IMPORTANCE OF METEOROLOGICAL MEASUREMENT DATA FOR AVALANCHE RISK ASSESSMENT

METEOROLOGICAL MEASURED DATA: A SUPPLEMENT DECISION SUPPORT FOR AVALANCHE COMMISSIONS AND AVALANCHE WARNING SERVICES

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INTRODUCTION

In former times avalanche risk assessment was predominantly influenced by outcomes of snow cover tests and by information obtained through the observation of local weather and snow conditions. Nowadays technical development enables us to gather in short sequences detailed data about snow depth, wind and temperature all over the Alps. This paper illustrates the importance of different information channels and it emphasises the importance of meteorological measurement data in order to improve risk assessments.

First of all it is important to understand the structure of Austrians risk management. The avalanche warning services are responsible to forecast the avalanche situation every morning and if necessary twice a day. Therefore, they use information from local weather and snow reporters, meteorological weather stations and weather forecasts. Besides, we have avalanche commissions who are in general responsible to observe local weather and snow conditions over a whole winter season, resumes Zenke. Additionally they do snow cover tests systematically (Zenke and Kronthaler, 2012). Members of Austrian avalanche commissions are locals who professionally work in the mountains e.g. ski-lift operators, people from the snow ploughing service, mountain guides etc. Avalanche commissions have the function to advise those public authorities who are responsible for disaster prevention and management. Commissions' advisement enlarges public authorities' knowledge about the local circumstances and supports them by making dispositions. Avalanche commissions not only advice decision makers but also recommend concrete solutions if this is necessary. In the case of tight position avalanche commissions but also the avalanche warning service have limited possibilities to assess the local situation. In such circumstances meteorological data are most important.

Since the end of the last century the avalanche services of the Alps started to build a network of meteorological measuring stations. In the meantime the number of measuring stations increased rapidly. In 1999 in Styria, Carinthia, Lower and Upper Austria there was no meteorological station built. Now, there are in Styria 23, Carinthia 24, Lower Austria 6 und Upper Austria 24 build. At the beginning of this century we were able to gather and document data from them only every 4 or 8 hours. In difference to that we improved our service since the last three years. Nowadays we are able to provide every 10 to15 minutes the latest data. In the next paragraph we present examples that exemplify how data from meteorological measure stations combined with further information helps to assess avalanche risk.

EXAMPLE FOR AVALANCHE WARNING

The example shows the development of an avalanche caused by snow drift. The diagrams below show the course of snow depth and wind from the 19th until the 22nd of December 2009. The data were measured at two locations at the Gstemmer (name of the mountain) in the region of the Planneralm in Styria. A lack of space led us to illustrate only 4 relevant days and not the whole December.

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Nevertheless from our measurements we know that the in diagram (a) visible 80 centimetres of snow resulted from heavy snowfall at the beginning of December. From the beginning until the 21st of December we documented freezing temperatures and wind coming from north. In 21st of December wind changed from north respectively northwest to south and wind speed increased (see diagram (b)). Although we did not have snowfall the snow level showed an upward movement of 50 centimeters (see diagram (a)). In example one snow drift was the reason for an increasing snow level. Snow drift means that snow was picked up from the snow surface and became transported by wind.

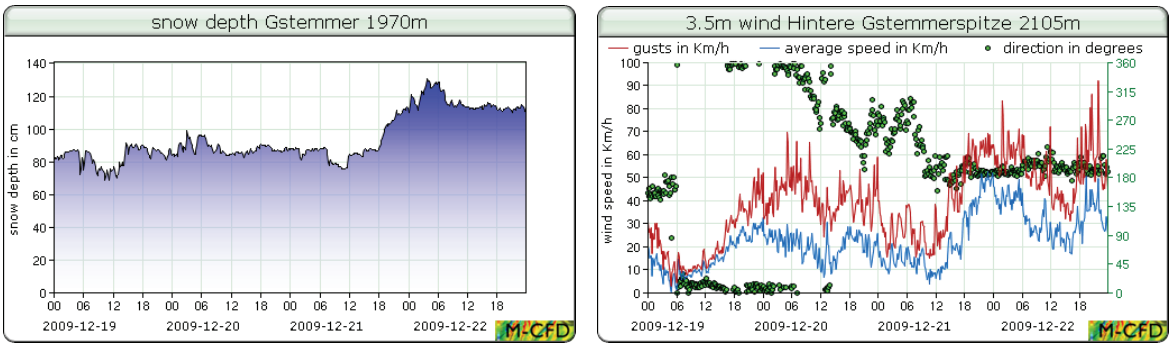

Fig. 1 From left to right: The course of snow depth diagram (a) and the course of wind (diagram (b) from the 19th until the 22nd of December 2009 in Styria.

Consequently Styrias avalanche warning service warned about snow slabs and raised the avalanche warning level from low to considerable. Indeed we documented in this region on 21st of December four avalanches with the involvement of people. Two different information streams were important for Styrias avalanche warning service in order to correctly interpret the local circumstances. The information of local snow and weather reporters about the amount of snowfall was a precondition for the correct interpretation of the meteorological data. Both, the use of local knowledge and of meteorological measurement data allowed to assess the avalanche risk. Other examples will be published in the full paper.
Also the local avalanche commission used information from the diagrams above, the weather forecast and the avalanche report of the day in order to assess the local avalanche risk. The use of different channels and a correct interpretation of the information allowed them to act at an early stage.

CONCLUSIONS

In sum, avalanche commissions and Austrians avalanche services improved their risk assessment by applying a holistic view. Only the consideration of different observation criteria and observation methods help to optimize the service of persons mainly responsible for risk assessment. The interpretation of meteorological data gathered through our network of measuring stations in the mountains is particularly important because they allocate information about the course of temperature, snow depth and wind for the whole season. The use of all information channels and the existing communication structure decreased accidents caused by avalanches.

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