This document includes reviewer 2 and editor comments. To each comment is associated an answer from the authors and the modifications performed in the text.

Reviewer 1 comments and answers are located from pages 2 to 4.

Editor comments and answers are located from pages 6 to 10.

Answers to Anonymous Referee #2

L15 & L63: re-check again on using “heatwave” vs. “heat wave” and correct.
Answer: Ok

Modifications: “Heatwave” is now written all along the manuscript.

L48: replace from “(black carbon for example)” to “(black carbon, for example)”
Answer: Ok

Modifications: The comma has been added.

L83: replace from “strucked" to “struck” & double-check using of verbs throughout the text of the manuscript.
Answer: Ok

Modifications: Done

L145: replace from “described in Sect. 2.2.3), “ to “described in Sect. 2.2.3,”
Answer: Ok

Modifications: The parenthesis has been removed

L168: replace from “MesoNH” to “Meso-NH”
Answer: Ok

Modifications: “MesoNH” has been changed to “Meso-NH”.

L188: may be? “the second in Palaiseau” vs “the second is in Palaiseau”
Answer: Ok

Modifications: It is now written “the second is in Palaiseau”.

L189 & L206: corrected to “Radome”, but not in L461.
Answer: Ok

Modifications: corrected to “Radome”

L267: at end of caption text to Table 1: add "." at end of "observations for the reference day (15 June)"

Answer: ok

Modifications: "." has been added to the caption.

Figure 1: Is it analysis for France? clarify on "14" LT (local time)? does it corresponds to 12 UTC time? clarify on difference in time between Paris, FR (vs London, UK, 00 UTC) locations? It is the same LTs values in different places in the text of the manuscript (double-check); Vertical axis to the right side of maps/plots: replace from "air Temperature" to "air temperature"

Answer: LT means indeed local time. In ACP guideline this is a common abbreviation and does not requires to be explicited. However, the sentence was misleading as 12 UTC is indeed 14 LT for Paris and not for London. This has been modified.

Modifications: add "14 LT in Paris" in the sentence and "air temperature" in the colobar legend. Furthermore, following the Editor suggestion, Figures 1 and 2 have been merged.

Figure 2: replace from "provided by provided by" to "provided by"

Answer: Ok

Modifications: Sentence removed as Figures 1 and 2 have been merged.

Figure 3: do you mean "platform" instead of "plat-form"

Answer: Yes, indeed.

Modifications: The text has been corrected.

Figure 9: add "." at the end of the caption text: from "and (d) 20 UTC terms" to "and (d) 20 UTC terms.". Same is for "." in Figure 10, etc. Re-check for EACH figure caption-text.

Answer: Ok

Modifications: Done for the corresponding figures and re-checked for all the others.

L343: replace from "8.0 g" to "8 g"

Answer: Ok

Modifications: "8.0 g" reads now "8 g"

L345: replace from “Paris ; ii)” to “Paris; ii)”

Answer: Ok

Modifications: Done

L379: replace from “(1.0 °C)” to “(1°C)”

Answer: Ok

Modifications: Done

Answers to Editor

Title: I suggest being more precise: "Numerical study of a dust plume impact…"
Answer: OK

Modifications: Numerical study of a Saharan dust plume impact on radiation, urban climate and thermal comfort in the Paris region during an heatwave event

Abstract: Please add a sentence highlighting the general implications of your results.
Answer: OK

Modifications: The following sentence has been added: "*This result highlights the need to integrate these insights into operational heat-health warning systems—by coupling aerosol forecasts with bioclimatic indices.*"

Introduction: The organisation of the section might be improved: because the paper focuses on dust, I'd first introduce aerosols in general, then anthropogenic aerosol and finally natural and dust aerosols, just before stating motivations and objectives of the paper.
Answer: Introduction organization is indeed much more fluid following the editor suggestions.

Modifications: The introduction organization has been modified following the editor suggestion. We also have improved the transition between the ideas.

Results: Not very clear to me the need for presenting C2, that is not contributing to the assessment of thermal comfort, which is the key target of the study. Please clarify what is the purpose of this simulation or consider removing it.
Answer: You are right, this point might remain unclear for the reader.

Modifications: Several sentences have been added in section 2.3 (Numerical experiments) to justify the need for the three simulations (italics in the following paragraph):

"Three simulations are performed: i) C0 sets the dust concentration to 0, ii) C1 uses the concentrations from CAMS data as input, and iii) C2 doubles the concentrations from CAMS data. *Given the substantial AOD variability across dust source models (see Fig. 2), both C1 and C2 remain scenarios considered as potentially realistic. Since aerosol quantity and composition are inherently uncertain, the most plausible scenario is the one closest to the observations and the urban thermal comfort analysis will therefore be conducted exclusively for that scenario. In contrast, C0 is not intended to be realistic but is used as a reference scenario to evaluate the effect of the dust in the two other simulations."*

Discussion: Better to organise the discussion of Wai et al. 2017, which is the key comparative paper, into a single paragraph, avoiding indents.

Answer: Ok

Modifications: The discussion of Wai et al 2017 is now written in a single paragraph.

