



Latest developments in road weather forecasting

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ABSTRACT

An accurate weather forecast is crucial for efficient road winter maintenance. Next to traditional road weather forecasts, some special types of road forecasts are available.

A route based forecast is a forecast for a gritting route that shows local temperature differences. Skyview is an important input parameter for a route based forecast, but relatively expensive and time-consuming to measure. Therefore a method has been developed to retrieve skyview data from Google Streetview information.

The second topic shows the importance of cycle lane forecasts. Due to different characteristics, cycle lanes can be more critical than normal roads.

Keywords: road surface temperature forecast, route based forecast, dynamic gritting, skyview, cycle lane.

1 INTRODUCTION

An accurate weather forecast is crucial for efficient road winter maintenance. MeteoGroup has many years of experience in road weather forecasting in different countries. In this paper we will discuss two special types of road forecasts: route based forecasts and cycle lane forecasts.

Route based forecasts are forecasts for a complete gritting route. It gives insight in the large local temperature differences that can occur due to local circumstances. Skyview is an important input parameter, but relatively expensive and time-consuming to measure. We present a method to derive skyview data from Google Streetview.

Cycle lanes generally have a thinner asphalt layer than normal roads, and can therefore be more critical, especially in black ice cases. This is the reason cycle lane forecasts have now been created.

2 ROUTE BASED FORECAST

For road weather sites it is possible to make a high quality road surface temperature and condition forecast, based on known local characteristics of the site. This forecast is based on both a physical and statistical approach. Road weather site forecasts can be very helpful for road winter maintenance, but it is still unknown what happens at other road sections.

3.1 Large local differences

Road weather stations are mainly located on cold road sections. Large local road surface temperature differences (up to several degrees) can occur along a route due to different environmental characteristics. If a road authority just uses the forecast of the road weather station, it may happen that in cases with road surface temperatures around 0°C, parts of the road are treated while it was not necessary. Reduction of the number of gritting kilometres is possible. This is important for both financial and environmental reasons.

Therefore a route based forecast has been developed, based on information about skyview, solar view, road type and local air temperature. In this way a forecast for every road section can be created. Figure 1 shows an example.

