Road weather forecasts and MDSS in Slovakia

ID: 0030

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Road weather forecasts in Slovakia

- No comprehensive road weather forecasts prepared before 2010
- Since 2010 cooperation with the National Highway Company, the Transport Research Institute and private sector

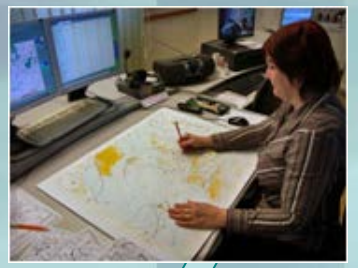
- The main goal was to provide reliable and well arranged information about the current weather and road conditions, especially for highways, and outlook of meteorological situation with the emphasis on temperature, surface temperature and precipitation.
- What we can use?
  - 115 RWS operated by National Highway Company
  - Numerical weather prediction model ALADIN
  - INCA (Integrated Nowcasting through Comprehensive Analysis) real-time analysis and forecast system
  - METRo - Model of the Environment and Temperature of Roads
  - 2 meteorological radars

Chart of the modular forecasting system used for road weather forecasts in Slovakia

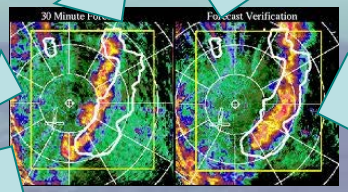
Road weather stations

Radar network

Support from weather forecasters

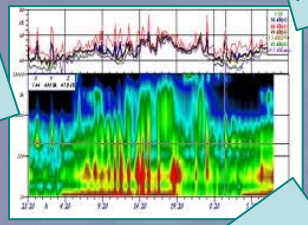


Professional weather stations

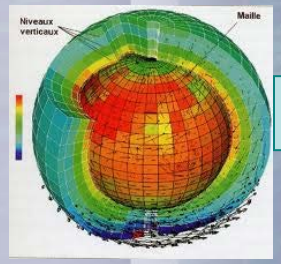


Nowcasting system

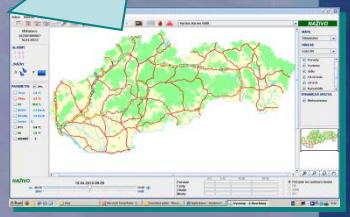
Postprocessing



Global numerical weather prediction model

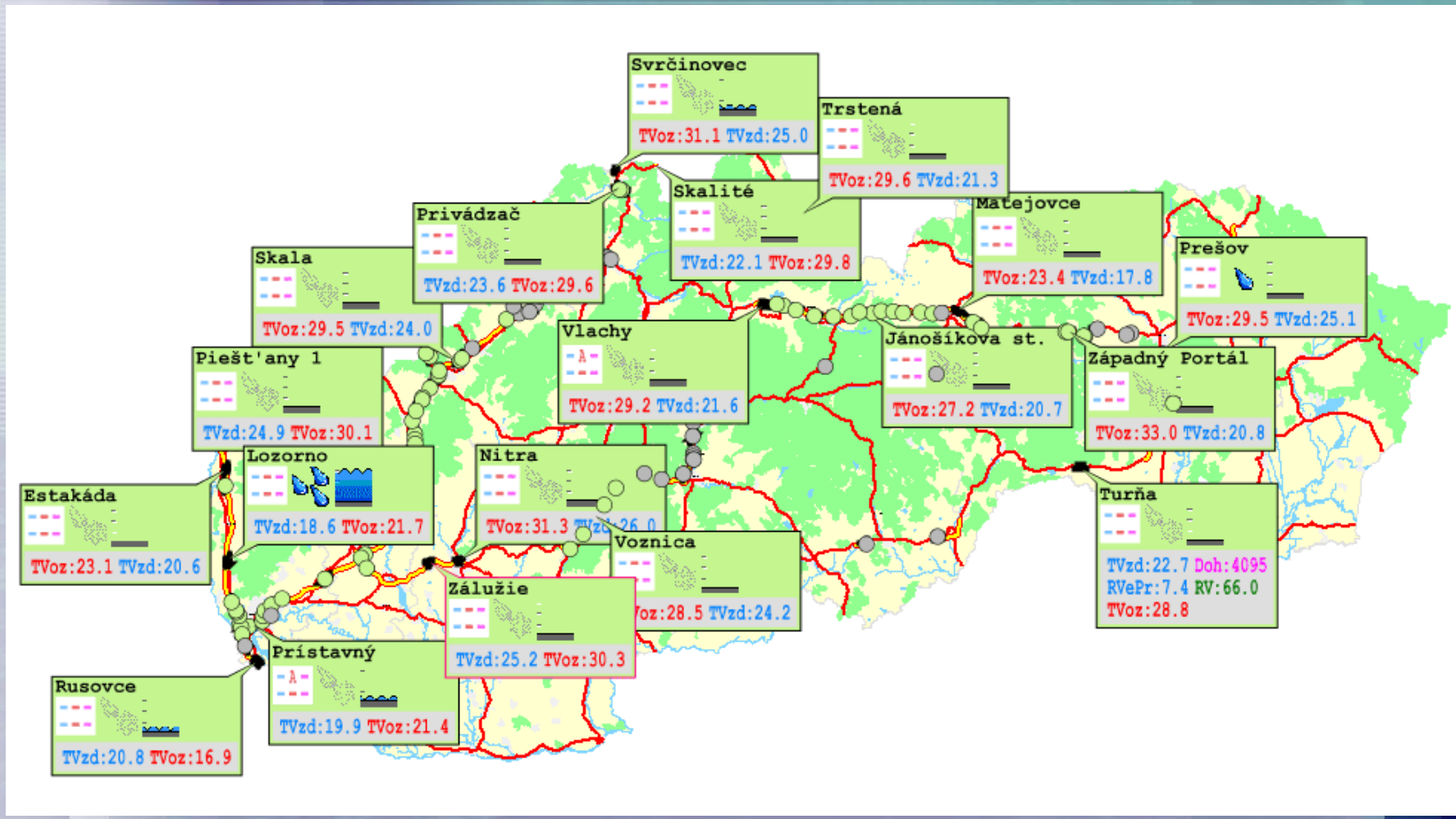


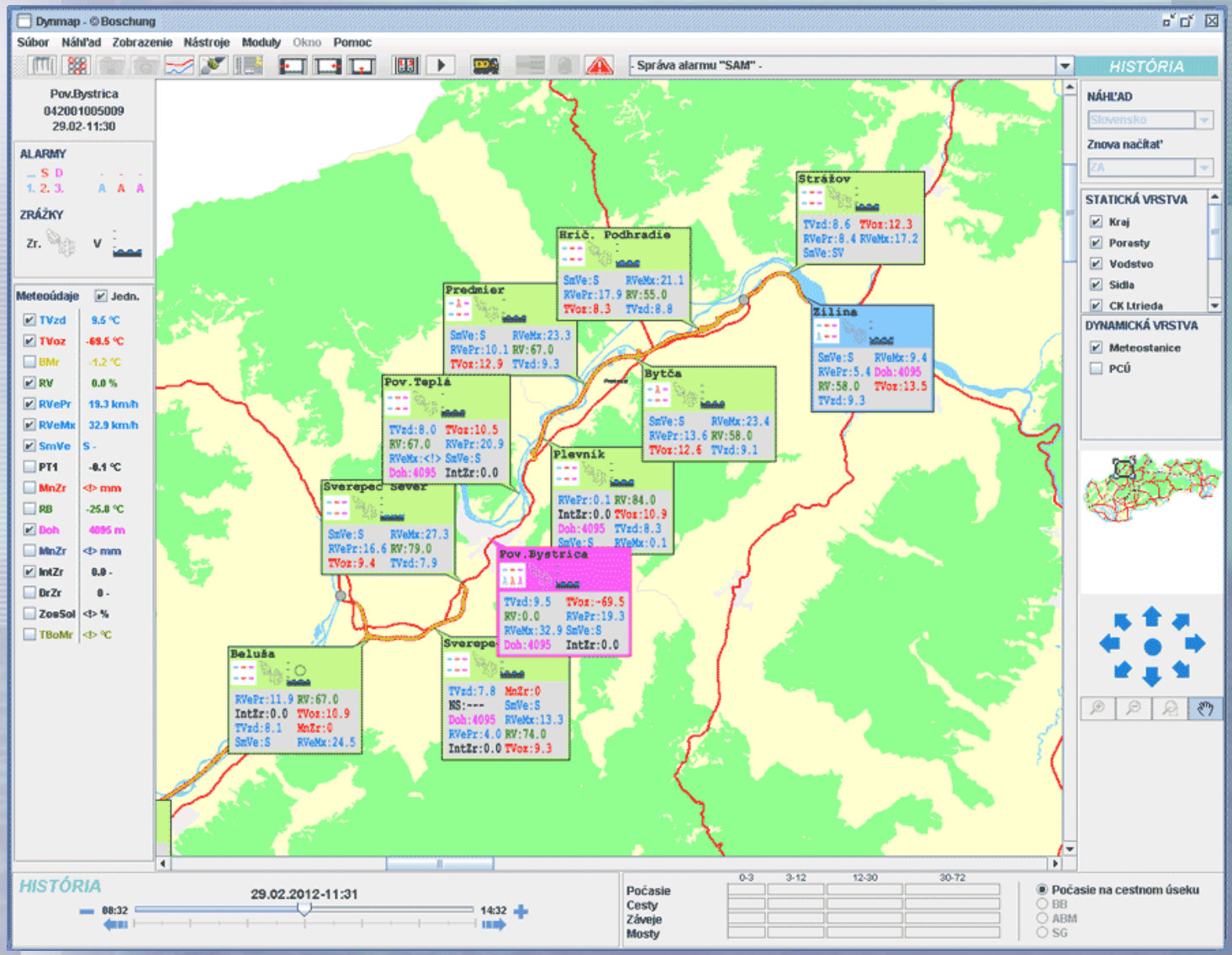
Detailed numerical prediction of meteorological elements



