AVALANCHE FORECASTER EXCHANGE PROGRAM U.S. – SWITZERLAND

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ABSTRACT: The exchange program for avalanche forecasters between the U.S. and Switzerland was developed in 2003. Since 2004 the three authors have been on exchange. The objective of this program is to exchange knowledge, experience and techniques between avalanche specialists. So far we have found the following analogies and differences between Switzerland and the U.S.
Analogies: The way forecasts are produced is similar – data is gathered and interpreted by an avalanche specialist. Models to calculate the avalanche hazard are not yet used operationally. All of us depend on high quality field and weather observations. We cooperate with national weather services and we operate our own weather stations.

Users: For the most part in the U.S., forecast centers forecast for recreational users, except for the Northwest Avalanche Center and the Colorado Avalanche Information Center which also forecast for highway programs. The recreationists in the U.S. rate the snow pack discussion and weather forecast as a priority. In Switzerland all groups threatened by avalanches, including roads, railways, and villages are addressed. The issued hazard category is very important.

Observers: U.S. observations mostly come from volunteers or modestly paid observers. Switzerland has a dense network of paid observers with well defined guidelines and annual training courses.

Forecasters: U.S. forecasters tend to have experience as ski patrollers or guides along with some academic training. They are typically employed about six months per year and spend about 50 to 75 percent of their time in the field. Swiss forecasters tend to have an advanced academic degree with limited experience as ski patrollers or guides. They are employed year around, and typically spend 10 percent of their time in the field and 90 percent developing advisories and performing other duties.
Hazard Scale: Both countries use a five level avalanche danger scale, and the definitions vary slightly.

KEYWORDS: avalanche forecasting

1. INTRODUCTION

The exchange program for avalanche forecasters between the U.S. Forest Service Avalanche Centers and the Swiss Federal Institute for Snow and Avalanche Research (SLF) in Davos, Switzerland started in 2003. Doug Abromeit, Director of the U.S. Forest Service National Avalanche Center in Ketchum, ID, visited the SLF and initiated the exchange program. Since 2004 the three authors have been on exchange. The duration was about one month each.

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The objective of this program was to exchange knowledge, experience and techniques between avalanche specialists with different backgrounds and to learn about different ways to create and publish forecasts, which will enhance working relationships among avalanche specialists.

2. METHODS

The visiting forecaster participated in field work, creating forecasts, briefings, and visits of avalanche specialists outside and inside the forecast centers. Discussions and asking pertinent questions was the main methods of knowledge transfer. English was the main language, but briefings in Switzerland were held in German.

3. RESULTS

During the exchanges, we found many similarities and even more differences among forecast centers in the U.S. than with Switzerland. These are described below, where U.S. stands for the U.S. Forest Service Avalanche Centers and Switzerland stands for the Swiss Federal Institute for Snow and Avalanche Research SLF in Davos, Switzerland.

3.1 *Similarities*

Forecasts are created and published very similarly in both countries. We all gather data and observations. Then, a skilled avalanche forecaster interprets the data, and transforms it into an effective statement. In both countries there is no described and pre-defined procedure of how to interpret the data. The procedure to gather data and the amount of data varies between the U.S. and Switzerland. It also varies widely between forecast centers in the U.S. The U.S. centers and Switzerland do not utilize models to calculate the avalanche hazard level. We seem to agree that the avalanche forecaster is still the most viable and effective method in producing an accurate forecast.

We both use synoptic weather models to either verify or create weather forecasts for the mountain areas we forecast. In addition synoptic weather models are available to correct or create mountain specific weather forecasts. We both cooperate with national weather services and operate our own weather stations.

We all depend on high quality field observations and the estimation of avalanche hazard by avalanche professionals or at least from experienced people who were in the field. However in the U.S., the forecasters themselves gather tend to get more of an opportunity to get out in the field than the forecasters in Switzerland. Switzerland has paid observers who have varying levels of skill that gather an impressive amount of data for the forecasters.

Our relationship with the media is very similar in the U.S. and in Switzerland.

There are many climatic differences within our forecast areas, even in the smaller ones. These climatic differences have a great effect on the formation and layering of the snowpack in different regions and are tracked throughout the winter with snow profiles and weather observations.

