

AVALANCHE FORECASTING IN FINLAND – PRESENT STAGE AND DEVELOPMENT NEEDS

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ABSTRACT: There are comparably few avalanche-prone areas in Finland, however several avalanches occur in Northern Finland every winter. Fortunately, Finland has had only a few avalanche fatalities inside its national borders, but several close calls take place each year. Back-country activities and free skiing have gained popularity over the past 20 years amongst Finns. Free-riders and other outdoor enthusiasts are likely to take their trips to the areas in question due to the mountainous scenery and speedy rides. This adds to the risk of severe avalanche accidents happening in Finland.

The Finnish Meteorological Institute (FMI) has issued avalanche forecasts to six avalanche prone areas in Northern Finland based mainly on weather forecasting models and observations from automatic weather stations since 2003. There are also a few FINLAV/SVELAV/CAA -educated actors issuing local avalanche forecasts in Lapland based on a voluntary service for local communities.

Due to the remarkable increase in the popularity of back-country winter activities it is vital to reach the wider public with information about the avalanche conditions and knowledge. Developing services offering information and knowledge is paramount. Not only for the free riders and professionals, but also for the recreationists who are not familiar with the avalanche danger when travelling in Lapland.

The quality of the FMI avalanche forecasts could be improved with manual observations of snowpack stability and avalanche problems in the avalanche terrain. The goal is to produce a high-quality forecast for all target groups that benefit from it.

FINLAV – Finnish Avalanche Education has created an education program increasing avalanche knowledge among the active winter recreationists and professionals who need avalanche knowhow at their work. The objective in the future is to increase awareness among public and winter recreationists and provide a training path for professionals benefiting the forecasting service. We aim to do this by building close co-operation between the meteorologists at FMI and the professionals with avalanche competence. Co-operation with Lapland Rescue Department, Police and Metsähallitus (Parks and Wildlife Finland) will also be improved.

The tools for avalanche forecasting and services have experienced great progress in our neighboring countries during the last decades. We aim to develop the Finnish avalanche service in co-operation with our neighboring countries and other stakeholders to support the needs of society.

KEYWORDS: Avalanche forecast, Finland, FMI Finnish Meteorological Institute, FINLAV Finnish Avalanche Education

1. INTRODUCTION

The need to update and uniform the Finnish avalanche forecasts has been recognized (Landon, 2024). There is also a need to reach the public better with the forecasts. FMI issues avalanche forecast for six avalanche prone areas in Northern Finland (Figure 1). In addition, local volunteers with professional avalanche competence in Ylläs and Pyhätunturi issue local avalanche forecasts for local communities. The forecast issued at FMI has a long history but is

based mainly on physical weather models. The local forecasts are more detailed, but the system is based on voluntary work.

The need and aim are to combine the best knowledge from avalanche professionals and meteorologists and build a new avalanche forecasting system that reaches and serves the public and professionals in the best possible way.

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Figure 1: Finnish Meteorological institute issues avalanche forecasts for six areas in Northern Finland (marked with circles). Manual observations of snowpack stability and avalanche problems are done in areas marked with red circles.

2. BACKGROUND

Avalanche forecasting was started at the Finnish Meteorological institute in 2003 following two fatal avalanche accidents in the Northern Finland. The forecast was advanced at the time being even if it was based mainly on the weather models. A few ski-centers provided FMI with snow-water-equivalent and shear observations, but this co-operation lasted only a few years.

The development on the avalanche forecasting field has been great during this millennium. At the Finnish meteorological Institute, the avalanche forecasting has been put on the side due to other development projects. It is still working on the method developed more than 20 years ago.

3. CURRENT SITUATION

Backcountry activities and free skiing have gained popularity over the past 20 years amongst Finns. The awareness and knowledge of avalanches has taken a big step forward as a result of a development project by Finnish avalanche education system FINLAV 2015-2017 (Mäkelä et al. 2018). Due to these reasons the avalanche forecasts are being more used and relayed on.

Backcountry winter activities have gained popularity also among people who are not familiar with the dangers of the severe Lapland winter. The avalanche forecasts, and the avalanche knowledge doesn't reach the wide public currently well enough. We can only speculate if a better warning system and awareness of avalanche prone areas and harsh mountain weather would have been able to prevent the serious avalanche accident in Pyhäkuru in January 2024 (Figure 2).



Figure 2: Pyhäkuru in Pallas region. Avalanches occur in the area regularly every winter. A massive avalanche killed two people in the area in January 2024. Photo by Otto Ponto.

Tourism has also grown remarkably both in Lapland and from Finland to the other countries. Uniform avalanche forecasts between the countries would increase safety.

The avalanche problems play a remarkable role in avalanche forecasts following the EAWS (European Avalanche Warning Service) standards (Figure 3). As well does *the aspect of the problems and the size of the forecasted avalanches*. These are factors that tell the user what kind of avalanches and where he/she needs to be aware of - which areas to avoid.

