Responses to referee #1:

We would like to thank the referee #1 for his/her constructive comments, which significantly contribute to the improvement of the quality of this manuscript. Our replies (in normal text, italic text in red corresponds to new or modified version, italic blue corresponds to the old version) to the comments from referee #1 (**in bold**) are addressed as below:

The paper addresses an interest issue relevant with the estimation of forest fire emissions, their characterization in terms of spatial resolution and temporal analysis. The paper presents also the impact of big forest fires on air quality of the Eastern Mediterranean which is also an interesting topic, considering the expected increase in the fire activity in the area due to the climate change.
The paper can be published in ACP considering though the following necessary revisions:

1) Section 3.2: The authors should try to better explain the differences in the amount of emissions estimated with the different algorithms and with GFASv1.1. Not only in figure 3a but also in figure 3b, the existing differences in daily values are important.

Regarding figure 3.a we decided to add the following figure (Figure 6) in the supplementary material. This should help to visualize the differences in daily values between MODIS and SEVIRI based observations of fire activities over the study area and over the Antalya fire. As said the differences over the entire region are mainly due to the presence of low energetic agricultural burnings common in summer time in Eastern Europe, and difficult to detect for SEVIRI due to his coarse spatial resolution, especially at those latitudes. We will add the following text (line 21 pg.16) to clarify this point:

The large differences in daily values observed in figure 3 can be additionally visualized in Figure S2 in the Supplement. This figure shows a large presence of low energetic fire pixels (daily FRP < 20 MW) over Eastern Europe depicted by GFASv1.1 during August 1st, 2008 (daily FRP integrated over the entire region, excluding the Antalya fire, ~14.4 GW). During the same day the homologous WF_ABBA and LSA SAF describe a reduced fire activities (daily FRP integrated over the entire region, excluding the Antalya fire, ~3.4 and ~2.4 GW respectively), especially in Eastern Europe where SEVIRI spatial resolution is larger.
On the other hand, if we reduce our study area only to the region surrounding the Antalya fire, the LSA SAF estimates a daily FRP more than double (6.6 GW) than GFASv1.1 (2.9 GW) that could only use for this estimation 4 MODIS observations of the area affected by the fire, despite the 96 available with SEVIRI, that more luckily captured the picks of the burning.