Visualization

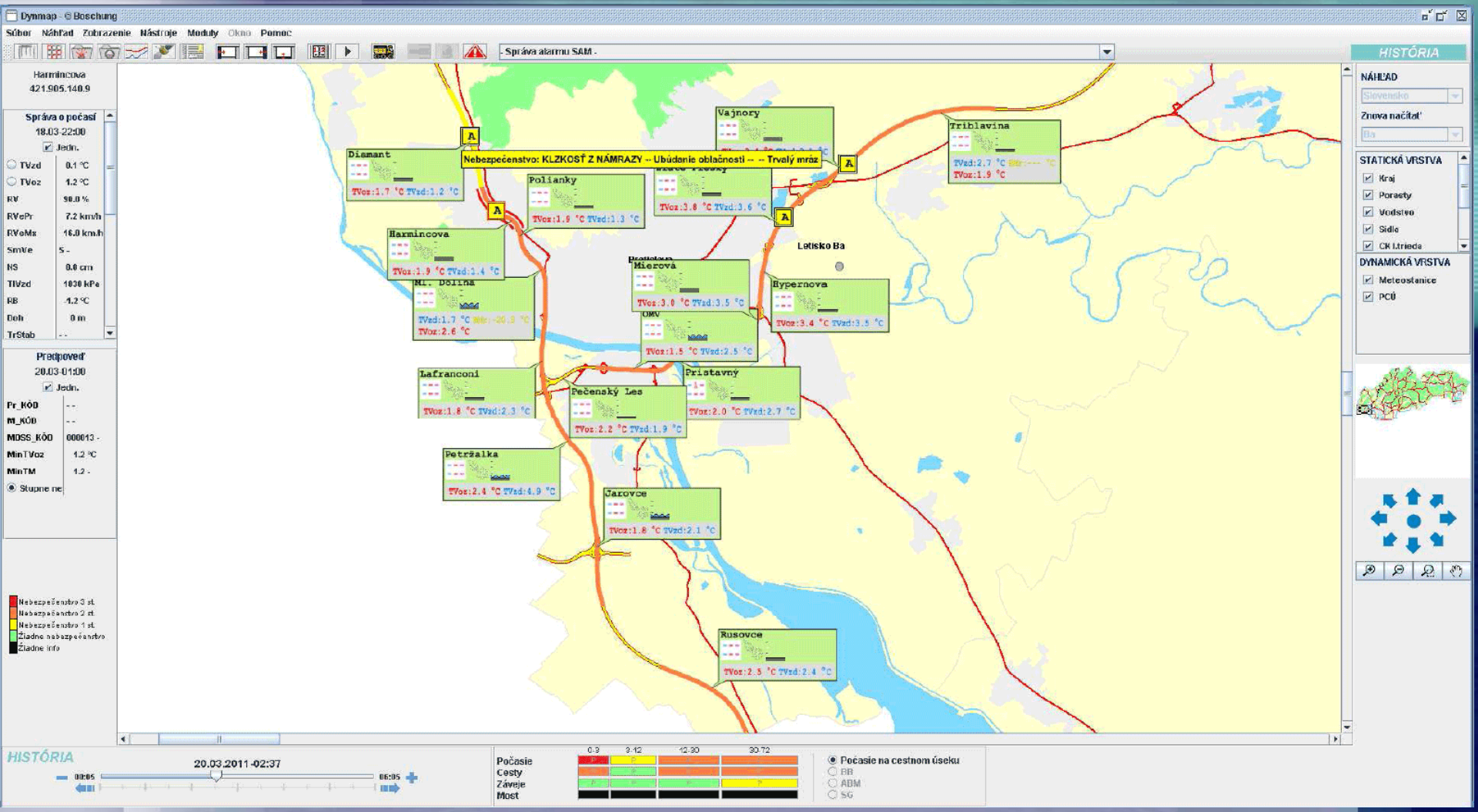
The dynamic map displaying a selection of information from road weather stations



