Author response for the reviewer #2 regarding the manuscript *"The road weather model RoadSurf driven by the HARMONIE-Climate regional climate model: evaluation over Finland"*

We thank the reviewer #2 for the comments (in blue). Please find our response below (in black).

We have made changes in the manuscript, and the changes are visualized in the attached file "gmd-2018-330_version2". The pages and line numbers as well as the reference numbers for figures used in this response correspond to the ones used in the attached documents.

Anonymous Referee #2

This paper evaluates the RoadSurf model forced with output from a regional climate model (HARMONIE-Climate). The RoadSurf is used operationally to simulate road conditions for the benefit of the public. Here, the authors extend RoadSurf by forcing it with output from a regional climate model. This successful endeavor then paves the way to make assessments of future road conditions under climate change by forcing RoadSurf with output from a projection-period regional climate simulation.

The paper is easy to read and understand. I am not an expert in road modeling, so it is difficult to criticize anything about the RoadSurf model. I certainly couldn't identify any glaring deficiencies. Much of the paper is devoted to assessing the skill of the regional climate model. There are biases and problems, as one would expect, but even with these biases, the RoadSurf model is able to reasonably replicate what is observed at the observed road sites. Clearly, it would be even more powerful if the simulation forced with regional climate model output could be compared to results with bias-corrected forcing or local forcing, but that may not really be feasible. So, in the context of the purpose of the paper, which is to assess whether or not RoadSurf forced with a regional climate model has the potential to provide useful information on Road conditions now and in the future, I would say that the authors have demonstrated this to be the case.

So, overall, I find this paper suitable for publication in close to it's current form. Will be interesting to see what happens when they run with climate change scenarios.

We thank the referee for the positive feedback on our manuscript. Evaluation of RoadSurf using local forcing would be interesting, but this is not feasible as the road weather stations in Finland do not observe solar radiation and precipitation measurements are considered unreliable (Kangas et al., 2015).

However, we have now added an analysis of the relationships between the road surface temperature biases and the biases in the input parameters at the road weather stations. Based on this analysis, the variability in the road surface temperature biases seems to be mainly explained by the variability in the air temperature biases (please see section 3.2.1 starting from P12 L351) as speculated in the first version of the manuscript.

References:

Kangas, M., Heikinheimo, M., and Hippi, M.: RoadSurf: a modelling system for predicting road weather and road surface conditions, Meteorol. Appl., 22, 544–553, https://doi.org/10.1002/met.1486, 2015.