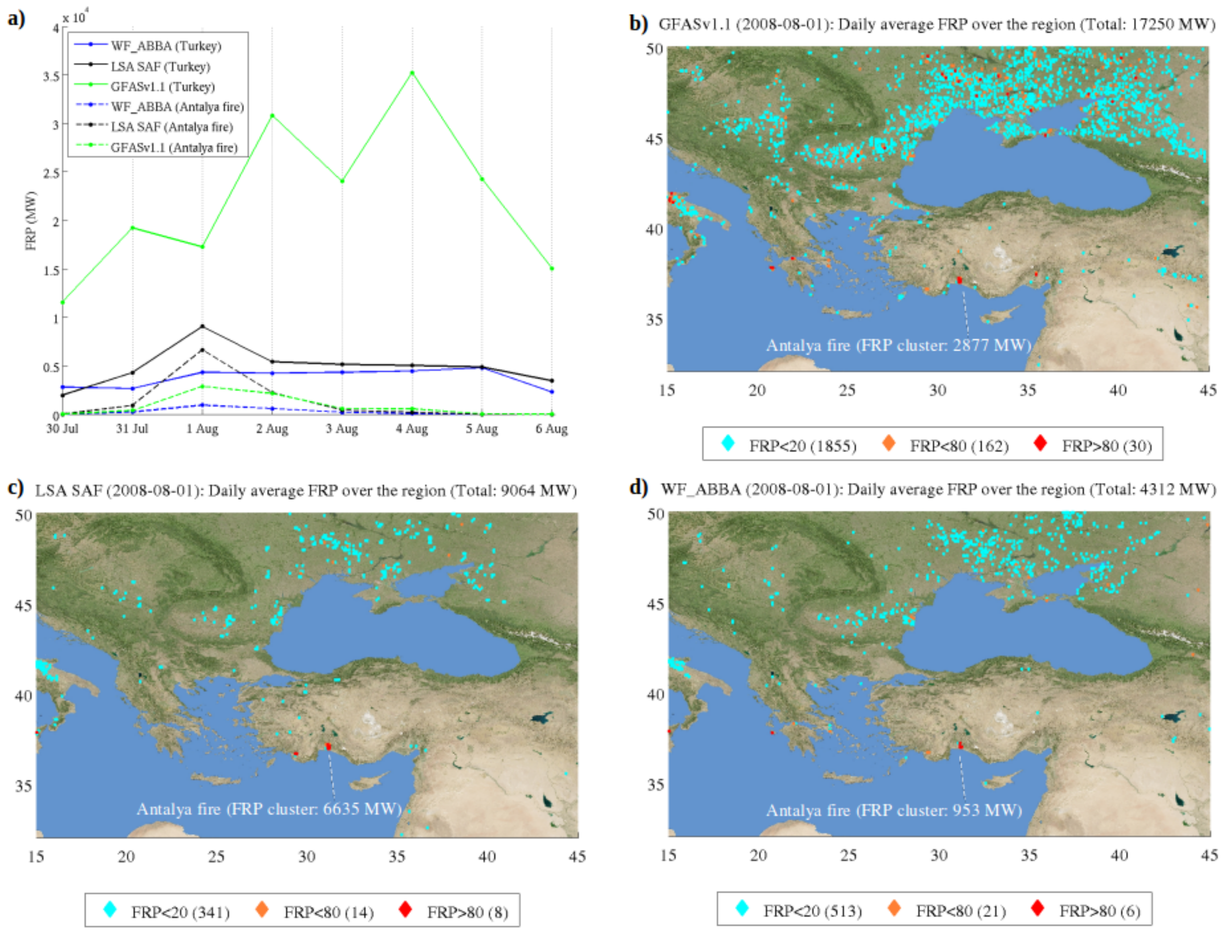

Figure S2. (a) Daily average FRP observed by GFASv1.1, LSA SAF and WF_ABBA over the Eastern Mediterranean (Turkey) and over Antalya fire (dashed lines) from 30 July to 6 August 2008. Aug 1, 2008. Spatial allocation of the domain pixels with daily average FRP > 0 according to (b) GFASv1.1, (c) LSA SAF, (d) WF_ABBA.

1) In figure 3 similar plots should be presented form CO, NH3 and NOx. NH3 emissions are missing in Table 1.

The new figure 3 will be the following:

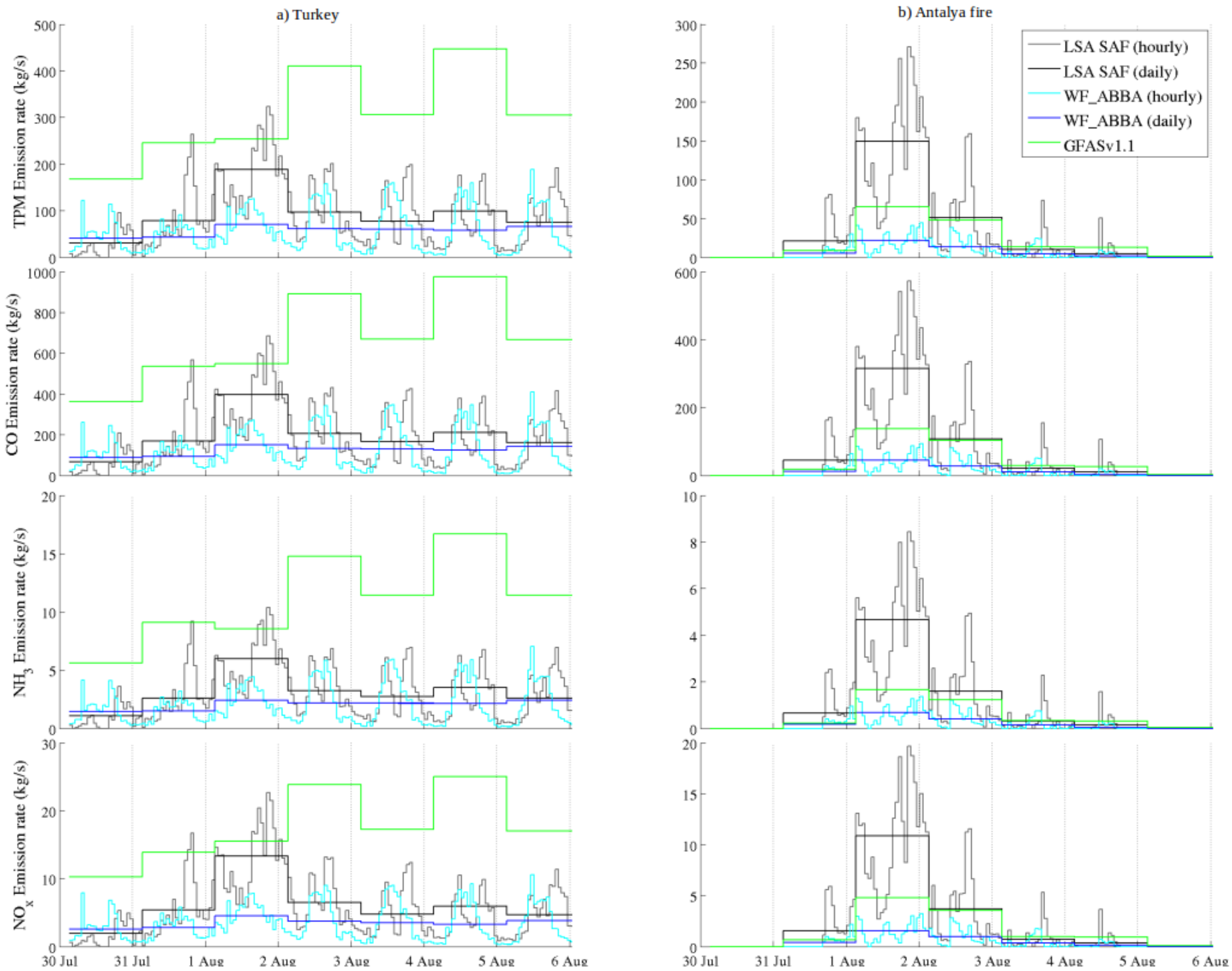

Figure 3. TPM, CO, NH3, NOx emission rate observed over Eastern Mediterranean (a) and over Antalya fire (b) from 30 July to 6 August 2008. Cyan and blue line: hourly and daily WF_ABBA FRP derived. Grey and black line: hourly and daily LSA SAF FRP-Pixel derived. Green line: GFASv1.1.

The old Table 1, now Table 2 will be the following:

Species	Turkey	Antalya Fire
CO	63338.5	8373.4
	102613.0	**40087.6**
	370204.9	27279.7
NMHC	5710.3	466.7
	7645.7	**2234.4**
	37019.9	1513.1
NOx	1782.7	288.3
	3181.0	**1380.1**
	9721.4	942.4
PM2.5	18817.5	2286.9
	29371.4	**10948.5**
	111233.7	7448.2
OC	10394.2	1493.5
	17507.1	**7150.0**
	58115.2	4846.2
BC	1193.8	214.7
	2250.6	**1027.8**
	6267.0	697.5
SO2	300.3	50.8
	548.4	**243.2**
	1586.6	163.2
NH3	1045.6	123.5
	1612.1	**591.5**
	6211.3	326.6

2) Section 3.3: In the section the temporal and vertical distribution of fire emissions is presented. Which is closer to the reality? Is there any validated evidence?

