

AVALANCHE DATA: TO SHARE OR NOT TO SHARE?

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ABSTRACT: An obvious way to assess snow avalanche risk consists in consulting a database. The first data collection organized in France traces back to 1900, and comprises today 79,000 written records of avalanches. An electronic database was created in the late nineties, but access was limited to a small number of experts. The structure was renewed in 2002 in order to allow open access to records and synthetic maps. Today this information is freely available on internet.

Due to questions of data reliability, we developed a new database accessible on-line since 2007. Avalanches are described with high standards of accuracy, and modern media techniques are used for presentation. Narrative accounts, photographic documents and precise localization in space are combined with traditional descriptive elements. The data input is performed by experts and experimented backcountry skiers.

During the last winter, more than 50,000 avalanche descriptions were accessed. We carried out a survey in order to improve our understanding of user expectations. Questions such as data sharing and database structure are raised. Our hope is to rally the efforts for globalization of avalanche data and set up a tool of international significance by sharing knowledge and competence.

KEYWORDS: DATABASE, SHARE, KNOWLEDGE, SOFTWARE

1. INTRODUCTION

Since 1994, we have been applying the concept of an information system to recording actual avalanche data for research purposes [ISSW 1998]. On this basis, a system was developed to support the estimation of avalanche risk for protecting roads in Savoy (France) [ISSW 2000]. New possibilities created by the development of the Internet and associated technologies, as well as the coming together of a passionate snow expert and information technician resulted in an information system going online in March 2007 that was exclusively dedicated to the description of actual avalanches (www.data-avalanche.org).

Was this really a new approach? How was it appreciated by internet users during the winter of 2007-2008? How was it perceived by other organisations concerned by avalanches in France? What are the perspectives in the short term?

This study, at national level in France, is aimed at evaluating the prospects for a free and easy exchange of data on actual avalanches, for all, at international level.

2. HISTORY OF RECORDING AND SHARING DATA ON AVALANCHES IN FRANCE

The organised collection of observations on avalanches started in France in 1900 with the creation of the *Enquête Permanente sur les Avalanches* (Permanent Survey of Avalanches) (EPA) in Savoy. This operation was managed by the national forestry commission (ONF). It was designed to complete descriptive forms (data, time, weather conditions etc.) for avalanches observed in certain defined corridors. In 1920 it was extended to the departments of the *Alpes du Nord*, *Hautes-Alpes*, and in 1970 to the whole of the Alps and Pyrenees mountain ranges. Since 1975, the EPA has only been maintained for sites that are observable from an easy access point, in order to guarantee regular observation. The entry and filing of handwritten records was carried out by RTM and the CEMAGREF. Many hours of work was needed by external experts wishing to use these records. The organisation of this data was considered between 2002 and 2006. The data files are now available on the Internet (www.avalanches.fr). Unfortunately, the data are not reliable, particularly regarding the date of avalanches. To be useful they therefore need to be combined with a search of other information (eye-witness accounts, photographs, traces on the ground etc.).

In 1971, the *Carte de Localisation Probable des Avalanches* (Map of probable location of

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avalanches) (CLPA) at a scale of 1/20 000 was created in order to draw up an inventory of all the avalanche sites in France. This was undertaken by the CEMAGREF, following the avalanche at Val d'Isère on 1st February 1970, which killed 39 people in a building. 1990 saw the second edition of the CLPA with 1/25 000 maps and the start of digitalising the data. Since 1992, the CLPA is supposed to be updated annually, with all the new events occurring during the previous winter. In 2001, the CLPA name was changed: the Map of *probable* location of avalanches became the Map of location of avalanche *phenomena* (*Localisation des Phénomènes d'Avalanche*). The database was renovated between 2002 and 2006. From 2004, the DLPA data has been available online at www.avalanches.fr. Alpha-numeric data are associated with the tracks of certain avalanches. Most of them come from the EPA. Since January 2008, the CLPA is in 3D on Géoportail (www.geoportail.fr). Information provided on these maps is very useful, but this information is the result of a synthesis of data, and does not describe actual avalanches.