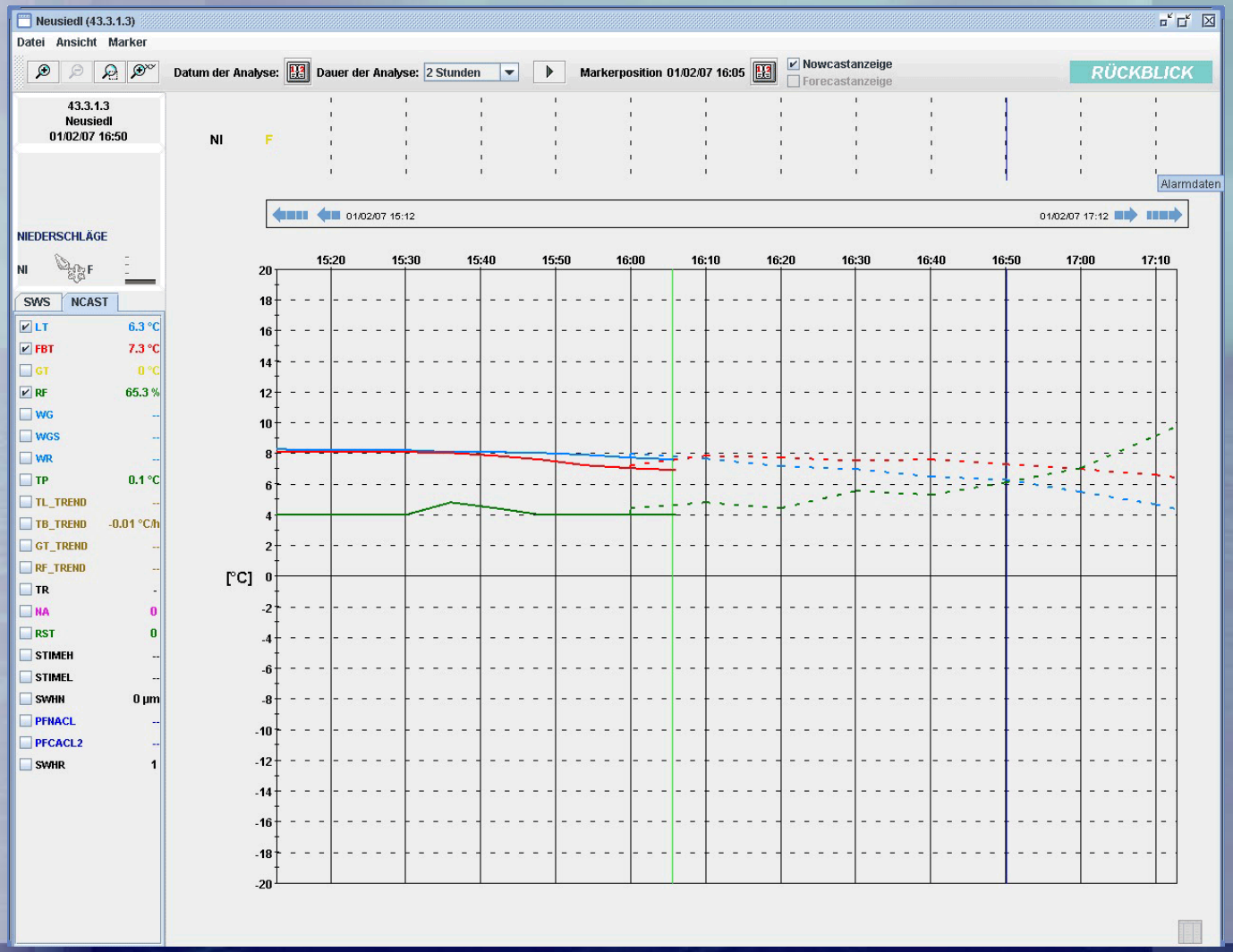


The dynamic map with visualization of selected area of highway. Little “flags” with measured information are coloured in accordance with level of risk