As mentioned in the answer to the comment 2 of the referee # 2, we do not have CALIPSO data for the most intense days of the Antalya fire, so not for the figures described in section 3.3. But the vertical distribution of the fire emission based on LSA SAF FRP product produces a simulated plume feature closer to the one observed by MODIS, as discussed in section 4.1.
This is what make us to infer that the LSA SAF based vertical distribution of the Antalya fire emissions is the one closer to the reality.

3) Section 4: Are there any observations of pollutants surface concentrations to compare with model results and strengthen the performance of the chemical model?

Unfortunately not, air quality data from the Antalya ground station are not available for the whole duration of the fire.

4) Section 4.1: Present and discuss (i.e. compare with plot 6b) the maps of AOT estimated from the different model runs not only as simulated changes in AOT due to forest fires but also as absolute values.

As said in the answer to the comment 3) of the referee # 2, we will add a new section with a more in deep discussion of the performance of the different fire emission inventories used in terms of simulated AOT.

Which of the vertical cross sections presented in figure 7 are closer to the real conditions; provide validation evidence and explain (in relation also to comment 2)?

As said in comment 2) we can infer that in figure 7 the cross section depicted by LSA SAF is the one closer to the real conditions.
To make it more clear what is the impact of different estimation, both in terms of magnitude, both in terms of spatiotemporal allocation, of the fire emissions, in a model like CMAQ, we substituted the figures 8 and 9 in the manuscript with the following figure (Figure 8), that includes 4 more snapshot of the simulated AOT and the vertical distribution of PM2.5 along the maximum simulated AOT, obtained by using the 4 selected emission inventories.

Therefore we changed the following paragraph (Page 20, line 7-13), as asked also in question 41 of referee #2:
This can be observed more clearly if we look at the same outputs of the CMAQ simulations 12 h before, at 03:00 LT of 1 August (Figs. 8 and 9). From this figures we can see that only the simulation performed with LSA SAF FRP-Pixel based emission inventory (Figs. 8c and 9c) describes a cluster of aerosols above 2000 m of altitude moving towards Cyprus. The same that 12 h later will deter- mine that particular shape of the fire plume, expanding upon southern–west coast of this island, confirmed by the MODIS observations.

to:
During the first 2 days of the Antalya fire, only LSA SAF FRP allows strong concentration of PM2.5 above 2000 m, and it is the only one who depicts a cluster of aerosol moving toward south west Cyprus, as confirmed by MODIS observations in figure 6. Probably, the higher vertical allocation of the emission estimated by LSA SAF FRP, allows a part of the estimated fire aerosols to catch a different wind dynamic in the upper atmospheric layers that leads them to south east directions like observed few hours later from the MODIS observations. (see also the animations in the Supplement).

