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Interactive comment on "Accounting for anthropic energy flux of traffic in winter urban road surface temperature simulations with TEB model" *by* A. Khalifa et al.

Anonymous Referee #2

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Snow and ice on winter roads is a serious hazard and a significant cause of human injury and economic damage. Overzealous use of de-icing agents contributes to environmental degradation in an already highly stresses urban ecosystem while inaction can lead to serious consequences. Contributing to better mitigation strategies for ice and snow on winter roads in cities has great influence on the quality of life for urban population and can contribute to more efficient use of resources.

The study "Accounting for anthropic energy flux of traffic in winter urban road surface temperature simulations with TEB model" describes and compares two model instantiations. This work is of interest, as may contribute to better forecasts of road conditions and the coordination of mitigation strategies. Of particular interest is the comparison

of two different approaches to estimating road surface temperature and their validation against field experiments.

Some of the equations are quite vague and assumptions are not further explained or justified. This problem is apparent right at the start in equation (1). With the equation, as presented, I have two questions:

- ΔZs is the first layer of the road cover thickness in metres. The authors set ΔZs = 0,001 to reflect only the road surface temperature. Since the authors relate the total heat flux across the road surface to the bulk heat capacity of the road, why do the authors minimise the road cover thickness? Is it to allow for an immediate response of the road surface temperature to heat flux changes without any thermal inertia? This choice should be explained in more detail.

- The equation only accounts for the latent heat of evaporation, not for the latent heat of fusion of ice to water. Surely this is a factor when considering iced road conditions? The reasoning for this choice needs to be explained as this equation is fundamental to the models proposed.

Both modelling approaches are validated against experimental data in the field. The authors were able to demonstrate that traffic does have a significant shielding effect but neither of the two models can accurately reproduce it. In the data presented, marked differences occur in the early hours of the day, a time most critical to the motivation of their research to improve mitigation of road hazards by iced roads. The experiments themselves were not conducted under relevant weather and road conditions. According to the data, all measurements took place at temperatures above freezing.

When the model results are compared to experimental results, both models underestimate road surface temperatures. In practice, this would lead to false alerts with respect to ice on roads.

In their conclusions, the authors should be clearer about the performance of their mod-

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els. They do demonstrate the relevance of including traffic in a TEB but the models do not perform well in critical situations.

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