



EGUsphere, referee comment RC2
<https://doi.org/10.5194/egusphere-2022-42-RC2>, 2022
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Comment on egusphere-2022-42

Anonymous Referee #2

Referee comment on "Radiative impacts of the Australian bushfires 2019–2020 – Part 1: Large-scale radiative forcing" by Pasquale Sellitto et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-42-RC2>, 2022

General:

Although there are already numerous publications on the radiative impact of Australian smoke on the market, this manuscript adds new aspects and discusses inconsistencies in previous articles and thus is worthwhile to be published in ACP.

I have only minor points.

Details:

page2, line38: Please specify.... whole fire season.... was that from September 2019 to January 2020 or from July 2019 to March 2020?

p2, l42: Meanwhile there are many smoke-ozone papers in addition to Yu et al., 2021, who presented not more than a few hypothetical sentences. Now we have in addition: Solomon et al., PNAS, 2022, Bernath et al., Science, 2022, Rieger et al., GRL, 2022, Ohneiser et al., ACPD, 2022, Ansmann et al., ACPD 2022.

p2, l42-32: I suggest to cite also

Peterson et al., 2021, Australia's Black Summer pyrocumulonimbus super outbreak reveals potential for increasingly extreme stratospheric smoke events, npj Clim Atmos Sci,

2021, doi=10.1038/s41612-021-00192-9 .

In this paper, a nice summary of this record-breaking Australian pyroCb event (29 December 2019 to 5 January 2020) is given including an estimate of 1.1 Tg of emitted smoke.

P4, I99: Can you provide numbers regarding the extinction coefficient measurement range that OMPS-LP at 675 nm can measure? Probably 20 Mm⁻¹ along the line of sight is too high (saturation effect) and 0.1 Mm⁻¹ may be too low (no longer distinguishable from clear air...)? But these are speculations, you should know the measurement range.... and thus should be able to provide numbers.

P6, section 2.2 Or provide the extinction measurement range here....

p8, Figure 2: I have a few questions to this figure!

25-60S: You probably had saturation effects in the height range from 10-15 km in January and February 2020. On the other hand, are you able to detect cirrus at heights up to about 12 km?

One should check the lidar long-term observations at Punta Arenas at 53S (Ohneiser et al., ACPD, 2022). Lidar does not suffer from saturation effects. This lidar data set is for ONE single site, however, should be in general agreement with the development of the smoke extinction and AOD (as given here for latitudinal belts) in January to March 2020. The lidar extinction values are for 532 nm, and can be translated into 675 nm values by using the Angstrom exponents.

15-25S: The same here for the height range from 10-15 km in January and February 2020. Can we trust the January 2020 data?

p9, Figure 3 corroborates my 'opinion'. There is a quite nice decay behavior from February to April. And because the smoke injection was in the beginning of January (not in the middle or the end of January). Why are the January data NOT in line with the general trend from February to April?

p10, Figure 4: Can you explain, why there is steady decrease of extinction coefficient from 12-24 km, but not in the belts 15-25S and 60-80S? Again, are you sure that all extinction is purely caused by smoke (no cirrus)? What about January profiles? Probably, signal

saturation effects should show up in the extinction profiles.

I am so critical or suspicious in these points.... because in section 4 the radiative forcing results are shown, and the main question arises: Do these well and carefully performed simulations reflect the REALITY or the shortcomings (especially wrong January extinction profiles) in the satellite observations.

p12, Figure 5: the y-axis text is too long and too small. Why not simply: Daily average RF (W/m²) ... and the rest is then explained in the figure caption.

Also the x-axis text could be enlarged. a), b), c)...e) in the panels are larger than the x-axis text! That is not optimum.

p13, l297-l328: What do we learn? ... if we do not trust the extinction observations?

p14, Figure 6, again, February to April values show a coherent development.... but January results are very different. Underestimation of smoke extinction values?

Please, improve y-axis text also here (too long, too small).

p15, Table 1, again the same problem, why are the January values not in line with the rest (Feb to April data).

p16, Table 2, the same problem.