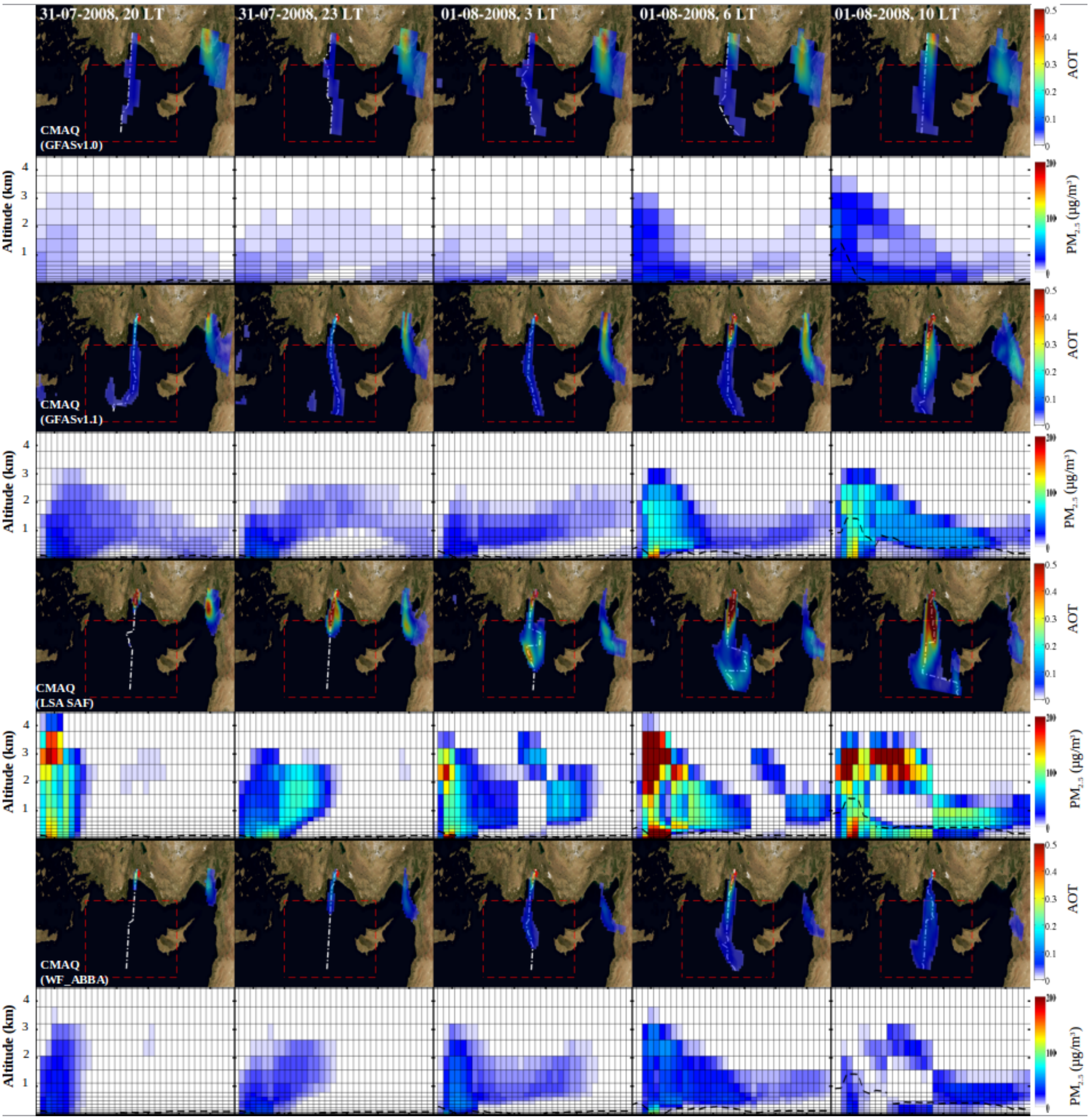

Figure 8. 31 July 2008, 20 LT, 31 July 2008, 23 LT, 1 August 2008, 3 LT, 1 August 2008, 6 LT and 1 August 2008, 10 LT. CMAQ simulated changes in AOT and the vertical distribution of fire PM2.5 concentration along the maximum simulated AOT, due to fires made by using GFAS1.0 (a), GFAS1.1 (b), LSA SAF (c) and WF_ABBA (d) based fire emission inventories. The changes in the AOT are calculated by subtracting concentrations from simulations without fires. The white dashed line, in the AOT map, connects the cells of the model grid having the maximum simulated AOD along the Antalya fire plume. Black dashed line, in the vertical cross sections, defines the PBL.

5) Figures 10 and 11 present a not good model performance when the WF_ABBA algorithm is used. Which are the necessary improvements to the algorithm according to the authors' opinion to ensure better emissions estimation and chemical model results?

Figure 2b shows that LSA SAF is in better agreement with the co- located, gridded MODIS FRP, compared to WF_ABBA. This makes us to assume that WF_ABBA is probably underestimating the energy released during the Antalya fire, leading to a general underestimation of its emissions.
Our limited use of the fire products described herein make it very hard to identify improvements in complex fire detection algorithms like the ones described in this work.

See also the answer to the comment 1 of the referee # 2

6) Figure 14 is presented but not discussed in the manuscript.

As said in the answer to comment 4, we will discuss the simulated AOT in a new section.