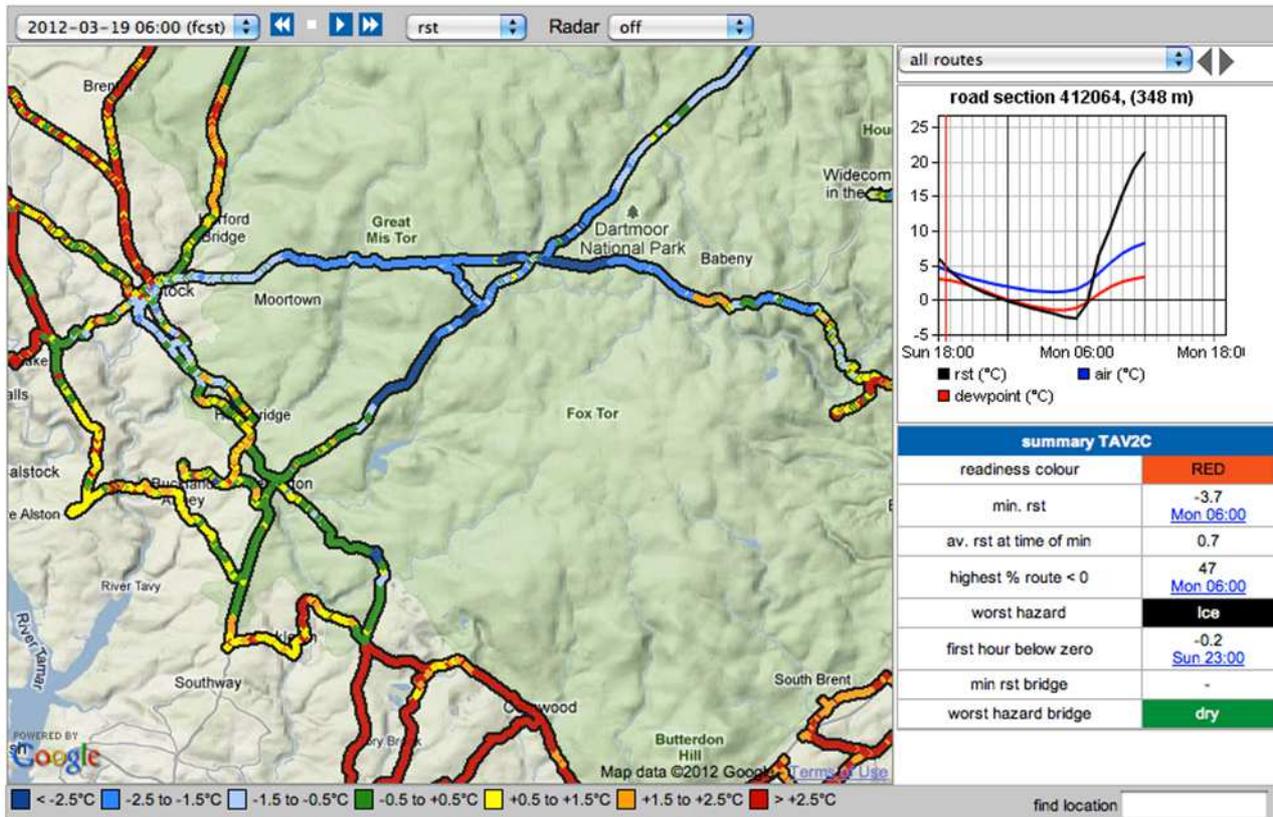


Figure 1. An example of a route based forecast for road surface temperature

3.2 Skyview

One of the most important input parameters for creating a route based forecast is skyview. See figure 2 for the impact of skyview on the road surface temperature. Skyview is the part of the sky that is visible, when you look upwards. Traditionally skyview is measured by a camera on the roof of a car that takes photos all the time. This method is very time consuming, expensive and can only take place in the winter season when there are no leaves on the trees. Besides this, specific weather conditions are required. With clear weather the sun will overexpose the images, the camera is sensitive to precipitation and in case of partly cloudy weather the clouds make it complex to analyse the photos. So you need overcast weather but without any precipitation.

