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Geoscientific Model Development Discussions

Interactive comment on "Development of the Surface Urban Energy and Water balance Scheme (SUEWS) for cold climate cities" *by* L. Järvi et al.

Anonymous Referee #1

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General Comments

This manuscript describes the development and testing of a snow scheme for the SUEWS model. The snow scheme itself is of appropriate sophistication for a model intended for use in a mesoscale model or used independently for urban planning, incorporating the primary effects of snow on albedo, heat storage, melting and re-freezing, and latent heat/evaporation, and fractional snow cover. A couple of the parameterizations are perhaps less process-based than snow submodels that can be found in land surface models, e.g., melting and freezing is calculated using the degree day method as opposed to an energy balance method, however, the authors acknowledge the need to assess site specific degree day parameters. On the other hand, the model accounts for the effects of heat release by rain on snow, an important process not always repre-

sented in land surface models. The model also accounts for snow-clearing on paved and built surfaces, although does this commonly occur on roofs? The model is evaluated for several cold climate sites with multi-year data. After being tuned, the model does quite a good job of reproducing observations.

Specific Comments

1. The discussion about modeling leaf area index seems out of place here. I assume LAI is influencing evapotranspiration but there is no description here as to how this is accomplished in the model, plus it is not clear how LAI (for non-deciduous vegetation) might interact with snow, e.g., is snow intercepted by vegetation, does it modify optical properties of vegetation? Furthermore, I don't see any reference to observations for LAI, yet it is concluded that the leaf growth algorithm is improved and appropriate in both Helsinki and Montreal. The authors should elaborate on this aspect of the model.

2. Does the model account for how interactions between vegetation and snow affect albedo. e.g., due to the height of vegetation, albedo can be a mixture of vegetation and snow albedo until the vegetation is fully buried?

3. There are numerous model parameters being adjusted for each of the sites. Perhaps the authors could comment on the implications for the transferability of the model to other sites, particularly those that don't have extensive observational data.

Concluding Comment

In general, the study is quite comprehensive, the model performs well despite or perhaps due to its complexity, and the manuscript is very well written and organized. I recommend that it be published after addressing the comments above.

Interactive comment on Geosci. Model Dev. Discuss., 7, 1063, 2014.