In addition to these two operations, it is worth mentioning a number of European projects (14 partners), consisting of reflections on the collection and sharing of avalanche data: SAME (1994-1998), CADZIE (1999-2003) and SATSIE (2003-2006). They have undoubtedly enabled a number of exchanges between partners, but few concrete applications to make data available seem to have resulted.

Lastly, since about 2005, a number of websites for mountain enthusiasts post more-or-less accurate descriptions of actual avalanches online, for example <http://pistehors.com>, www.volopress.net and www.skitour.fr. The ANENA website also gives concise online data on fatal avalanches that have occurred in France since 2000 (www.anena.org). Since December 2007, these avalanches have also been linked to maps and to the risk estimation bulletin of the day of the accident. The ANENA has organised the collection of data from rescue organisations in France.

Since March 2007, we have put a database online that is exclusively dedicated to the description of actual avalanches observed during accidents, monitoring missions and leisure activities (www.data-avalanche.org). In addition to the reliability of the data, we require, for each avalanche, a precise date, time and location, and one or more photographs.

3. EXPERIENCE OF AN ONLINE DATABASE DURING THE WINTER OF 2007-2008

3.1 *Principles of data-avalanche.org*

Data-avalanche.org is a database that is freely accessible on the internet. Its structure is based on a conceptual model of data created from 1994 according to the principles of the Merise method. It is designed to record a large number of avalanches which are easy to select with a request system. Because they are necessarily identified by a date and a precise location (a point or an area on Google Earth), it is easy to associate geographic (altitude, exposition, slope etc.) or meteorological (precipitation, temperature, wind etc.) parameters. Photographs allow the user to understand data that is not recorded in the database fields. The statements of witnesses or victims (pdf files) allow a lot of detailed information to be mentioned, which is very useful, but this only concerns one avalanche in particular. Lastly, information on each victim, as well as any rescue operation, is also recorded. This last function is only available to users with a password.

3.2 *Data collection and entry*

As of July 2008, 187 avalanches have been recorded. Most of them were observed and described by Alain Duclos, but more and more observers send us their information, including rescue workers, witnesses of avalanches, victims and experts.

For the moment, data entry is done exclusively by specially trained members of the association "data-avalanche.org". The operation is very easy from an IT point of view, but specific skills are needed for a good understanding of the avalanche described and to verify the validity of the data. The value of the database depends to a great extent on this phase.

3.3 *Consultation of the website*

From the moment the database went online (1st March 2007), a module was installed for counting both the number of visits and the number of descriptive avalanche records. As of 25th July 2008, the counter shows:

- ✓ 22 722 visits
- ✓ 74 992 records consulted

In addition, since 1st December 2007, we have used the Google Analytics service to monitor the origin of visits and consultations of visits precisely. The results are shown in Figure 1.

3.4 *Comments from site visitors*

40 of the people who consulted the database responded to an online questionnaire to give us

their comments, which can be summarized as follows:

- ✓ Some of the information provided by www.data-avalanche.org is not available elsewhere.
- ✓ The descriptions allow users to identify themselves more easily as possible victims. Some seem to have discovered that they too could be caught in an avalanche through reading the descriptions.
- ✓ The amount of information provided is sometimes considered to be still insufficient, particularly concerning the degree of the slope, the snow and weather conditions and the bulletin of risk estimate.
- ✓ The request system is little used or not at all.

These comments have been taken into account to plan possible improvements to the system.

4. ATTITUDE OF INSTITUTIONS WITH REGARD TO THIS EXPERIENCE

In order to complement the opinions of internet users, we interviewed representatives of 23 French organisations that are concerned with avalanches, all of them members of the ANENA. They were informed of a request for a meeting by letter, then they were recontacted by telephone. 75% of them replied to our survey by giving us an interview, either in their offices, or by telephone. The others either did not have the time to speak with us or did not wish to do so. We also sought the opinion of the state prosecutor of the Albertville tribunal where numerous legal affairs concerning avalanches are judged. The information presented here represents what we understood from the interviews and does not therefore engage the responsibility of the people interviewed.

