A new iconographic avalanche bulletin for the Catalan Pyrenees: a beginning for a future avalanche forecasting database

Glòria Martí, Jordi Pujol, Jorge Fleta, Carles García, Pere Oller, Olga Costa & Pere Martínez
Institut Geològic de Catalunya, Barcelona, Spain

ABSTRACT: Since 1989 the Geological Survey of Catalonia, at present Institut Geològic de Catalunya has been issuing daily avalanche bulletins in winter season in collaboration with the Servei Meteorològic de Catalunya. From that time until present new needs focused on the comprehension of the avalanche bulletins has been thought as a motivation in order to improve text based bulletins. Furthermore building an avalanche forecasting database is one of the tasks to be reached in medium term. Because of these needs during the recent season 2008-2009 the first step has been to issue a new bulletin with icons using a new application based on xml format. This development has allowed to provide more comprehensible and visual avalanche information by distributing the contents in a hierarchical way. Thus the icons have been thought as an aid for the end-user so, the information to be understandable and easy to keep in mind. At the same time, the hierarchical structure allows the user to reach more detailed information step by step. From the forecaster point of view the application allows to elaborate the bulletin in a friendly way. In addition the build up of an avalanche forecast database will be able in future work by exporting the fields of the xml application. The generation of automatic processes will enable to disseminate further information: html, pdf, rss, sms, etc.

KEYWORDS: avalanche bulletin, icons, users, forecast database.

1 INTRODUCTION

From the beginning of avalanche forecasting in the end of 80's until 2008 the avalanche bulletins in Catalan Pyrenees (figure 1) has been text-based in terms of regional forecast (Gavaldà and García, 1996). Through this long period of time our bulletins were more focussed in describing precisely the hazard (phenomena, localisation, probability, overload, trend, etc.) than on how to keep this information in mind. Taking into account some of the users, for instance civil protection, text-based bulletins accomplish their perspectives and needs, but concerning backcountry and recreationists, some improves should be done in order to avoid on one hand time consuming, which at the end leads not reading the whole text, and on the other just keeping the avalanche danger rating. Both lead having vague or non completed information. Moreover as described in some unpublished studies (Staudinger, 2008; EAWS, 2005; Paul Mair oral communication), keeping in mind and reproducing the information in field was not optimal with text-based bulletins. Another important goal is to be helpful from the less experienced users to the more skilled ones.

Short term perspectives include also avoid-

Corresponding author address: Martí G. Institut Geològic de Catalunya, Barcelona, Spain; tel: + 93 553 84 30; fax: +93 553 84 26; email: gmarti@igc.cat

ing language barriers specially due to the spreading of winter tourism in the study area. Avalanche bulletins in Catalan Pyrenees are issued both in Catalan and Spanish language and thus some users coming from foreign countries find severe handicaps to consult the information. All those problems reveal that major changes have to be done so that the information can be simultaneously accurate and user oriented.
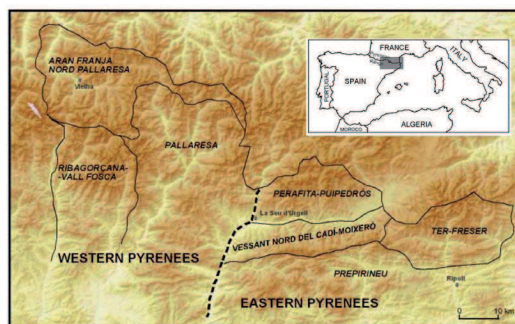

Figure 1. The study area is the Catalan Pyrenees. It has been divided in 7 regions for forecasting purposes.

Graphic-based bulletins in combination with short texts allow the user to retain better the information. The spreading of new media and in special the web capabilities seem to be a powerful tool to launch coming novelties.