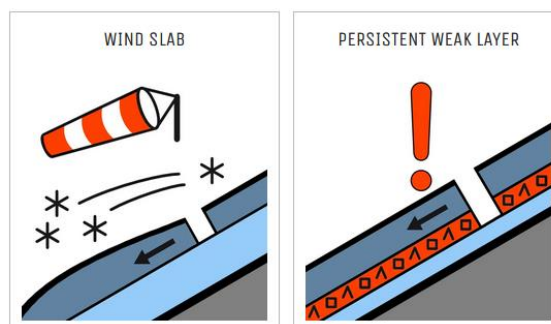


Figure 3: The most common avalanche problems in the Finnish avalanche terrains are the wind slab and persistent weak layer. Picture www.avalanches.org.

The national avalanche forecast issued at FMI gives the user only the danger scale. The same danger value can consider several different combinations of avalanche sizes, snowpack stabilities and distributions. In addition, the EAWS danger scale is not at its best in a Finnish terrain where the avalanches are often relatively small. Further information on the prevailing conditions would be very useful.

The local avalanche forecasts issued at Ylläs and Pyhänturi area provide us with the avalanche problem, size and distribution information.

4. FUTURE DIRECTION

Having the FINLAV/SVELAV/CAA educated avalanche professionals in Finland brings us to a good starting position for the improvements of the national avalanche forecast. Combining the knowledge of avalanche professionals with the knowledge of the meteorologists at FMI we have the information needed for the avalanche forecast following EAWS standards.

There have been lots of studies and development in the avalanche forecasting field last decades. Our neighbouring countries have established their own avalanche forecasting systems. For that reason there is no need to develop once again a new forecasting system for Finnish use but we could adapt methods that are considered to be working well for our neighbours.

5. PROBLEMS FACED

Awareness of avalanches happening on Finnish fells is increasing. Fortunately, we have had only a few avalanche fatalities in Finland, but several close calls have occurred each year. All our rounded mountains with avalanche terrain are located in Northern Finland, and it is still only a small portion of our population who travels in these landscapes. These are some of the reasons that make it very difficult to gain funding for improving the Finnish avalanche forecasts and services.

Manual observations of the snowpack stability and avalanche problems in the avalanche terrain are needed. You can use drones, satellite images etc. to complement your manual observations, but human being is still needed to study snowpack and distribution of snow conditions. Condition of persistent weak layer (PWL), as an example, cannot be observed remotely. Working hours are expensive and the trend

is to let machines do the work. Finding the organization(s) to pay for the avalanche terrain observations in Finland is difficult.

Manual snowpack stability and avalanche problem observations are made only in two areas in Lapland, at their own expense. Snow observations are needed also from the other forecasting locations. This would cause need for educating more avalanche professionals and thus expenses.

A fundamental problem to solve is the funding for the national avalanche forecast in Finland. The forecast influences the safety of many actors, tourism, nature services, rescue, police, education etc. It would benefit society in many ways. The funding solution could be a combination from several organizations.

6. A POSSIBLE PILOT PROJECT

Co-operation is tightened between FMI and FINLAV. A plan is in place for a pilot project to develop and test a new avalanche forecast method together. The test forecast could be done for four most remarkable avalanche prone areas, Kilpisjärvi, Ylläs, Pallas and Pyhänturi. There are active avalanche technicians and other avalanche professionals present in Ylläs and Pyhänturi areas. Professionals need to be obtained also for the other two areas.

Three main improvements needed for the Finnish national avalanche forecast are the following: 1. Regular snow observations from the avalanche prone terrains, 2. The forecast given to the public needs to be more informative with *the avalanche problems, aspect of the problems and size of the forecasted avalanches*, 3. Work needs to be done to get more publicity and usage for the improved forecast.

During the pilot project the best tools and platforms for Finnish avalanche forecast should be found. This is best done by networking with our colleagues in neighboring countries. We need a tool to collect snow and weather observations together and produce informative forecasts for the public.

Finding permanent funding for the national avalanche forecast in Finland would be one of the biggest challenges of the project.

7. NEXT STEPS - CONCLUSION

Awareness of avalanches happening in Finnish Lapland is increasing slowly that may make it more likely to find actors to fund the service.

We will continue promoting the development of avalanche forecasting and awareness in Finland. We will collaborate with our colleagues in other countries to find the best solution for Finland and follow the development in this field.

The collaboration achieved between FMI and FINLAV is supporting the development. FINLAV is the actor in Finland who can give the avalanche education needed for the advanced avalanche forecasts.

Collaboration with Lapland Rescue Department, Police and Parks and Wildlife Finland is important to develop a service where the forecast reaches the recreationist and professionals, and the information moves between actors. The aim in the future is to increase awareness of avalanches among the public and professionals and increase safety.

8. ACKNOWLEDGEMENT

FMI and FINLAV would like to thank all the actors who have been contributing for the avalanche forecast development work in Finland so far. FMI and FINLAV would like to warmly thank our neighboring countries for their great cooperation and guidance, and we hope this continues.

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