4.1 What is appreciated about data-avalanche.org

The database is used to help estimate the risk of avalanche by organisations that need to operate in the field (rescue services, the military during training exercises and academics from ENSA). It is also used by CEMAGREF to add to avalanche maps and associated data (CLPA). Above all, the avalanches described are a very rich source of information for organisations involved in training (principally ENSA, but also the military and the union of mountain guides). Better preventive action enabled by the rapid online availability of information is highlighted by the rescue organisations (PGHM and the CRS). This aspect is also appreciated by the representative of the law (the Albertville state prosecutor).

4.2 What is not appreciated about data-avalanche.org

The principle criticism expressed concerned the overlap between our database and that of the ANENA. And yet, they do not have the same purpose (the ANENA database only provides data on fatal avalanches), and the functions are different (for example, there is no request system and no written statements on the ANENA system). The lack of comprehensiveness of the www.data-avalanche.org database is strongly criticised by the national service for forecasting avalanches (CEN and *Météo-France* – the national meteorological office), which is also critical of the limited number of requests possible. Most of the organisations consulted would like there to be some reflection to enable a single online database to be constituted.

4.3 Sharing of data

Although we did not have any contact with the people responsible for ski-slope services, one of the organisations consulted (SNTF) suggested it would be useful if we could obtain information on avalanches from ski resorts. The Albertville state prosecutor agrees that we should use data collected during judicial enquiries, once these enquiries have been judged or filed without judgment. The rescue services agree to continue giving us information, but regret that they have to give it to several different organisations (ANENA, SNOSM). *Météo-France*, on the other hand, refuses to allow us to associate the avalanches recorded in the daily avalanche risk estimate bulletin.

Lastly, we regret not having been able to obtain the opinion of the mayors, who are primarily responsible for security in their communes. We know that some would agree to communicate information about the risk of avalanches (Tignes for example). Others are no doubt more reticent because of the possible impact on tourism. One of the important actors in this domain, the *Syndicat National des Guides de montagne*, (national union of mountain guides) did not find the time to answer our questions.

5. DEVELOPMENTS AND POSSIBLE PROSPECTS

Many options for development are possible to:

- ✓ Increase the amount of information available,
- ✓ Facilitate access to information.

Some of these improvements will be developed within data-avalanche.org. Others require partnerships and collaborations to be created.

5.1 Development of data-avalanche.org

- Internationalisation: adaptation of the interface language and the descriptive information according to the language of the user.
- Link with weather data: import of weather data from automatic weather stations, with the possibility of displaying weather data from stations near to an avalanche.
- Link with Géoportail: display of the avalanche location on Géoportail as with Google Earth.
- Access points via Google Earth and Géoportail: utilisation of these GIS engines as access points to avalanches. Access to the description of an avalanche by clicking it on the map.
- Improvement of the interface: improvement of the presentation and increase in the number of filters possible.
- Use of data on victims: possibility of creating statistics and filters on the victims' parameters.

5.2 Development of collaboration

- The simplest way to enrich an information system on avalanches would be to make it known so as to centralise the collection of as much reliable information as possible (from mountaineers, rescue services etc.). However, this possibility, alone, is not satisfactory because it does not provide a durable solution to the overlap of data – it is normal that several organisations want to use the same data.
- As is already the case, it would be possible to feed one database with data entered into another (for example, an American database is already systematically updated using data from the ANENA database). This solution has been considered between Data-avalanche and the avalanche database of the Catalan Pyrenees (*Base de Datos de Aludes de Catalunya*, online at the website of the *Institut Geologic de*

Catalunya www.igc.cat/). Here too there is still some overlap, unless there are links created from one database to the other.