Another similarity that we found in the U.S. and in Switzerland is that there is not a set standard of guidelines on how to travel safely in avalanche terrain. Avalanche forecasters are expected to be able to make proper and safe decisions in avalanche terrain as part of their job. This not only includes safe travel but also the way forecasters collect useful and comprehensive data. Most forecasters are very skilled and have learned to make proper decisions. Some employees have limited experience in safe decision making. There is very little required by the employers and little is done to improve and coordinate safe travel techniques and field work, both in the U.S. and in Switzerland.

Forecasters of both countries are involved in avalanche education and the creation of teaching tools. U.S. forecasters teach avalanche awareness classes at all levels. Swiss forecasters train their observers and public safety authorities, but do not offer avalanche awareness classes to the public. In both countries we face a significant increase in extreme skiing (and high marking with snowmobiles in the U.S.). This trend is supported by the development of equipment that makes it possible to ski, board and ride even in unfavorable conditions and in very steep terrain.

3.2 Differences

Besides the similarities there are even more differences between forecast centers in the U.S. than in Switzerland. Most of the differences are minor, and are mainly due to budget constraints.

3.2.1 *Weather Services:*

The cooperation with the National Weather Service is different within the U.S. Some forecast centers rely heavily on the forecasts, which are made twice a day for certain mountain locations. Other forecast centers do not have a forecast above 1300 m, therefore must create their own weather forecast. In Switzerland the MeteoSwiss creates snowfall forecasts specifically for avalanche professionals, and it issues a number of forecasts that can be used for avalanche forecasting that are also available to the public for an extra charge.

3.2.2 *Users and perspectives*

In the U.S. mostly recreational users are addressed by the U.S. Avalanche Centers. Two exceptions are the CAIC (Colorado) and NWAC (Washington). The recreationalists are:

snowmobilers, skiers, snowboarders, snowshoers, nordic skiers, hunters and hikers. The snowmobilers are the largest demographic group in most U.S. areas.

In Switzerland all areas threatened by avalanches, including roads, railways, and villages are addressed with the SLF's avalanche bulletins. Avalanche threatened highways in the Alps have their own forecast and avalanche control programs. SLF avalanche bulletins address skiers and snowboarders that are both on piste and in the backcountry. However, snowmobiling is mostly forbidden by law in the Alps.

During higher levels of danger, people who travel on roads or in trains as well as people who live in endangered communities in Switzerland are at risk and must therefore be addressed by law. However, these groups of people are commonly not addressed directly but via many different public safety authorities. These various authorities take care of safety measures and bear the responsibility of implementation and enforcement.

Since 1951 over 1 Billion (U.S.$) has been invested in Switzerland into permanent avalanche defense structures. Therefore many sites are safe from avalanches to a great extent. On the other hand tourism use and traffic in the mountains has increased dramatically within the last 60 years. The forecasting of the avalanche hazard does not take into consideration these permanent defense structures. However, the damages in severe avalanche cycles have been significantly reduced, which was demonstrated in the avalanche winter of 1998/99. (Wilhelm et.al. 2000)

3.2.2 *Contents of the bulletins*

The content of the bulletins are very similar (introduction, weather, discussion, and danger rating). The discussion is more important in the U.S. where as the level of hazard is more important in Switzerland. This latter statement was supported by the introduction of numerous statistical risk reduction methods in recent years. Some warning services in Europe are in favor of this development because it increased the value of the bulletins. Others are disappointed because the discussion is often reduced to a single number and does not reflect its true value. This will continue to be a challenge worldwide as whether to use sexy graphics or sexy words to get the information and message out to people.

3.2.3 Network of observers:

In the U.S. it varies from center to center as to how many observations are received and heavily depends on volunteer work. Observations are called in, faxed or sent by e-mail.

Switzerland has an extensive and costly network of paid observers ($800,000 U.S. $ annually) with well defined guidelines and annual training courses. Observers perform measurements, which are used for snow climatology, snow stability assessment and avalanche forecasting. A new organization of this extensive network is aimed to better use the individual forecaster's qualification as well as to reduce costs. Collected data is then transferred via internet and stored in a data base.

Snow profiles are done a little differently in the U.S. vs. Switzerland. One major difference is that the Swiss utilize the Ramsonde as part of their snow profile and forecasters in the U.S. do not for the most part. Both utilize the Rutschblock and compression tests. The Rutschblock is done a little differently in Switzerland than in the U.S. (the scale used does not refer to the same loading of the Rutschblock).

3.2.4 *Operations*

U.S. forecasters tend to have experience as ski patrollers or guides along with some academic training. They are typically employed about six months and spend about 50 to 75 percent of their time in the field.

