Poster No.10

ICEWARN – Influence of shading and sky-view factor on road temperature forecast

Pavel Sedlák, Petr Pešice, Petr Zacharov, Vojtěch Bližňák, Lukáš Pop, Zbyněk Sokol

Institute of Atmospheric Physics CAS, Prague, Czech Republic

EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
OP Praha – pól růstu ČR

1. Motivation

Within the **ICEWARN** project, the Institute of Atmospheric Physics in Prague and the Czech Hydrometeorological Institute have developed and currently run the **FORTE** (**FO**recast of **R**oad **TE**mperature and condition) road weather model for the city of Prague (Zacharov et al., 2018, Poster No. 2). In cities, the impact of obstacles on the modification of radiation fluxes, and consequently on the road temperature, is of a particular importance. The modification includes shading the direct shortwave radiation and the sky view restriction. This contribution presents our first experience with testing a parametrization of these effects in the FORTE model.

2. Methods

- We prepared a detailed pre-calculated dataset where for individual points along the road, sky-view factors are stored as well as zenith angles of the upper edge of obstacles in a fine azimuthal resolution.
- In the computation of modified radiation fluxes in the FORTE model, at each time step the decision whether shading of the direct shortwave radiation occurs is based on a comparison of the Sun zenith angle with the stored obstacle information for the corresponding azimuth. For the sky-view effect on the longwave and the diffuse shortwave radiation, we adopted a simple parametrization according to Müller and Scherer (2005).
- Model results are evaluated against the road temperature measurements.

Road weather stations selected for comparison

Fig. 1. Detailed map with the positions of the non-shaded RWS **A906** and the RWS **A918** with shading effects. Both stations are located on a bridge between 2 tunnels.
Above: View of RWS **A918** and southern tunnel entry (23th June).
Source: www.mapy.cz