From the forecaster point of view there was another perspective: to have a friendly interface which allows to issue advisories and at the same time to store and to consult data. Planning

and organisation of the avalanche bulletin database are the main goals to be reached in short term. All these tasks are meant of a basis to build up the future avalanche forecasting database which is scheduled as a medium term achievement.

2   BACKGROUND

In the last few years improvements in showing avalanche information have been done both in Europe and America.

In Europe there have been several samples of advisories containing icons, graphics and avalanche rating maps (Staudinger, 2008; EAWS, 2007). Austria, Bavaria, Italy and Switzerland among others have been working deeply in this subject specially in the frame of the working group of European Avalanche Warning Services with the aim to produce some standards. In this sense the new development of the EAWS web page will use next season the same rating icon (EAWS, 2009).

In North America and Canada there have been lots of efforts to organise graphic based bulletins with tiers and to use new media to spread their information (Tremper and Conway, 2006).

In Pyrenees, concretely in Aran Valley (Western Catalan Pyrenees) graphic-based local forecasts addressed to recreationists began in 2007-2008 season (Gavaldà and Moner, 2008). These warnings include maps, icons and traffic lights in order to represent avalanche danger.

Concerning regional forecasts some changes were done in our institute by means of adding pictures and profiles in the classical text format during 2007-2008 season. Those changes included the set up of a new interface so that the forecaster can put the required data in a friendly way. This improvement was of a great helpfulness for our on-duty tasks and furthermore the basis for the future developments presented in this paper.

3   AVALANCHE BULLETIN INFORMATION IN THE CATALAN PYRENEES

Avalanche bulletins are meant of a basis to assess avalanche hazard and communicate critical avalanche information (SLF, 2008). Specifically for the Catalan Pyrenees it is done by means of two daily regional bulletins (eastern and western part). They are issued by two types of layouts: a text based bulletin (ABT) and as a result of the new development attained during this last season an icon Based bulletin (ABI).

ABT is available in Catalan and Spanish language and ABI is available in Catalan, Spanish and English language in our website.

In this section we will describe the ABI features and structure. Catalan Pyrenees have been divided in seven different regions for avalanche forecasting purposes: 4 in the eastern part and 3 in the western. The hierarchical structure consists of describing the following items:

- In the first tier the rating for the whole Catalan Pyrenees.
- The second tier describes briefly the hazard for the western/eastern part.
- The main avalanche hazard features of each region in the third tier.
- Finally in the fourth tier the user can get deeper information by consulting ABT.

In this way the user can get more detailed information step by step.

While ABT is distributed by several media (fax, e-mail, telephone, sms and web) ABI is based on internet at present so we will describe its structure as follows.

3.1 Basic avalanche information

This first tier consists in a general map of the whole Catalan Pyrenees where each region has the rating icon inside. The icons are the same used by SLF (SLF, 2008). Each region has a color shade inside that coincides with the danger level one (figure 2).

The European Avalanche Danger Scale is always shown in this page as well as the links to the icon's legend and the user's guide.

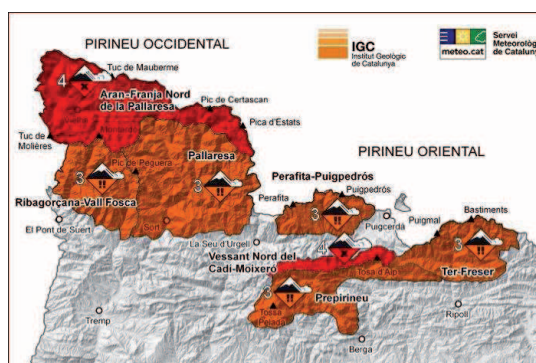The user can get more information of Western or Eastern Pyrenees by selecting each one on the map.

Figure 2. General map of the Catalan Pyrenees with the basic avalanche information. It is available in the first tier of IGC webpage.

3.2 Avalanche forecasting Western/Eastern Pyrenees

The next tier provides first the information of the danger level on a schematic map and a text box with a brief avalanche forecasting summarize of the Eastern or Western Pyrenees (figure 3).