L2: "Saharan"

Answer: Ok

Modifications: "Saharian" has been changed to "Saharan"

L39: sentence not clear, please clarify how "Bangert et al. (2012) simulation reduced significantly (up to 1 ◦C) the positive bias in the forecast of near-surface air temperature" and the logical link with the previous sentence.

Answer: The sentence was indeed not clear because of missing information.

Modifications: The sentence now reads :

Similarly, Bangert et al. (2012) reported that accounting for dust–radiation interactions in a simulation of a late May Saharan dust event over southwest Germany reduced net solar radiation by up to 80 W m^{-2} (AOD of 0.36), with corresponding near-surface air temperature decreases of up to 1°C across several regions of their domain. They further concluded that the positive bias commonly found in numerical weather forecasts during this dust event could be largely attributed to the absence of aerosol–radiation interactions in the forecast simulations.

L47: why you don't mention here the specific radiative effects of dust after you introduce the thermal impact in the paragraph just above?

Answer: Ok

Modifications: The radiative effects of dusts are now introduced with the radiative effects of ther other aerosols:

While the effect of some aerosols (such as sulfate or nitrate) is mainly limited to solar radiation diffusion, some others (black carbon, for example) can also absorb the solar radiation and convert it into heat (Liu et al, 2019). Mineral dusts have a dual behavior by scattering solar radiation, but also absorbing both solar and long-wave radiation depending on their size, shape, and mineralogical composition (Schepanski, 2018).

L77: "To fill the gaps in the existing literature, we study how…"

Answer: Ok, this section was not clear.

Modifications: The sentence now reads: "To fill these gaps, this study investigates how aerosol concentration can impact thermal comfort in urban areas during an extreme event: the July 2022 heatwave in the Paris region, which coincided with an inter-continental Saharan dust outbreak. We use an atmospheric model coupled with an urban surface model at a resolution of 1.2 km, allowing us to explicitly resolve urban heterogeneities and assess the combined effects of aerosols on air temperature, wind speed, radiation, and mean radiant temperature across different urban morphologies."

L210: what variable is used to estimate the UBL height?

Answer: Attenuated backscatter profiles are used to estimate the UBL height

Modifications: The sentence now reads: "The atmospheric boundary layer height is also estimated from *attenuated backscatter* profiles measured by two ceilometers, located in Jussieu (near the city center) and Palaiseau, and using the algorithm described by Kotthaus et al. (2020)."

3.4 Thermal comfort: The thermal impact should be reported in a more quantitative way: instead of guessing from the maps, you could provide spatial averages (with uncertainty) on the study area or specific areas cropped from the maps. Same comment for all the reported values concerning an area rather than a station.

Answer: OK

Modifications: Average values =- standard deviations have been added for every variable in a quantitative way. Two areas have been differentiated: the "Paris city" and "outside Paris" areas are shown on Figures 10 and 11.

Figures 1-2: why not to merge them into one? To directly compare the evolution of atmospheric circulation and dust transport. Instead of using adapted data and figures, you could make your own figure and show the same geographical domain by using either CAMS reanalysis or forecast, easily accessible through the Copernicus portal (https://ads.atmosphere.copernicus.eu/datasets).

Answer: Ok

Modifications: Following the Editor suggestion, Figures 1 and 2 have been merged and the dust AOD is no longer an adapted figure but one of our own.

Figures 5-8: what do the shadings represent? When we don't see any shadings, does it mean no

uncertainty is associated? Or uncertainty is too small to be appreciated?

Answer: Shading is not representing the uncertainty but the dispersion of the plotted variable, either between the hourly mean and hourly minimum and maximum when considering only one station or across the stations network when considering several stations. Fig are now number 4-7. For Fig. 4 (former Fig. 5), there was a mistake in the caption: the AOD values shown are the ones for Palaiseau AND Jussieu stations. Thus color patches represent the AOD value difference between the two locations: a larger patch thus denotes higher spatial variability. For Fig. 5 (former fig 6), the observation curve is delineated at the bottom and at the top by the hourly minimum and maximum, respectively. For Fig 5 (former 7), The mean value of the nine (two) global (direct and diffuse) solar radiation stations is represented by the curve and is surrounded by a patch delineated at the bottom and at the top by the 0.1 and 0.9 quantiles, respectively. For Fig 7., the shading is delineated at the bottom and at the top by the 0.1 and 0.9 quantiles, respectively.

The dispersion is not always plotted. It is plotted only for the variables specified in the caption, even though the reason for having only some variables is not motivated. Thus in Fig. 5 (former 6) the dispersion is only plotted for the observations since the initial data is 6 minutes data. For Figure 7 (former 8), the dispersion is only displayed for rural temperature difference (for absolute air temperature it would not have been readable and there is only a single urban station, thus there is no dispersion).

Modifications: Fig. 4 caption has been modified to integrate the information that it is Palaiseau AND Jussieu station (and the text accordingly when this information was wrong). Some captions have also been modified when unclear.

Technical: Please check carefully the track-changes version, many references are not shown in the text (replaced by "?").

Answer: You are right, we wanted to highlight changes in the reference section of the manuscript but we have not managed to make the diff_latex software work properly for the reference section.

Modifications: We have managed to make the diff_latex work for the references.