Road segments with displayed forecast and warnings



The charts with measured and forecasted data for selected RWS

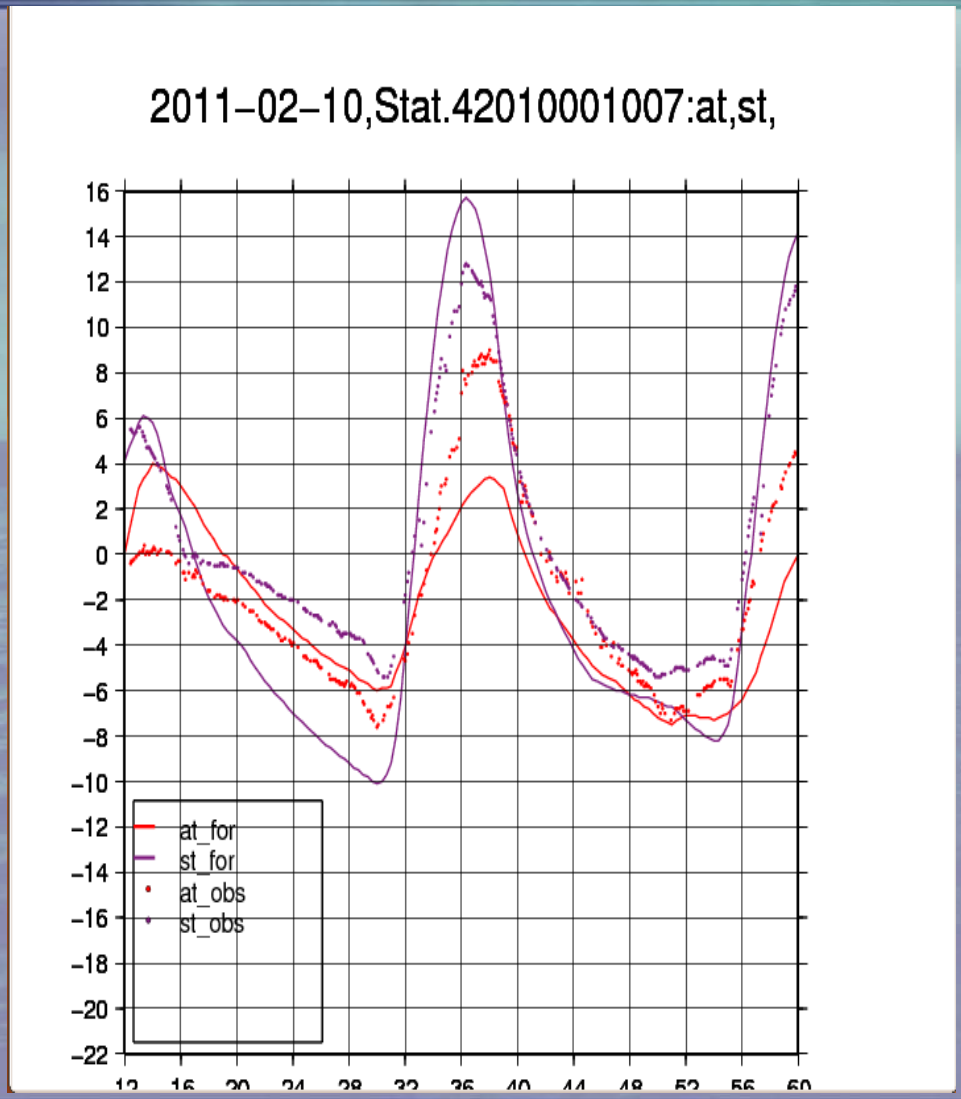


Conclusions and future work

- We developed and started to operate a system that:
  - Integrates data from several types of the measurement stations
  - Uses one visualization tool
  - Integrates the predicted values with the measurements
- The road operator gets the tool which enables a more objective way to improve decision-making process
- Further tests in realistic conditions are needed

