Geosci. Model Dev. Discuss.,
doi:10.5194/gmd-2016-240-AC2, 2017
© Author(s) 2017. CC-BY 3.0 License.

Geoscientific Model Development Discussions
Open Access
EGU

Interactive comment on "Efficiently modelling urban heat storage: an interface conduction scheme in the aTEB urban land surface model" *by* Mathew J. Lipson et al.

Mathew J. Lipson et al.

m.lipson@unsw.edu.au

Received and published: 27 January 2017

This document is the authors response to the comments of Referee 1 (RC1) for the manuscript: http://www.geosci-model-dev-discuss.net/gmd-2016-240/

Page and line references (P# L#) are listed for original manuscript (in red with referee comments) and for the revised manuscript (in black with response).

This paper presents a new heat conduction scheme which can be implemented in the urban land surface models and compares it with a well-established and widely used scheme in current land surface models. The study is interesting and in the scope of

Printer-friendly version

Discussion paper

CC BY

the Geoscientific Model Development. The author(s) made a reasonable effort and the research was carefully conducted. I think that this paper could be published promptly because the new proposed scheme and the discussions in the paper are helpful for the developers and users of the urban land surface models. However, there are some flaws in the manuscript, which I think that the authors should consider to revise before the manuscript is finally accepted.

Major: 1. One of my major concerns is about the structure of the manuscript. I feel a little confused when I read through the manuscript and had to go back and forth for a few times. I think it is clearer that if the authors can restructure section 2, into which part of section 3 and 4 can be moved. The new section 2 serves as a Methods section, where the authors introduce the two conduction schemes, the aTEB model, modeling setup, idealized method, as well as the data used. Then section 3 and section 4 serve as results sections to discuss about the idealized results and observational results.

We thank Referee 1 for their advice regarding the structure of the manuscript, which we have adopted. We feel these changes will help make the manuscript easier to read and understand. The parts of Section 3 and 4 which described methods and model description has been moved to Section 2. The remaining parts of Section 3 and 4 have been combined into a results Section 3. Discussion and conclusion Section 5 has become Section 4 and some other section titles have been revised. A snapshot of the structural changes are attached at the end of this document.

[Major] 2. The authors use two methods to assess the performance of the two schemes: idealized environment and observational datasets. When using observational dataset, the improvement in Qs and other fluxes when changing from half-layer scheme to interface scheme are rather small (< 5 W m-2). I wonder whether the magnitudes of these improvements are statistically significant? Could the authors provide any statistics to prove that?

Printer-friendly version

Discussion paper

CC BY

As suggested, we have extended the study to test the statistical significance of mean improvements for all fluxes (Table 3). We undertake a paired, two-sided T-test for the null hypotheses that two dependent samples have the same mean values (i.e. we test the significance of the improvement of the interface scheme). In each case, the 95% confidence interval is reached. We note the significance in the text (last line of Taylor diagram section, previously P13 L6), and in the body and caption of Table 3.

Minor: 1. Page 2 Line 3: “the alternate method” -> “the alternative method”

P2 L2: Sentence has been reworded and “the alternate method” removed.

[Minor]2. Captions in Figure 4 and Figure 5: (a) flux density and (b) normalized error. I suppose the authors mean: (top panel) flux density and (bottom panel) normalized error

Yes, that was the intention, it has been revised.

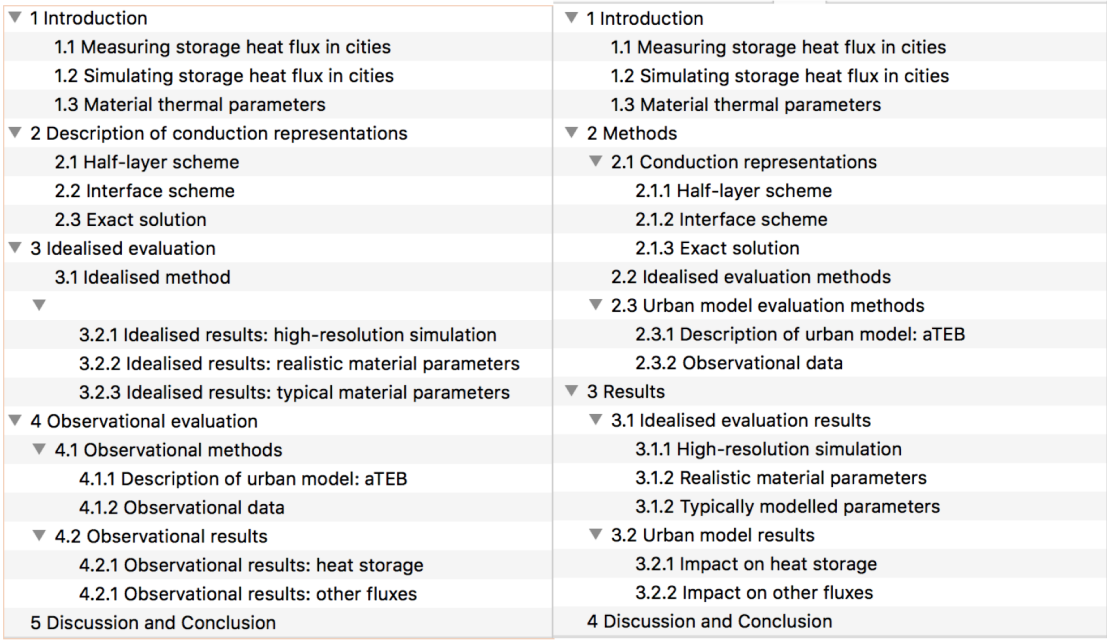
Again, we thank the reviewer for these comments.

Interactive comment on Geosci. Model Dev. Discuss., doi:10.5194/gmd-2016-240, 2016.

Printer-friendly version

Discussion paper

CC BY



1 Introduction	1 Introduction
1.1 Measuring storage heat flux in cities	1.1 Measuring storage heat flux in cities
1.2 Simulating storage heat flux in cities	1.2 Simulating storage heat flux in cities
1.3 Material thermal parameters	1.3 Material thermal parameters
2 Description of conduction representations	2 Methods
2.1 Half-layer scheme	2.1 Conduction representations
2.2 Interface scheme	2.1.1 Half-layer scheme
2.3 Exact solution	2.1.2 Interface scheme
3 Idealised evaluation	2.1.3 Exact solution
3.1 Idealised method	2.2 Idealised evaluation methods
	2.3 Urban model evaluation methods
3.2.1 Idealised results: high-resolution simulation	2.3.1 Description of urban model: aTEB
3.2.2 Idealised results: realistic material parameters	2.3.2 Observational data
3.2.3 Idealised results: typical material parameters	3 Results
4 Observational evaluation	3.1 Idealised evaluation results
4.1 Observational methods	3.1.1 High-resolution simulation
4.1.1 Description of urban model: aTEB	3.1.2 Realistic material parameters
4.1.2 Observational data	3.1.2 Typically modelled parameters
4.2 Observational results	3.2 Urban model results
4.2.1 Observational results: heat storage	3.2.1 Impact on heat storage
4.2.1 Observational results: other fluxes	3.2.2 Impact on other fluxes
5 Discussion and Conclusion	4 Discussion and Conclusion

Fig. 1. The old (left) and new (right) outlines.

CC BY