

The significance of the severe events warning service in relation to the classic methods of road meteorology

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1. Preface

It is a well known fact, that the national meteorological services are providing besides the classic forecast products also a number of warnings, concerning the probability of occurrence or possibility of extravagating of certain meteorological elements or phenomena. Routinely there are several levels of hazardousness of respective phenomena.

The warning service has its inevitable role also in the field of applied road meteorology, where a good working early warning system can prevent the influence of severe weather impacts on road traffic by means of „in time“ employment of proper winter maintenance technologies. A significant role is a good working network of road weather stations and the outputs of sophisticated systems which evaluate the current conditions and provide relevant information to the road maintenance dispatchers. The outputs of the derived informations however can be limited in particular meteorological situations, therefore the need of „pure“ meteorological warnings has its significance.

2. Meteorological elements and phenomena

The early warning system on the territory of the Czech Republic is provided by civil and military services. In order to avoid unnecessary redundancy and to provide higher efficiency in the generated information, the project of mutual co-operation was established between National Meteorological Service (NMS) – Czech Hydrometeorological Institute (CHMI) and Military Weather Centre (MWC) which results into an Integrated Warning System.

In the warning service on the territory of the Czech Republic the following elements and phenomena are processed :

Temperature
Wind
Snow (snow–drift)
Glaze
Rime
Rain
Thunderstorms
Floods

A whole complex of criteria for each of the elements and phenomena, which was created to meet the needs of the end users from state and private enterprises comprises a part of the „Integrated Rescue System“ in the country.

A great majority of the above mentioned elements and phenomena have an influence on the roads and not exclusively in the winter period (in summer the informations are frequently used in order to optimise the construction and reconstruction technologies of the roads)

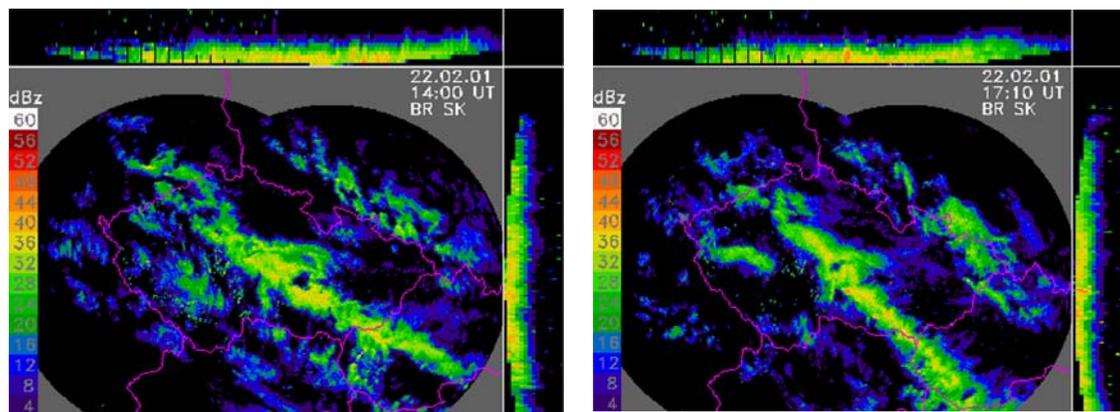
3. Necessity of meteorological inputs

The process of the road maintenance needs a quick response to the state of the weather in the particular location, road line or region. In most of the cases the future development of weather is available from the forecast outputs. An essential status have the specialized road weather forecasts for the road maintenance which are provided with the respect to the specific end user as regional, line, and forecasts for urban agglomerations.

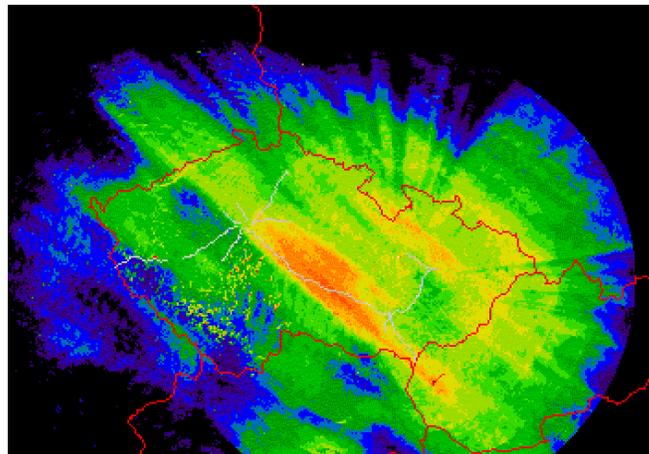
Increased attention is paid to the short term road weather forecast for the next 9 hours (in some cases this forecast has the characteristics of nowcasting) and the outlook for the next 24 and 48 hours.

The above mentioned specialized weather forecast usually contains the warnings on severe elements and phenomena and in some cases involve warnings on glaze and black ice.