Swiss forecasters tend to have an advanced academic degree with limited experience as ski patrollers or guides. They are employed year around, typically spend 10 percent of their time in the field and 90 percent developing advisories and performing other duties. They speak two to four languages which is necessary because the bulletins are published in 3 languages (but translated by professional translators) and the observers also speak different languages.

In Switzerland the basic work load tends to be higher than in the U.S. This is due to; meetings, writing reports and papers, keeping the observer network running and analyzing the data provided by the observer network along with the 180 automatic weather stations.

Forecasters in Switzerland need one season of forecasting training on the job before they are allowed to issue forecasts, and are still under close supervision. In the U.S., a forecaster

issues forecasts after going through on the job training that usually lasts a few months. Then, if the director of the individual avalanche center feels like the forecaster is ready, they are allowed to produce forecasts. This procedure varies from center to center in the U.S.

The forecasting period in Switzerland starts in October and ends in June. It is limited by the summer heat, not by funding. The U.S. centers usually forecast from mid November through the end of March or Mid April, dependant upon the snow pack and the funding.

Forecasters in the U.S. usually work a few days a week then are off for a few days. In Switzerland one forecasting cycle has a duration of between 12 and 20 days, depending on the available staff and duties. In the U.S. forecasting as a single person is common, where as in Switzerland there are always 3 forecasters on duty and one of them is designated to substitute if one forecaster drops out. Consequently decisions in the U.S. are commonly made by a single person the morning of the issued bulletin. The U.S. forecasters usually communicate their observations and information through e-mail, notes, and via telephone. In Switzerland all the forecasters on duty get together for a daily briefing. The Swiss are able to meet with colleagues and discuss what the consensus is through the processing of information.

Forecasts in the U.S. (as well as in most of the Alps) are issued in the morning. In Switzerland the main and national forecast is issued at 5 p.m. and regional forecasts are issued in the morning as an update.

The entire forecasting for the Swiss Alps and most of the research is centralized at the SLF in Davos, Switzerland. Backcountry Avalanche Forecasting in the U.S. is done by 16 individual avalanche centers throughout the country and coordination is through the U.S. Forest Service National Avalanche Center in Ketchum, Idaho. Most of the research that is done in the U.S. is conducted either at universities or through the National Avalanche Center, Avalanche Scientist, Dr. Karl Birkeland in Bozeman, Montana.

Swiss forecasters have the luxury of being able to rely on the support of computer specialists and companies who take care of expensive automatic weather stations. In the U.S. forecasters have to deal with computer problems, data bases and instrumentation to a great extent themselves, mainly due to budget constraints.

Swiss forecasters never ride a snowmobile. Most of the U.S. forecasters do from time to time.

3.2.5 *Differences in the danger scales*

Both countries issue a category of avalanche hazard. The meaning of this category is defined in the danger scale, which consists of 5 categories. The European Hazard Scale was introduced in 1993, and the U.S. Danger Scale was revised in 1996. The U.S. Danger Scale is not a translation of the European Hazard Scale, but self-contained. Although both scales are similar there are a few differences that are worth discussing. The main difference is in the definition of *Considerable* (3). The European Scale defines it as: “Triggering is possible, sometimes even with low additional load.” The U.S. scale defines it with: “Human triggered avalanches probable.” Human triggered avalanches are probable is the definition of *High* (4) in Europe. Although both scales do not define the probabilities for possible and probable, there is consensus that probable indicates clearly a higher probability than possible. Therefore a U.S.-*Considerable* indicates higher hazard than a European *Considerable*.
The European scale defines *Very High* (5) as: ”Numerous large natural avalanches are likely…”. The U.S. scale defines *Extreme* (5) as: “Large destructive avalanches possible”: Thus a European very high describes a more severe situation than a U.S. *Extreme*.

It took us a while before we recognized these differences in the exchange program. In the field, we assigned avalanche conditions to the same hazard category, although we had “our” definitions in mind which were a little different. Thus we do not think that the differences in the danger scale definitions are a problem for the bulletin users. A harmonization of the scales is not necessary.

Another difference was discussing size classification of avalanches in the field. The U.S. uses a 5 level scale for avalanche sizes (usually in combination of the Canadian classification) relative to path and destructive force. Switzerland uses a 4 size absolute scale. This is important with higher categories of hazard because size matters in the definitions.

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