

USE OF THE CALMET MODEL FOR PREPARATION OF WIND ROSES FOR THE REGULATORY MODELLING PURPOSES

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Introduction

The software system *CALMET Integrator* is a user interface for calculation of wind roses divided into classes of wind speed and atmospheric stability. The system development is a result of cooperation between **Czech Hydrometeorological Institute** and a private programming company **IDEA-ENVI**.

The model core of *CALMET Integrator* system is a diagnostic 3-dimensional meteorological model CALMET which is a part of CALPUFF dispersion modelling system (Scire et al., 1990a, 1990b). CALMET model includes diagnostic wind field module which provides hourly wind speed and wind direction data on a predefined 3-dimensional gridded domain.

For the successful run of the CALMET model it is necessary to prepare three basic input data files. The first file describes the geography of a model domain giving the information about the domain extent, terrain elevation and land cover. Other two input files include meteorological data from surface and upper air stations. Optional is implementation of prognostic meteorological data fields. These are not included in the system yet.

Wind rose calculation is divided into four steps – input data preparation, model configuration, model run and statistical processing of model results. Each step is being solved in separate sheets of the user interface (examples in Figures 1. to 3.).

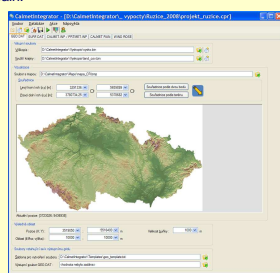


Fig. 1. Sheet for preparation of geographical input data file.

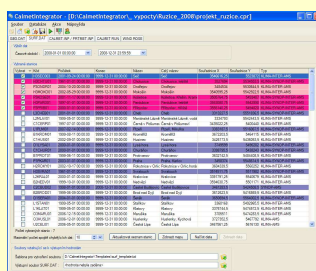


Fig. 2. Sheet for preparation of input file with climatological data.

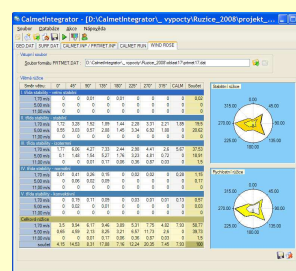


Fig. 3. Sheet for statistical evaluation of the wind rose.

Model calculations

Figures 4. to 6. present comparison between average annual wind roses calculated by *CALMET Integrator* system and wind roses created on the basis of measured data in particular measuring station. In all cases, station location has been selected as the center of model domain and observations from individual stations were not included in the model input data. Orography of the model domain and the location of wind rose reference point is outlined for each model calculation.

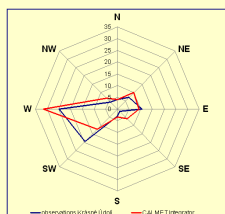


Fig. 4. Wind rose at Krasné Údolí station for year 2004.

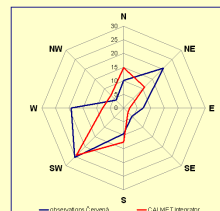


Fig. 6. Wind rose at Červená station for year 2006.

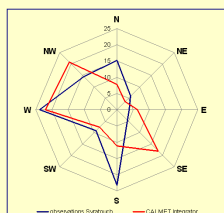


Fig. 5. Wind rose at Svatouch station for year 2004.

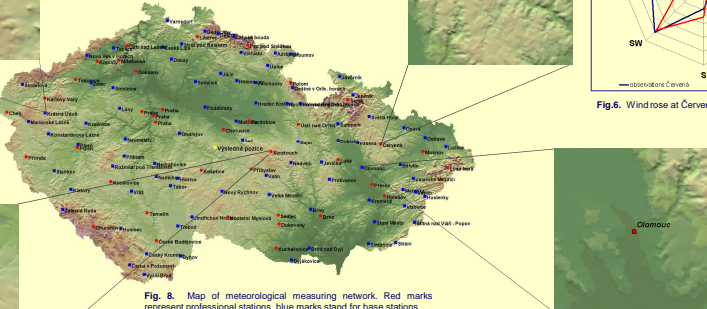


Fig. 8. Map of meteorological measuring network. Red marks represent professional stations, blue marks stand for base stations.

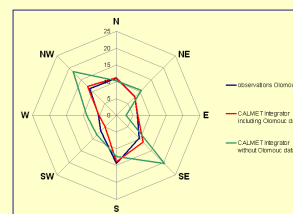


Fig. 7. Wind rose at Olomouc station for year 2008.

Conclusions

The comparison of model results with measurements leads us to the fact that wind roses produced on the basis of model simulations without inclusion of data from the station differ from those based on the meteorological observations. Although model is able to capture the mean wind flow (with exception of Svatouch station), the agreement with observations is not quite as we would expect. The reason of these discrepancies may lie in the insufficiency of the input data, whose influence is even more profound in a complex terrain. The network of measuring stations is regrettably not dense enough and exclusion of one station causes loss in the model input data and it is not possible to compensate it by other station in the vicinity. On the other hand, if the model has the information about measurements in the location, the agreement between model results and observations is almost absolute, as it is presented in Figure 7. The lack of input data could be solved by inclusion of meteorological fields from prognostic model ALADIN. The test calculations with use of these data will be performed in near future.

References

Scire, J.S., D.G. Strimatis and J.R. Yamartino: Model formulation and user's guide for the CALPUFF dispersion model. Sigma Research Corp., Concord, MA. (1990a).
Scire, J.S., D.G. Strimatis and J.R. Yamartino: Model formulation and user's guide for the CALMET meteorological model. Sigma Research Corp., Concord, MA. (1990b).

Acknowledgement

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