The user can get avalanche forecasting description for each region by selecting each one on the schematic map or scrolling.
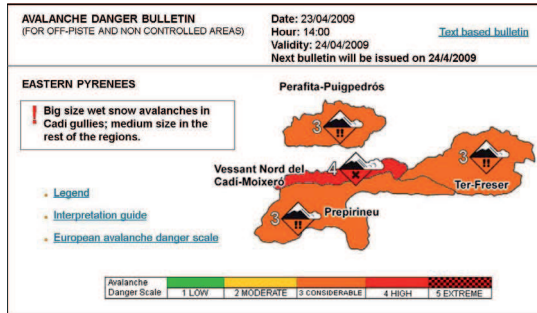

Figure 3. Example of the second tier. A headline for the whole area and the rating of each single region is shown.

3.3 Avalanche forecast for each region

The user can get the detailed information of each region in this tier. It is summarized using a text box with a headline and with the icons describing the following terms:

- Snowpack distribution in north and south slopes.
- Type and size of avalanches.
- Height and aspect prone to avalanches.
- Additional load (natural release, single or high load).
- Day time of occurrence (only for wet avalanches).
- Likelihood (possible, probable and very probable).
- Tendency for the next 48 hours.
- Weather forecast for the next 24 and 48 hours provided by SMC.

The final layout is an avalanche regional forecast composed by a single icon describing the snowpack distribution, another one for danger level and five more icons describing the avalanche danger (what, where, when). At the end of the page the weather forecast is also showed with icons that are provided by the SMC (figure 4).

3.4 Text based avalanche information

Advanced users in needs of further information and in special civil protection for its own purposes have at its disposal text based bulletins. This document contains all those elements described above and more detailed information that cannot be summarized by icons.

Some of the contents of ABT are spread by sms and reduced information by phone services (TxT).

4 DATA ORGANISATION

During snow season, the Avalanche Bulletin is daily generated, in two languages and both for Western and Eastern Pyrenees. The amount of input data has been increasing to satisfy the requirements of the graphic information offered. These data must be published in scheduled time and with the better quality and accuracy within many media:

- A full version on website (ABT and ABI).
- An ABT version for answering telephones.
- A pdf format of ABT version for e-mail and fax.
- Short version of ABT for SMS.
- Reduced information of ABT for specific SMC phone services.

Furthermore there are also special warnings in case of danger level 4 and 5 and specific snowpack information without rating (usually at the beginning and the end of the season).

All those data formats and their dissemination is time consuming. So we had to choose a friendly way to store and manage input data so that they can be automatically set up in many ways. The application enables to optimize and reduce on-duty tasks.

In 2007-2008 season we updated the system to make a simple ABT on a XML file format. This first version had 21 different fields to place this information and a simplest structure defining the snowpack information and warnings. On 2008-2009 season we designed a new version with 39 fields that included the structure and fields of the first xml version. With xml structure we indicate hierarchically all the data fields that are implicated both in ABT and ABI. As we have all our fields defined and separated, we can choose which of them must appear in a media and which formatting and styling has to be applied.

Icons for each region are elaborated automatically: snowpack distribution, danger by aspect and height, and time prone to avalanches. Each development creates final products that can be spread or integrated in different media.