Conclusions and future work

- Surface temperature – crucial parameter
- The correct evaluation of the energy fluxes at the road surface determines success of prediction of all predicted parameters
- it is not possible to directly forecast the biggest weather risks affecting traffic on roads during winter, such as freezing rain, frost, ice, freezing fog, or snow drifts, using the numerical models
- Main problems:
  - probably the largest problem is to determine the individual fluxes at the surface
  - there is still lack of information about road material parameters for all road stations as heat conductivities and heat volumetric capacities
  - the installed model in our operational suite has tendency to overestimate the amplitude between minimal and maximal values of surface temperatures
  - large sensitivity to material parameters and to 40 cm subsurface temperature (it is not measured in majority of our RWS)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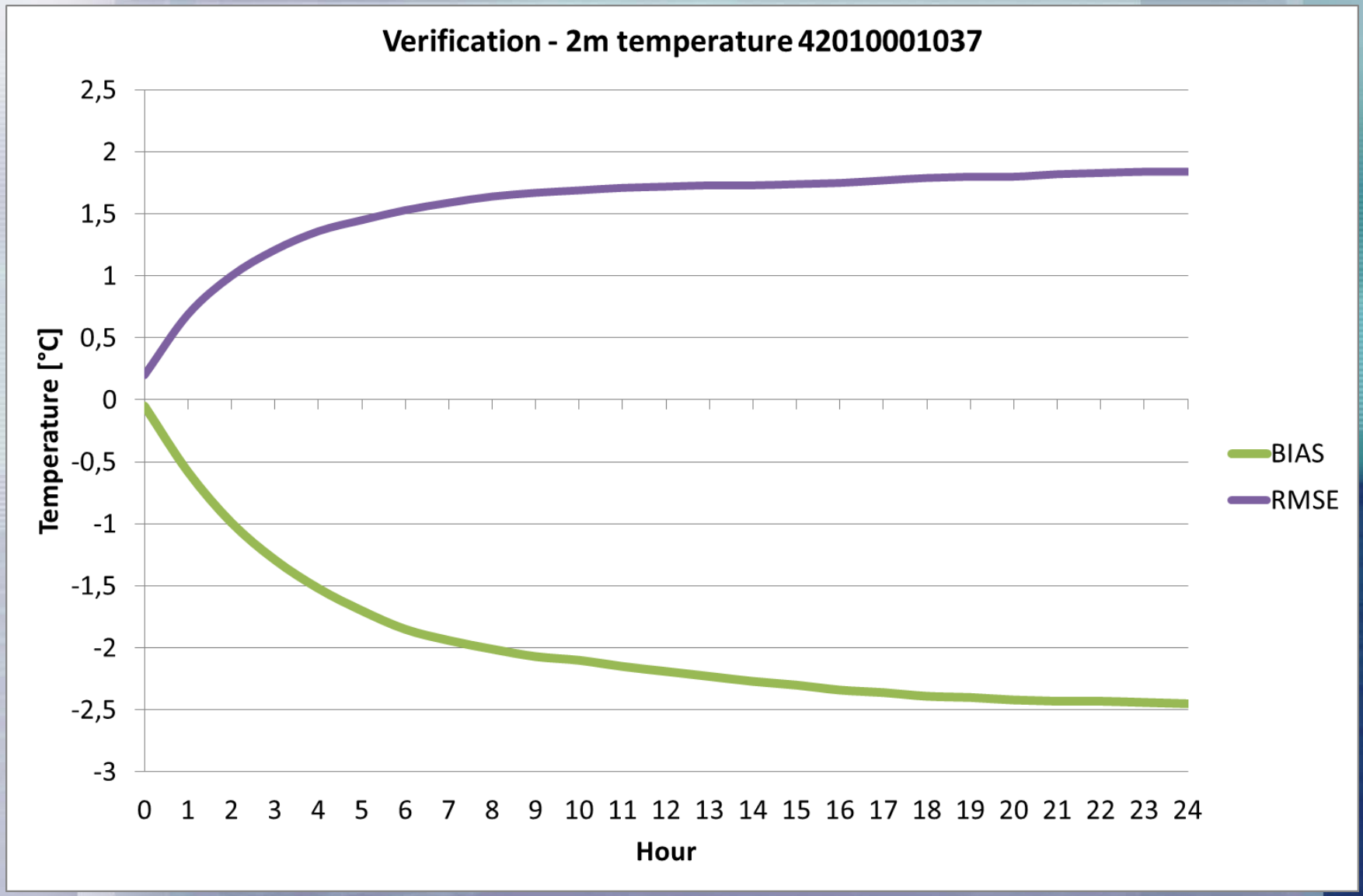
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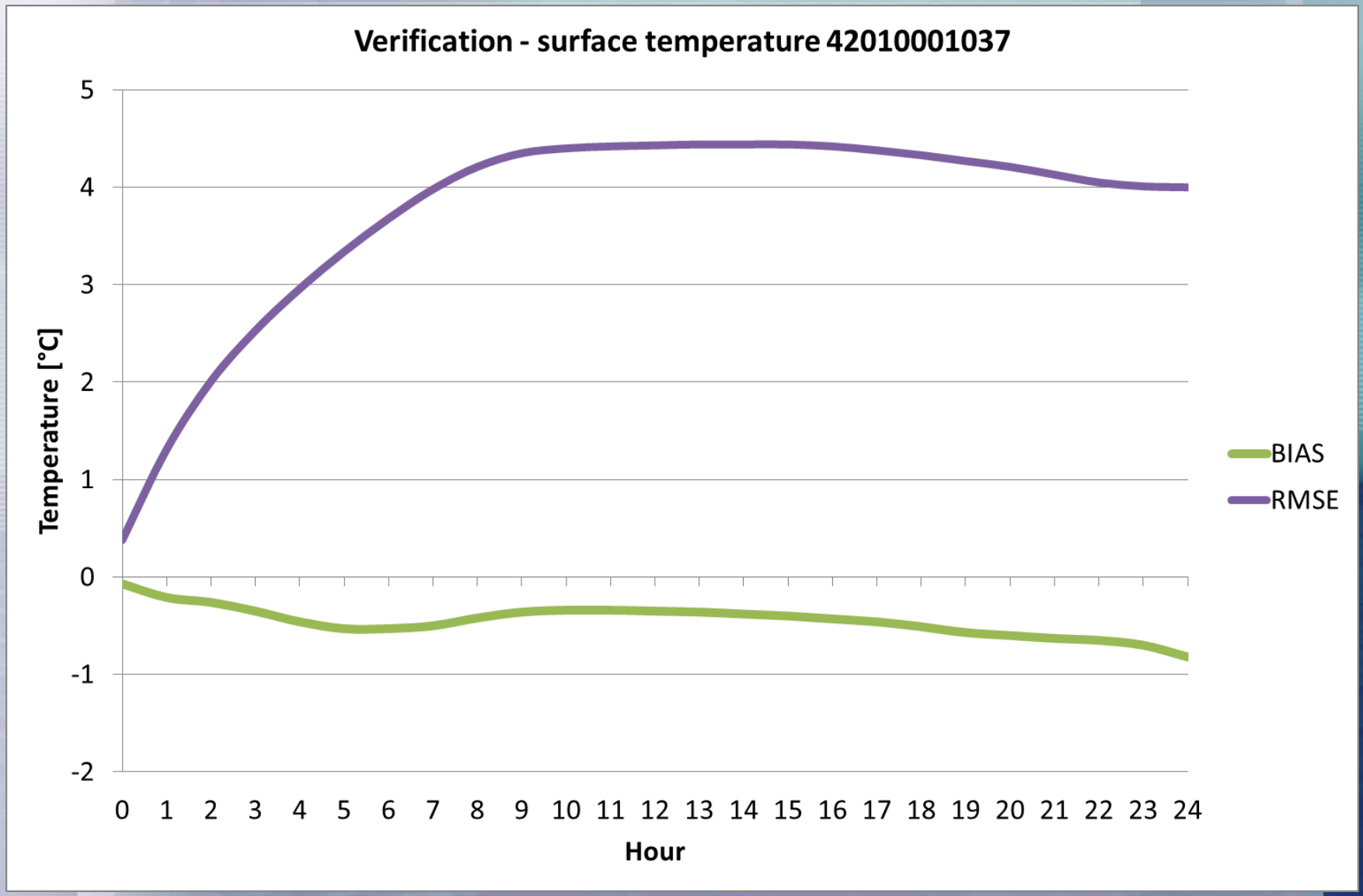
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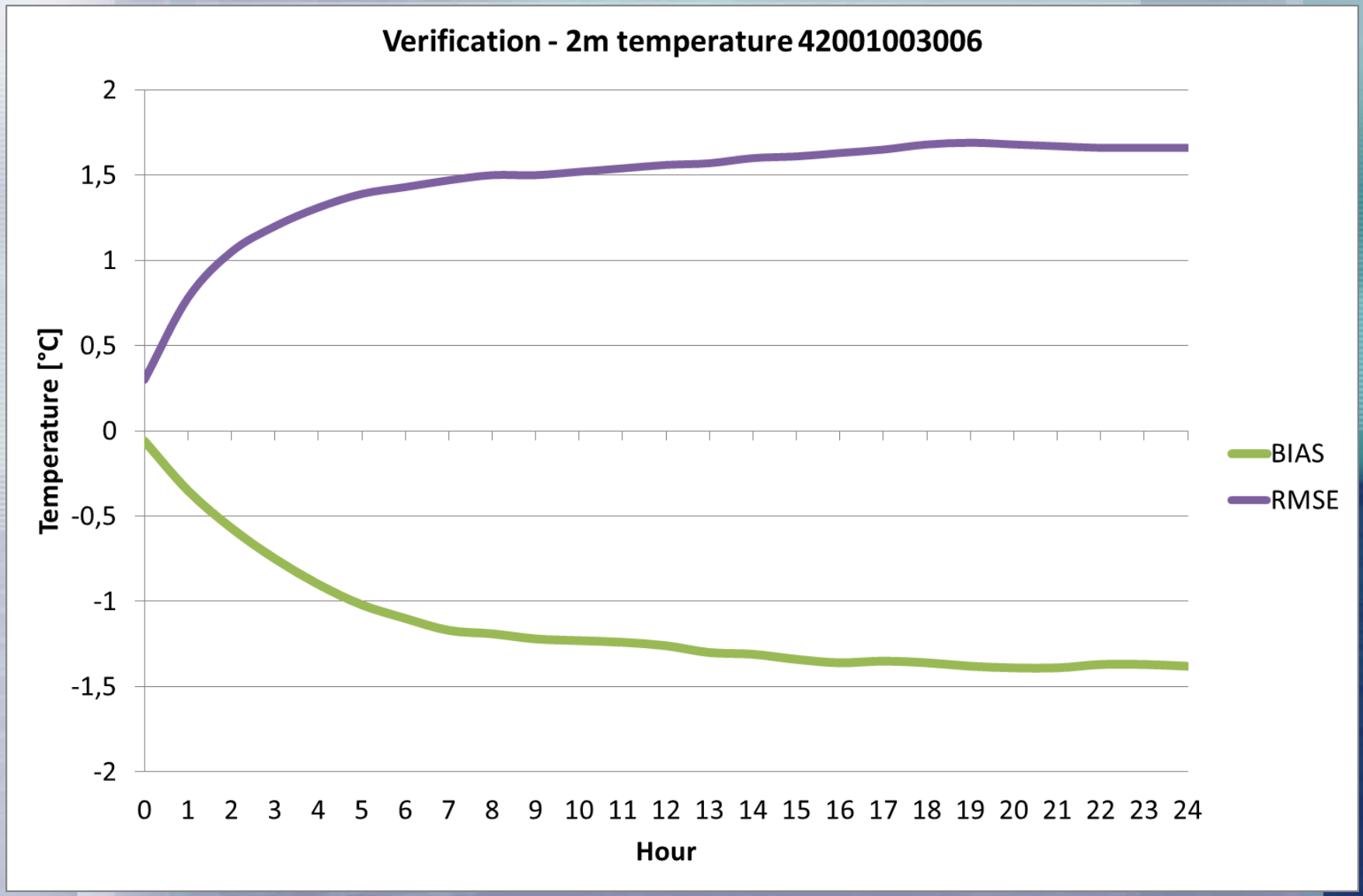
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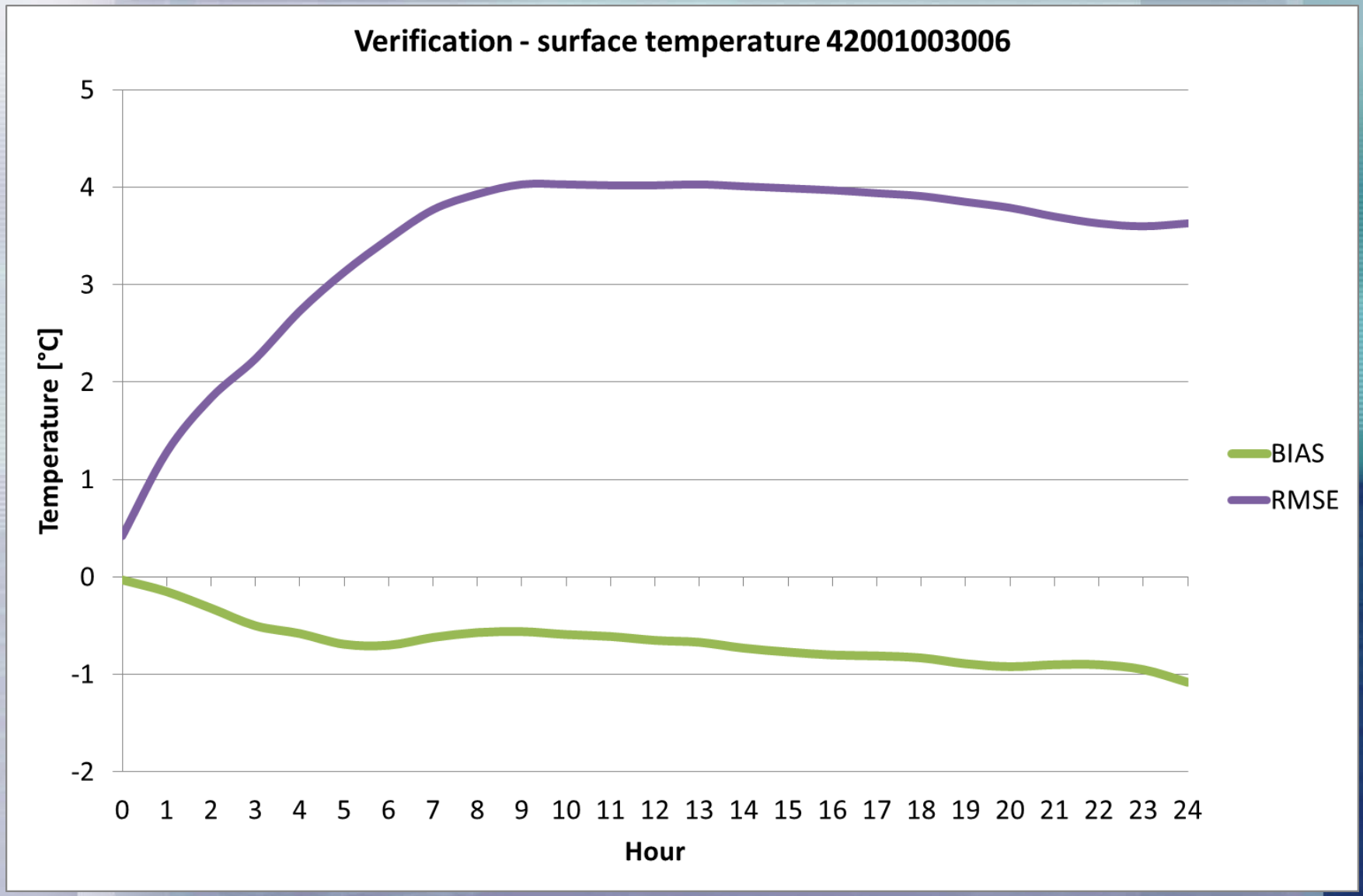
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Hour
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RMSE

Conclusions and future work

- We tried to solve the problem with conduction of heat in a road profile (the method is based on Fourier expansion of time/space functions)
- From series of surface and any subsurface temperature we can compute the whole temperature profile
- We tried to determine the material parameters by measurement of temperatute profile at typical RWS location
- The result of the process was more acurate calculation of road surface temperature
- The heat conduction model was improved and tested on various stations over the whole Slovakia
- It was tested a simple idea of inclusion of model fluxes (Solar, IR, BB) for prediction of the surface temperature

Conclusions and future work

- To improve ALADIN 2m temperature , wind speed, precipitation, air pressure and humidity, we will use INCA data
- To improve model radioactive fluxes the cloud cover from MSG data (with used of NWCSAF method) in the framework of INCA project will be improved
- The pyranometers for detection of incident fluxes will be installed in various stations, the measured data will be used for improvement of used roadcast model

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