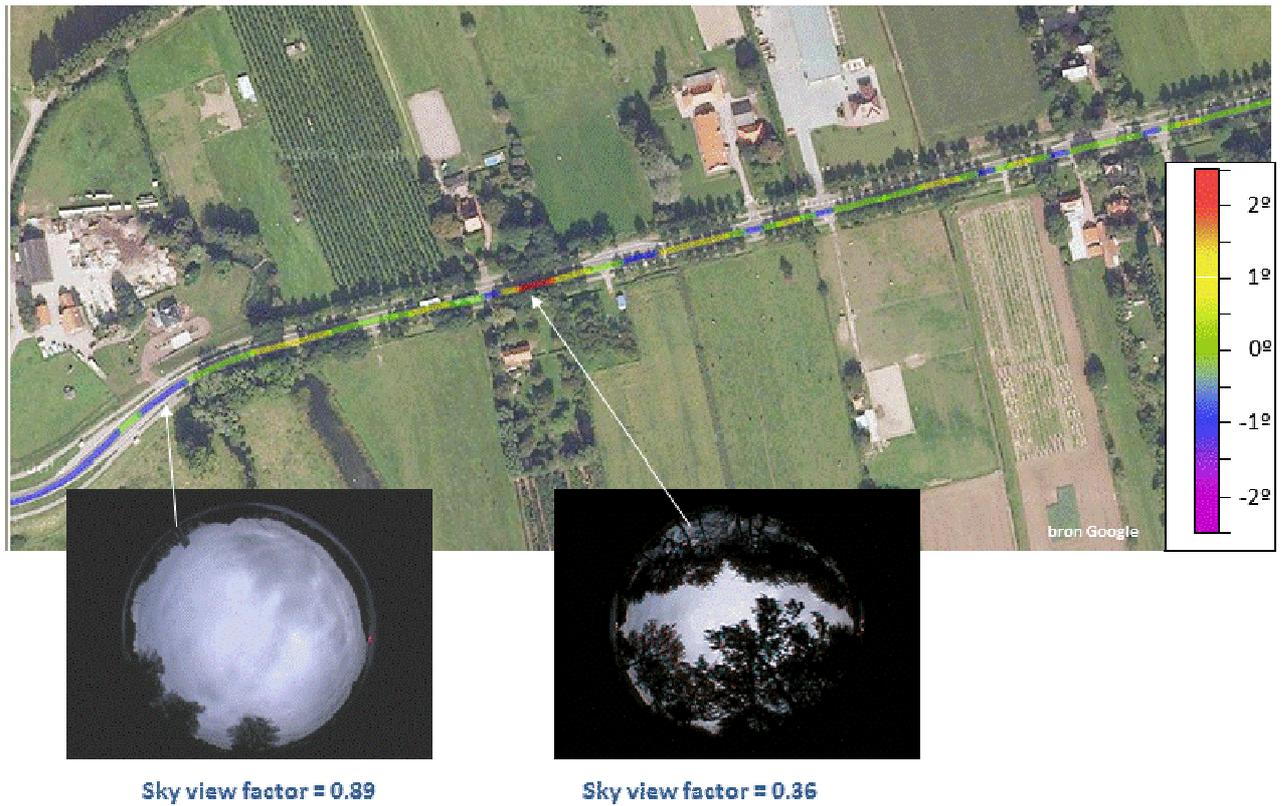


Figure 2. A thermal map with corresponding skyview.

Because of the disadvantages of the car measurements, we recently have explored the possibilities of retrieving skyview data by means of Google Streetview information. Google Streetview is available in an increasing number of countries and cities. There are still some challenges, but generally the method shows results that are comparable to traditional skyview measurements. Examples of challenges of this method are the leaves on the trees (most Google images are taken in summer, whereas we look for a winter situation) and white buildings or windows (that have a similar colour as the sky).

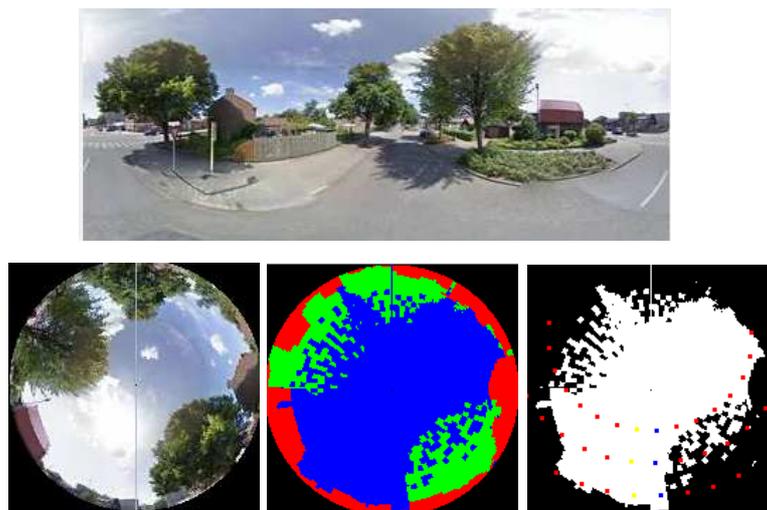


Figure 3. The different steps in determining skyview from Google Streetview.



3.3 Dynamic gritting

The route based information about the road surface temperature and condition can be automatically transferred to a gritting machine. Based on this information it can be decided how much salt each road section needs: dynamic gritting. Currently a dynamic gritting pilot project is going on in cooperation with a governmental road authority.

4 CYCLE LANES

Forecasts can be made for different road types and bridges. As Holland is a bicycle country, and cycling becomes more and more common in other countries, another new development is the creation of special forecasts for cycle lanes.

Surface temperature measurements in cycle lanes show that the thinner asphalt layer can cause cycle lanes to cool down more rapidly than normal roads. Currently cycle lanes are often treated based on a forecast for a normal road. However as cycle lanes become quicker critical than normal roads, it is very important for the safety aspect to create special cycle way forecasts, especially in black ice cases.

In the Netherlands our clients now have access to cycle lane forecasts. Like for roads and bridges, the forecasted surface temperature and condition of a cycle lane are presented. When there are no sensors in the cycle lane, a regional cycle lane forecast is made, which is representative for a cycle lane in the customer's area.

4 CONCLUSIONS

For safe road winter maintenance, weather forecasts are essential. Next to traditional road weather forecasts, some special types of road forecasts have been created.

The first example is a route based forecast for an entire gritting route. Skyview is an important input parameter that is needed in order to create a route based forecast. Measuring skyview is expensive and time consuming; therefore a method has been developed to retrieve skyview data from Google Streetview.

The second example are special forecasts for cycle lanes. Cycle lanes can be more critical than normal roads, so those forecasts are very important for the safety aspect.