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Geoscientific Model Development Discussions

Interactive comment on "Improvements of the hydrological processes of the Town Energy Balance Model (TEB-Veg, SURFEX v7.3) for urban modelling and impact assessment" *by* Xenia Stavropulos-Laffaille et al.

Anonymous Referee #2

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The authors have added improved hydrological processes to the TEB model. These additions are welcomed by the urban modelling community and will allow for more sophisticated urban impact studies. Overall, this work and well thought-out and the model testing/evaluation is robust. I only have minor comments most of which are clarifications and/or editorial in nature. My biggest criticism of this manuscript is the writing quality, which can be significantly improved. I have suggested a number of editorial changes below but I would suggest that this manuscript be carefully proofread before the revision is submitted.

General comments:

The link to urban planning / climate change adaptation is not well made and the flow and writing structure of the abstract and introduction is quite poor.

The terminology of "sewer" and "stormwater" etc is a little confusing at first. Can you please carefully define variables like Qsew and Qtown/Rtown - in some contexts a "sewer" is strictly wastewater and "stormwater" is rainwater runoff - please make sure you clarify and explain these terms, so readers from different geographical regions understand your meaning clearly.

Does the TEB-hyrdo improve and/or significantly change urban ET? You made the point that these coupled approaches are needed for accurate urban-microclimate assessment but you didn't actually show how TEB-hyrdo influence urban climate. Is this planned for future work? ———————————

Specific comments

P1L10-11: your first sentence doesn't provide relevant context for this sentence: "Local authorities and stakeholders have therefore opted for more nature-based adaptation strategies, which are especially suitable to influence both hydrological and energy processes". What do "nature-based adaptation strategies" have to do with climate change and demographic pressures. Can you be more slightly more specific?

P1L13: "better representation" is subjective - perhaps say "more physical representation" or "more complete representation"

P1L14-16: change sentence beginning: "The developments studied concern. . ." to:

"The developments include the introduction of subsoil beneath built surfaces, horizontally rebalancing intra-mesh soil moisture, draining soil water via the sewer network, and limiting deep drainage. The aim of these developments is achieving a more realistic base flow pattern in the sewer system."

L20: change “roughly” to “approximately”

P1L21: remove “yet”

P1L25: “Urbanisation is the predominant trend in today’s world” - this is vague - I suggest deleting or improving.

P1L29: can you say something about why/how so called “natural-based solutions” help with adaptation? 1-2 sentences.

P1L29: change “has been” to “have been”

P2L5: change “As regards” to ”With regards to”

P2L5: “As regards hydro-microclimatic patterns, the processes of evapotranspiration (or latent heat flux) constitute an increasingly significant portion of both the urban water and energy budgets” - please provide a reference or evidence for this statement.

P2L15: unclear what is meant by: “Consequently, urban hydrological models are being more heavily promoted, even though they still simplify or neglect the energy balance.” - are you saying that urban hydrologists prefer hydrological models over energy balance models? Clarify.

P2L20: the authors use very long and confusing sentences with multiple commas - often sentences can be split into two sentences: e.g. sentence beginning: “Unlike hydrological models. . .” change to:

“Unlike hydrological models, the urban micro-climate models (Masson, 2000; Musy et al., 2015; Gros et al., 2016) provide a detailed solution of energy and radiative budgets. However, the water balance has been simplified in micro-climate models, which can lead to an alteration of the modelled latent heat fluxes (Grimmond et al., 2011).”

P2L23: Malys et al. (2016) used what model? And what did they find with regards to your previous point?

P2L24: remove “hence”

P2L29-32: Sentence beginning: “this approach initially. . .” - please restructure into two clear sentences.

P2L33: remove comma after “artificial surfaces”.

P2L34: sentence beginning: “Using the ISBA-DF model. . .” - this sentence is backward. You should start by saying: “The TEB model has evolved into TEB-Veg (Lemonsu et al., 2012) using. . .”

P4L4: what does the “(-)” mean? Typo?

P4L15: change “is affected” to “are affected”.

P4L25: can you please clarify the difference (if at all) between stormwater or combined sewer networks and how they work in the model.

P6L20: you will need to provide more information about the Ip calibration parameter here?

P7L7: what is the coefficient of retention?

P8 Fig. 2: This map is not readable and will need be made larger.

P8L6-7-: “It was instrumented. . .” - What was instrumented?

P10L9: “..two types of analyses were conducted” - do you mean by you, or others? Please clarify.

P10L14: I suggest adding the sources of chosen values to Table 2.

P10L15:-17: sentence beginning: “The MIN and MAX....:” - please rephrase sentence and clarify.

P10L18: “factorial plan” should be “factorial plane”?

P10L18: remove “or not” ?

P10L20: change “..is of common use. . .” to “is commonly used...”

P10L22-23: Confusing phrasing here. Also, table 3 is unnecessary - simply state that the +1 and -1 respectively denote the MAX and MIN values in Table 2?

P10L24-25: citation for “Yates Order”?

P11L24: “..to anticipate problems upon initialising. . . “ - perhaps change this to something like: “..to allow the model to numerically stabilise”?

P11L26-27: simplify this sentence - just say that the model is calibrated and evaluated with two separate time periods.

Table 4: it would be easier for the reader to interpret table 4 if you added the parameter that is perturbed to the table - I found myself flicking back-and-forward between table 2 and 4 a lot.

P12L29-30: “In fact, soil water. . .” can you please clarify your meaning and logic here.

P13L19: First sentence is poorly written.

P14L4: change “independently” to independent

P14L6: change “For starters” to “Firstly”

P14L20: “..most likely caused by the various hydrological properties of both simulation periods.” - this is vague - please be more specific or remove.

P14L20-21 “a total precipitation height. . .” change to “...had 1873 mm of precipitation..”. I also think you should say a little more, maybe 1-2 sentences, on why you think the model performed worse during the dry year.

A minor point but the number notation changes on the x-axis in a number of Figures - e.g. 4 and 7.

Can you please add a list of symbols.

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