3. Measured data

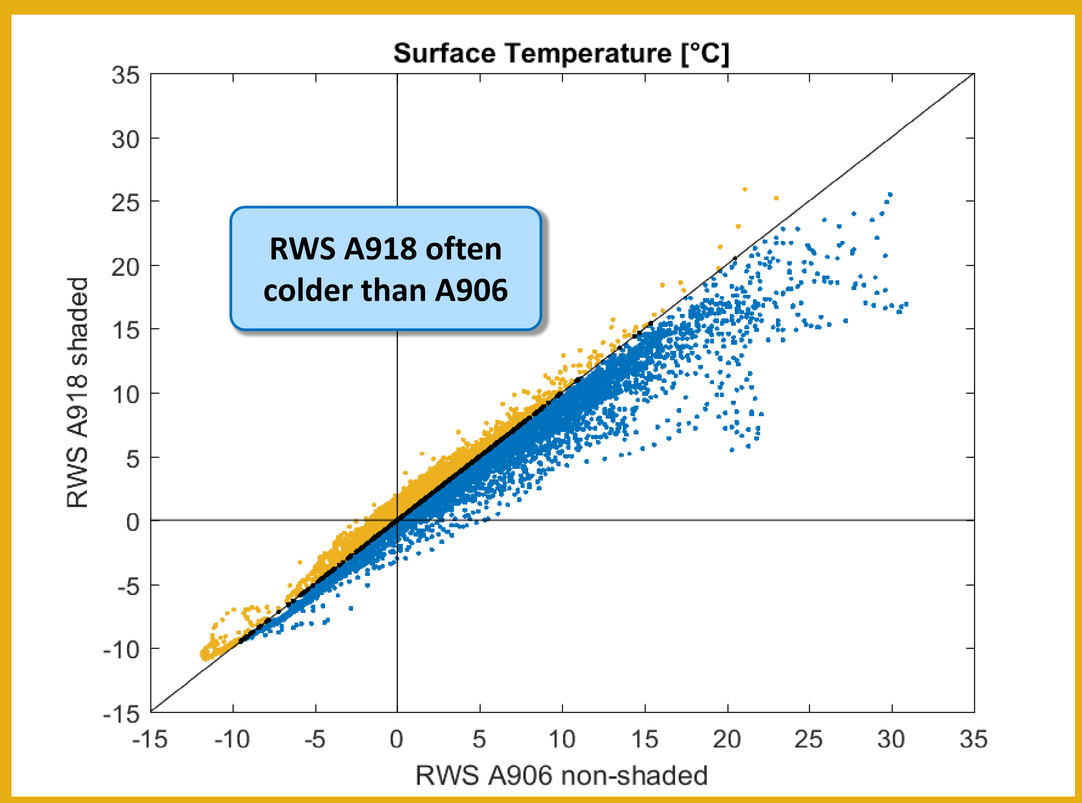
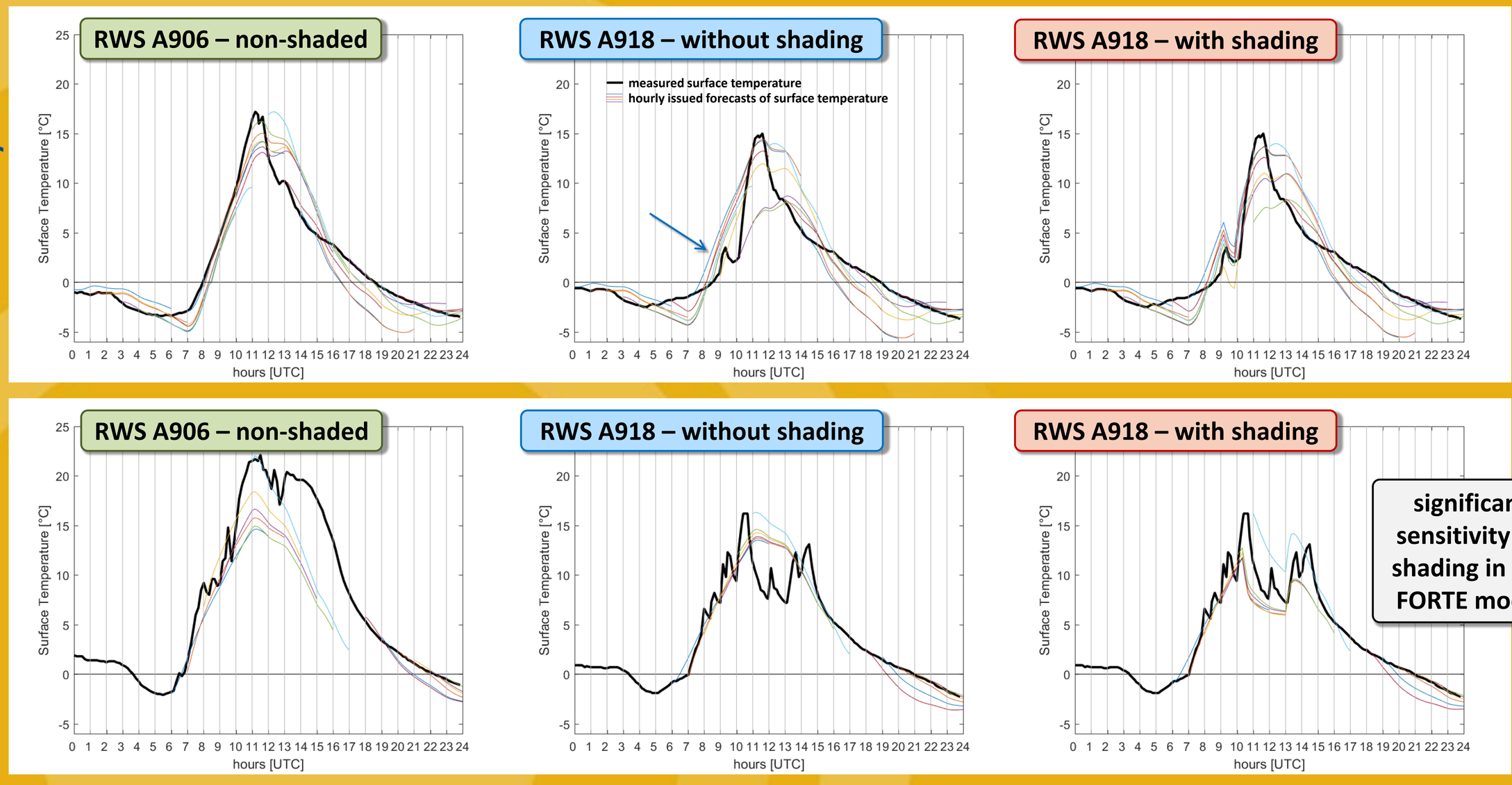


Fig. 2. Scatterplot of the road surface temperature measured at RWS **A918** (vertical axis) and **A906** (horizontal axis) in the period **1st January - 31nd March 2018**.

4. Comparison of model results with measurements



5. Conclusions

- Detailed fine resolution data on obstacles that modify radiation fluxes are necessary for successful road surface temperature prediction at locations with shading effects in cities. This effect was proven on two selected events.
- Positive impact of starting the model run every hour in the nowcasting mode (Sokol et al., 2014) is apparent when the curve of temperature prediction issued at a certain hour is compared with the prediction curve generated earlier.

Acknowledgement

The work was supported by the project CZ.07.1.02/0.0/0.0/16_023/0000117: Forecasting of road-surface temperature and road condition on the area of Prague in winter season provided by Operational Programme Prague – Growth Pole of the Czech Republic.
Road weather data was provided by Technical Administration of Roadways of the Capital of Prague and Road and Motorway Directorate of the Czech Republic. ALADIN model data was kindly provided by the Czech Hydrometeorological Institute.

References

1. Zacharov, P., et al., 2018, ICEWARN – Road weather forecasting for Prague city, 19th International Road Weather Conference SIRWEC 2018, Smolenice, Slovakia, May 29th – June 1st, 2018. (Poster No. 2)
2. Müller, M. D., Scherer, D., 2005, A grid- and subgrid-scale radiation parameterization of topographic effects for mesoscale weather forecast models, *Mon. Wea. Rev.*, **133**, 1431-1442.
3. Sokol, Z., Zacharov, P., Sedlák, P., Hošek, J., Bližňák, V., Chládová, Z., Pešice, P., Škuthan, M., 2014, First experience with the application of the METRo model in the Czech Republic, *Atmos. Res.*, **143**, 1-16.