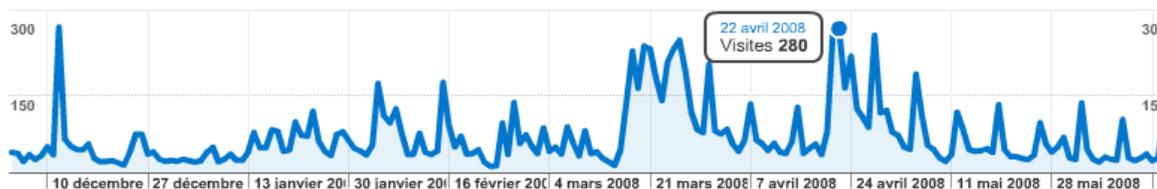
- Finally, another possibility is to make our database available to organisations that don't already have one, or have one that they would like to develop. This possibility would be particularly interesting to us, if it leads to collaborative work for greater effectiveness.

6. CONCLUSION

With nearly 75 000 records describing avalanches consulted in one year, www.data-avalanche.org has shown the interest of internet users in precise description of actual avalanches. The comments from internet users and French organisations consulted during a survey confirm this interest, whether it be for a better knowledge of dangerous sites, high-risk periods or the conditions that increase the chances of an avalanche accident.

It would therefore seem valuable to develop this operation further. Nevertheless, certain organisations that are already engaged in the forecasting of avalanches in France and in making this information available are not in favour of this, invoking the fear of seeing a multiplication of databases dedicated to avalanches.

The possibility of improving knowledge of avalanches depends undoubtedly on a managed sharing of information. To this end, we wish to work with partners to create a shared set of data, but also to work collaboratively on ideas for the structure of information systems. It seems to us in fact that a database built from a rigorous model is necessarily compatible with possibilities for exchange and sharing.



13 803 Visites | **70,42** Visites par jour

Figure 1. Visits to www.data-avalanche.org between 1st December 2007 and the end of May 2008 (maximum: 280 per day)



62 384 Pages vues

Figure 2. Pages seen at www.data-avalanche.org between 1st December 2007 and the end of May 2008 (maximum 1521 per day)

	visits	pages/visit	time/visit
France	13 092	4,48	00:04:35
Switzerland	374	4,09	00:04:11
United Kingdom	303	4,83	00:04:08
Italy	263	4,85	00:04:40
Germany	90	3,57	00:03:42
United States	84	3,42	00:03:31
Belgium	61	4	00:03:13
Spain	57	3,89	00:04:13
Canada	53	3,98	00:03:38
Netherlands	33	5,24	00:05:10
Average :	1 441	4,24	0:04:06

Figure 3. Visits to www.data-avalanche.org between 1st December 2007 and the end of May 2008, by the 10 countries from which the site is the most visited.

ANENA	Association Nationale pour l'Etude de la Neige et des avalanches (National association for the study of snow and avalanches)
CEMAGREF	Centre d'Etude pour le machinisme Agricole, le Génie Rural et les Eaux et Forêts (Centre for the study of agricultural mechanics, rural engineering and water and forests)
CEN	Centre d'Etude de la Neige (Centre for the study of snow)
CLPA	Carte de Localisation des Phénomènes Avalancheux (Map of localisation of avalanche phenomena)
CRS	Compagnie Républicaine de Sécurité (Republican company of security, security forces)
ENSA	Ecole Nationale de Ski et d'Alpinisme (National school of skiing and mountaineering)
EPA	Enquête Permanente sur les Avalanches (Permanent survey of avalanches)
National forestry office)	
PGHM	Peloton de Gendarmerie de Haute Montagne (Mountain security forces)
RTM	Service de Restauration des Terrains en Montagne (Service for the mountain land restoration)
SNOSM	Système National d'Observation des Secours en Montagne (National mountain rescue observation system)
SNTF	Syndicat National des Téléphérique de France (Union of ski resort operators)

Figure 4. Acronyms

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