"

11. P22643, Line 6, impact in -> impact on

12. P22644, Line 3, monitor -> monitoring

13. P22650, Line 21, ratio -> fraction

14. P22651, Line 16, are -> is

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 22639, 2013.

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