Poster 1

VALIDATION OF ROAD WEATHER MODEL ROADSURF IN FENNOSCANDIA USING REGIONAL CLIMATE MODEL DATA

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At northern high latitudes, road traffic sector benefits from improved local and regional climate information. These regions experience frequent winter-time snow and ice conditions, and traffic weather conditions can also change quickly with e.g. the onset of snowfall or during rapid temperature variations around the freezing point. Systematic consideration of upcoming weather events helps not only the general public in safe every-day commute but also the road maintenance authorities to attend the roads in a cost-effective manner. In Finland, Finnish Meteorological Institute (FMI) has a duty to issue warnings of hazardous traffic conditions to the general public. To support this purpose, the institute has developed a road weather model RoadSurf, which has been in operational use since 2000 (1). RoadSurf produces information on road surface temperature, friction as well as road surface classification index describing the status of the road surface (e.g. dry, snowy or partly icy) and a traffic index describing the weather-related traffic conditions (normal, difficult or very difficult) which are used when issuing road weather warnings.

The road weather conditions are expected to be altered by the ongoing anthropogenic climate change throughout the inhabited northern high latitudes as this region is strongly impacted by the Arctic amplification of climate warming. For example, winter months in Finland have warmed most rapidly (by 3-4 degrees) and this trend is projected to continue in the coming decades. In addition, precipitation is projected to increase, most strongly in the northern part of Finland in winter-time (2). The expected warmer and wetter future climate implies new challenges to road maintenance and traffic safety as precipitation events are likely to shift towards less snowfall and more frequent rain and sleet episodes. This would decrease the snowy road conditions, but at the same time increase wet road surfaces, which could lead to more frequently observed icy road conditions during the night and the morning. It is also possible that outside the summer season the events of rapid temperature change around the freezing point will become more frequent leading to increasing black ice conditions and making the roads more vulnerable to erosion.

We have combined a high-resolution regional climate model, the HIRLAM–ALADIN Regional Mesoscale Operational Numerical weather prediction In Europe (HARMONIE) Climate (HCLIM) (3), and RoadSurf to study how the future road weather will be affected in Fennoscandia by the climate change. Currently, the combined HCLIM–RoadSurf configuration has been evaluated against 25 traffic weather stations in Finland (**Fig. 1**) in terms of road weather conditions in the present-day climate. For the evaluation, HCLIM was run for the years 2002–2014 with a horizontal domain resolution of 12.5 km*12.5 km and with 65 vertical levels. The lateral boundary conditions of HCLIM were taken from ERA-Interim reanalysis, and the HCLIM data was further utilized by RoadSurf. The first results show that the HCLIM-RoadSurf modeling system is able to predict the road surface temperature with a very high accuracy. In addition, the model produces realistic

road surface conditions, although it tends to predict more partly icy road conditions compared to the observations. However, the evaluation of HCLIM-RoadSurf indicates that this model configuration can be used further to estimate the effects of climate change on the road weather conditions in Fennoscandia.

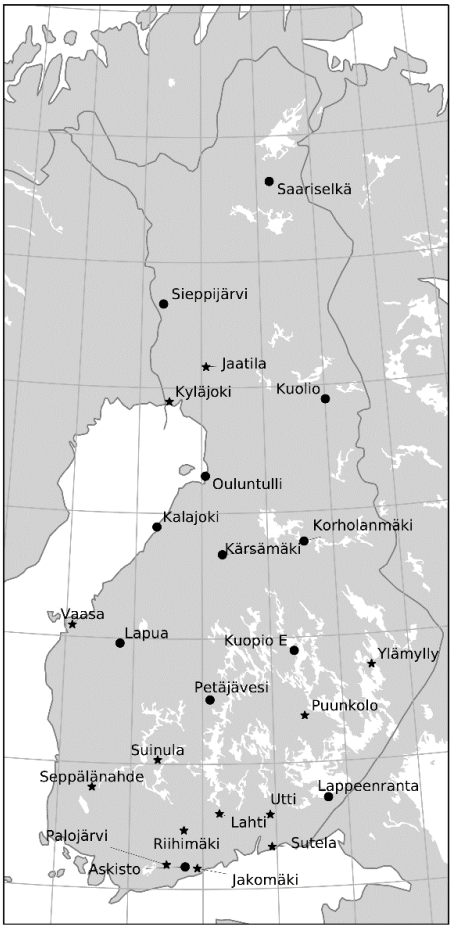

Fig. 1. Locations of the road weather stations used for the model evaluation. Stars are representing stations which have also an optical sensor defining e.g. friction.

References:

1. Kangas, M. et al., **2015**, RoadSurf: a modelling system for predicting road weather

and road surface conditions. *Meteorological Applications*, *22:3*, 544–553. DOI: 10.1002/met.1486.

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scenarios. *Geophysica*, *51:1*, 17–50.

3. Lindstedt, D. et al., **2015**, A new regional climate model operating at the meso-gamma scale: performance over Europe. *Tellus A: Dynamic Meteorology and Oceanography*, *67:1*, DOI: 10.3402/tellusa.v67.24138.