Primary however is the warning of the Integrated Warning System of CHMI and MWC which shall involve all severe situations. As a typical example let me mention the situation with heavy snowing accompanied with strong gusty wind reduced on a small territory of the Czech Republic on 22th February, 2001.



The presented images from the precipitation radar network of CHMI illustrate the situation of strong north-west flow reaching from the North Sea over Central Europe towards south-east, a secondary cold front has developed and proceeded over the territory of the Czech Republic. The good visible, relatively narrow zone of precipitation related to the strong north-west flow and strong convergence of the wind in the unstable air masses within the passage of the mentioned cold front.



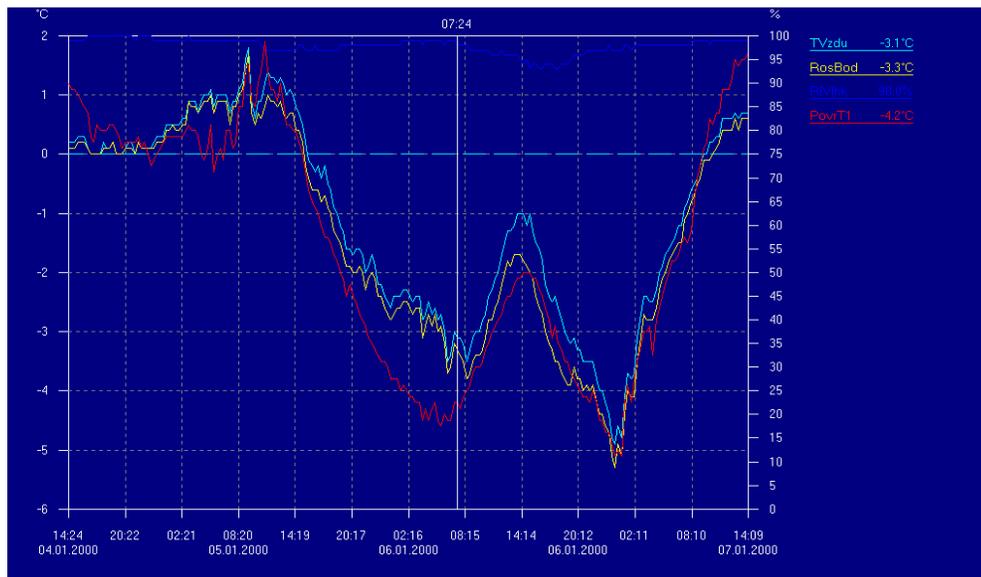
The above presented image shows the 24 hours sum of precipitation where a significant cumulation of precipitation is located in the region of the Czech-Moravian highlands. The height of snow cover there is 30 to 40 cm. Due to the influence of the wind gusts in the higher locations in particular (over 800 m a.s.l.) massive snow drift was observed. The total duration of the heaviest snowfall was from 5 to 6 hours.

The severe weather resulted in a complete closing of one of the main traffic routes in the country, the highway D1 connecting the two largest cities Prague and Brno, for the first time in history. The mentioned situation clearly illustrates the essential role of severe weather warnings for the road maintenance. In such case the outputs from the road weather stations and its sensors have only secondary role. However the classic weather forecast information is inevitable.

4. Significance of sensors and sophisticated systems

In contrary to the last mentioned situation the role of the road weather stations and its sensors is essential for forecast of the road state for the next 24 hours in typical anticyclonal winter weather. The weather is characteristic by little cloud cover, no precipitation and light breeze. In these situations it is possible that by prevailing the low air temperatures due to the advection of humid air masses from the near water surfaces to the body of the road the black ice build up occurs. (the state of the road prior to this phenomenon has of course its basic role).

The role of the data coming from the remote sites of the road weather stations and the surface sensors in particular is inevitable. The special forecasts can only seldom precisely describe this often very local development. Here the major role is the application of sophisticated system and the skills of the road maintenance dispatcher.



The presented image shows a situation with build up of icing on 63rd km of the highway D5 followed by a series of car accidents due to the road conditions.

5. Presentation of warnings

For effective dissemination of the warnings in the Czech Republic a multimedial information platform is applied.

Direct connection to the central dispatching centres

Internet

Teletext

SMS

RDS

Fax and telephone

A project of implementation of these information into the car navigations system is in progress. For a wide public the informations on severe weather conditions is presented on statutory TV and radio broadcasting stations and some others.

6. Conclusion

This paper was not aimed to describe the different severe weather elements and phenomena having effect on the roads. The main task was to emphasize on the role of the NMS integrated severe weather early warning systems as an essential complement to the sophisticated systems used on the roads.

On this place let me mention that the exchange of early warnings among the NMS of neighbouring countries is a great contribution to the quality of road weather forecasts as we experienced in several mutual projects in the past.