Point-by-point response for the comments of reviewer #1

The font colour of the reviewer's comments is in black and our response is in blue.

General:

The paper by Salim et al. supplies a comprehensive overview of model physics, numerical procedures and computational techniques adopted by the obstacle resolving model MITRAS. It may serve, and is intended to serve as kind of a reference manual of the model, therefore going into some detail in places.

Authors are happy that the paper's objectives are clear.

Overall vote:

I consider the paper as acceptable with minor changes. However, I would suggest to think about shortening the paper by leaving specialised applications of MITRAS (e.g. wind turbines) to the follow-up article to present typical applications as announced in the authors' outlook in section 7. Shortening would also leave some space to discuss software and hardware requirements of the model system. This is just a suggestion; I would also accept the paper in its current scope.

Authors value the suggestion given by the reviewer to shorten the paper and move the applications part to the following paper. However, authors want to keep the focus of the following paper on the model validation/evaluation only, which is already long enough. Also, it was requested by the editor in the initial submission to add a section showing the model capabilities and applications. So, we prefer to keep this part and we are happy that the reviewer would kindly accept the paper in its current status.

Detailed remarks:

1. The combination of a terrain-following coordinate system with blocked-out cells representing buildings is an interesting approach. From the figure presented to illustrate it, however, the impression arises, that coordinate surfaces will be exactly horizontal already at the height of the highest buildings. I assume that this is not the case and the impression is owed to the graphic depiction. If so, the authors should comment on the figure in more detail.

As the reviewer pointed out, in a terrain following coordinate system the coordinate surfaces will NOT be exactly horizontal at the height of the highest building. Authors agree that the figure in its current status may be confusing. We changed the figure so that the terrain-following system is more clear, yet not to scale.

2. I recommend a re-structuring of section 2.2. The sub-sub-sub-sections about the closure methods should be 'lifted' by one level, because these methods don't apply to fluxes of scalar quantities only.

Section 2.2 has been restructured accordingly.

3. In section 2.3.2 (page 8) the sentence starting at line 19 is hard to understand. Of course, the value of a quantity, in this case diffusivity, will increase if one adds more of that quantity. A more precise formulation would be appreciated.

The sentence has been reformulated to show that artificial diffusivity is used to avoid numerical artefacts.

4. In section 3.1 (page 10) after the citation of Tiedtke and Geleyn resp. Deardorff, the word 'equations' is misplaced.

The word 'equations' has been removed.

5. In section 3.3 (page 11) some detailed numbers concerning the Rayleigh damping would help: typical vertical extent of the model domain in terms of k, typical value for the index of lowermost damping layer.

We added some details to describe the Rayleigh damping: the recommended values of the coefficient δ as well as the number of damping layers. The number of vertical levels and the lowermost damping layer index implicitly depend on the domain height, therefor we could not provide specific values here.

6. In section 4, an equation for the roughness length for the temperature at buildings falls from the sky. Assumably, the equation follows Brutsaert's suggestions, but the authors should include a citation as well as a slightly deeper explanation at this point, e.g. what leads to the value of 442413.

The equation for the roughness length for the temperature at buildings in the manuscript contains two details, which may result in this confusion. The first one is substitution of the Reynolds number and the second is the limitation used to limit the roughness length. We have removed these details and we stick to a simpler form leaving these details to the model documentations. We have changed the text correspondingly.

7. The symbol 'ny' is used for cinematic viscosity as well as thermal conductivity. This is not advisable, better use a different symbol for the latter. The unit of the thermal conductivity should start with a capital W for Watt, the table shows a lower case w.

The symbol for thermal conductivity is changed to νs to distinguish the kinematic viscosity symbol. Also "W" is used for "Watt".

8. In the list of references, several German titles (Eichhorn, 1989; Gierisch, 2011; Linde, 2011; Lopez, 2002: Molly, 1978; Schlüter, 2006) appear with all capitalized starting letters, these should be transferred to correct German notation. Also, in places regular German vowels are used instead of "Umlauts" (Bachlin, Schlunzen, etc.)

German capitalization and German Umlaut characters are now used in the respective references.

9. There is no publication by Eichhorn, J. and Anke, K. but one by Eichhorn, J. and Kniffka, A.

The authors list in the reference is corrected to Eichhorn, J. and Kniffka, A.

10. Comments on figures:

Figure 4: Keep the order of the data items (terrain – building – surface cover – vegetation) before and after preprocessing.

The order is corrected according to the reviewer's suggestion.

Figure 5: Add a note to the caption or to the text, telling about the number of vectors plotted.

We edited the caption to show the density of vectors, as a proxy to the number of vectors, and the purpose of showing the velocity vectors.

Figure 8: Think about different color schemes for wind speed and tke. Most of the tke values are small, therefore I would suggest to use a colorbar starting with a less dominant color than dark blue. Add letters A and B to the figures.

The color scheme is changed as recommended by the reviewer and the letters A and B are added.