

Author's response to review of Referee #3, posted on 13 March 2013
on “The diurnal evolution of the urban heat island of Paris: a
model-based case study during Summer 2006”

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Note: our changes in the manuscript are highlighted with the yellow marker.

The authors would like to thank the anonymous referee for the time devoted to review the manuscript and for his/her useful and constructive comments. All comments by the referee were carefully addressed and the manuscript has substantially benefited from the proposed changes. We would like to clarify our changes below.

Comment on P25943, L2: *“characteristics” (instead “characterstics”).*

We have corrected this in the final manuscript, see r. 44

Comment on P25943, L4: *“...favoured by high solar irradiation...” not clear (during the previous daytime period)*

We have made this sentence more clear in the final manuscript, see r. 48:

“It is especially favoured by high solar irradiation (clear-sky) during the **preceding** daytime period, no precipitation, low wind speeds and stable stratification.”

Comment on P25943, L9-L28: *This part of the introduction does not add much. Authors should instead focus on the state of the art on the understanding of the processes (which is the subject of this article).*

We have shortened this part of the introduction. We now keep focus on the relevance of understanding the UHI processes, see r. 54 – 62

Comment on P25944, L16: *“known” instead “know”* → the corresponding sentence was reformulated (r. 85 – 89)

P25944, L18: *“...mixed-layer height during the day is at least ...”* → corrected at r. 79 – 82

P25944, L19: *“...than the during the day and ...”* → corrected at r. 80

P25944, L16: *“...Therefore, an ~~an~~ idealized advection model...”* → corrected at r. 193 – 195

P25945, L1: *“...little is known about orographic...”* → the corresponding sentence was reformulated (r. 85 – 89)

P25945, L10: *“... for an in-depth analysis of the evolution...”* → corrected at r. 121

We have corrected these typing errors in the final manuscript.

Comment on P25945, L19: *References must be in alphabetical order or in the order of year of publication (check all)*

We have checked that the references are in alphabetical order

Comment on P25945, L23: *“...using Ridder’s (1979)...”: reference is missing*

This reference is now added to the final manuscript, see r. 963 – 965

Comment on P25946, L3: *“... Rodell et al. (see 2004) ...”*

This refence is corrected in the final manuscript, see r. 150

P25947, L1-L2: *“... with values reaching...” : this has been already specified earlier in the text*

We have left out this sentence from the final manuscript, see r. 185

Comment on P25947, L16: *“... at horizontal resolution of 16, 4, 1km.”* → corrected at r. 204

P25948, L8: *“...(Jain, 1989) are applied subsequently...”* → corrected at r. 234

P25949, Eq(2): *Mistake in the sign of equation* → corrected at pp. 4

P25949, L18: *“...can be integrated from Eq. (2):”* → corrected at pp. 4

P25951, L25: *“.. have a daily mean of ...”* → corrected at r. 322

P25951, L26 : *“... or 19% which starts to increase too early...”* → corrected at r. 324 – 325

We have corrected these typing errors in the final manuscript.

P25953, 1st / 2nd paragraphs: *These paragraphs are not clear. For instance, “The reduction in latent heat is the most important urban heating mechanism ...” is a bit confusing.*

We have carefully revised these 2 paragraphs. Hereby, we now clearly identify and compare the source terms for urban heating by looking at the differences in the surface energy balance between the two scenarios, see r. 353 – 383

P25956, L6-L9: *It would be more appropriate to remove this sentence. It is repeated in the conclusion of the section and in the conclusion of the paper.*

We have removed this sentence. As the introduction paragraph in section 3.4 is very short, it is now removed. Instead, we have clearly defined the goal of section 3.4 at the end of the introduction, see r. 119 - 124

P25956, L22: *How the fit has been done? (It does not seem to be the best for the run SCEN?)*

We have improved the fits by using linear regression on the lowest 150 metres in both scenarios.

Therefore, the stability of the linear profile in the scen case was increased from 5K/100m to 5.8 K/100m. The temperature at the inversion height was calculated from the averaged temperature between 150 and 400m above ground level. This improvement slightly affected the results for the idealized model for the adiabatic cooling. As a result, the decreased adiabatic cooling over the city compared to cropland is 1.5K (25%) instead of 1.3K (compare r. 581 in the new manuscript with r. 15 on page 25958 in the old manuscript.) We have now described the method of the fits at r. 488 – 496.

P25958, L12 “decreases” instead “increases” ??

We have replaced the sentence in the new manuscript (r. 573):

Original sentence: “If only the surface sensible heat flux is considered ($wh = 0$), the relatively low difference between the base case and scenario case in surface heating between 22:00 UTC and 23:00 UTC increases the UHI to 4.8 K”

New sentence: “Excluding the upward motion, the differential surface heating between the base case and scen case between 22:00 UTC and 23:00 UTC results in an UHI buildup from 2.7K to 4.6K at the surface (compare ‘base NLFT’ with ‘scen NLFT’ in Fig. 12 (b)). This UHI buildup is smaller than for the simulations including the vertical motion (6.1K).”

P25958, L17: You could also mention that the vertical extent of the UHI is different.

Yes, it is true that the vertical extension is affected. We have added this interesting finding to our results in Section 3.4.3 (see r. 587 – 588) and to the conclusions (see r. 795 - 796)

P25959, L9

“... is not sophisticated, the UHI...” → corrected at r. 735

P25966

Ref “Makar et al. 2006” is missing → added at r. 947 – 949

Figures General comment: the captions are sometimes very long and should be simplified.

We have revised the captions of Figs. 1, 2, 3, 6, 7, 9 and 10

Fig.2 and Fig.3: These diagrams are not very clear. You should specify which curve is for $\theta(t)$ and which one is for $\theta(t+dt)$ and clarify the values on x-axis and y-axis. The dotted line for the $\theta(t)$ vertical profile is not clear and confusing with the dotted lines used to show dh .

We have improved these two figures and captions according to your recommendations. We have indicated on the figures which lines correspond to $\theta(t)$ and $\theta(t+dt)$.

Comment on Fig.9: You should add the star that indicates the Paris city centre (like for Fig.10).

We have added the star at each panel of Fig. 9