Generation based on xml improves all the other available products: for instance the
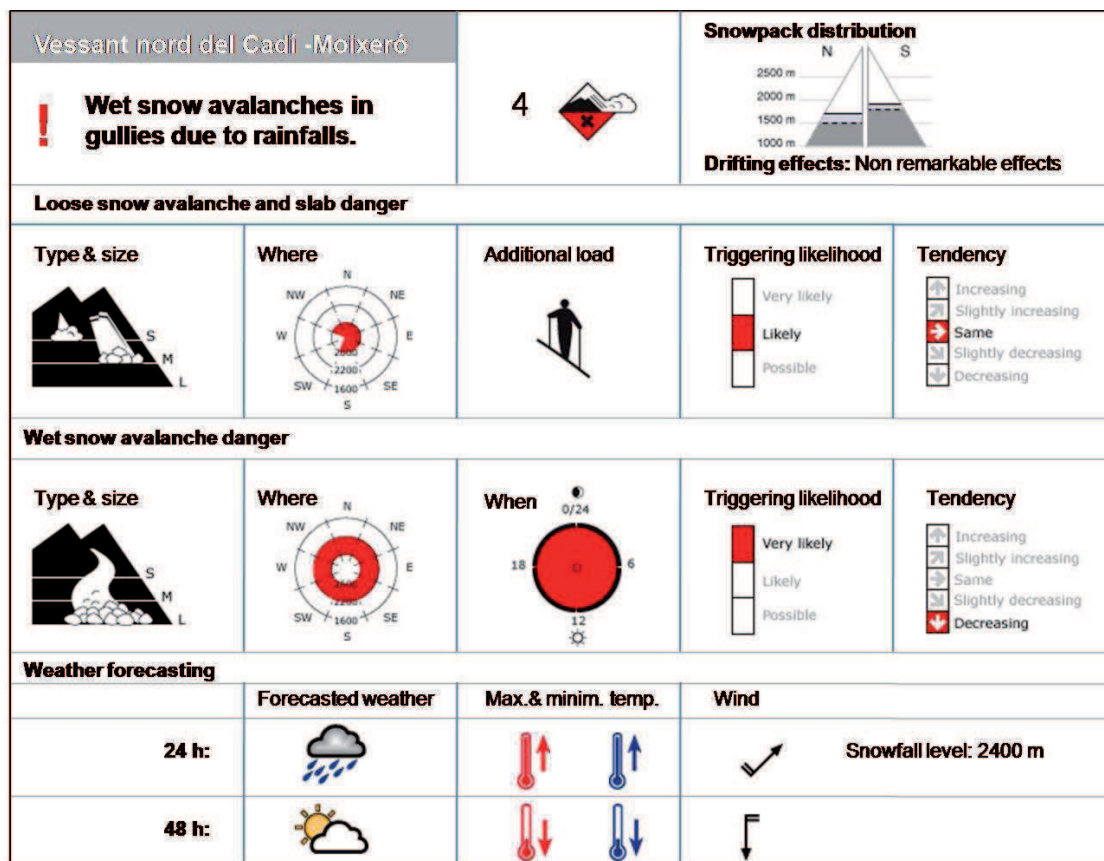
363

Figure 4. Layout of the third level. The features describe the danger level, its tendency and the weather forecasting.

website has been updated with the hierarchical structure described above. A printer-friendly version of the avalanche forecast for each region is available and includes a header per page (date and validity) and controlled page breaks.

5 FEEDBACK FROM USERS

Statistics relating to our web page consults tell us that the 83% of users go through the first tier and access at least at the second and at the third level. Solely the 17% of users stay exclusively in the first tier which contains only the rating. In contrast with text based bulletins ABI favours not only the consult of the rating alone but important clues for backcountry and recreationists. Website pages focussed on help-tools such as the legend and the user's guide are the less consulted with a ratio 5%.

Personal communication with users reveals us that:

- The ABI version was very well accepted.

- ABI clears up the danger level and the danger scale.
- Some users had the perception that ABI contains more information compared with ABT.
- The most difficult icon was the one merging height and aspect. This topic matches with the general idea that education on reading maps is needed (Mair et al 2008).
- Some expressed the idea that there should be harmonized icons in Europe.
- Although only the 9% consulted the ABT, single users expressed the need on having it easily in the website.

6 FUTURE WORK

At present we are working on map based outputs to supply snow depth and new snow distribution. Other short term tasks include showing snow pits and pictures of the whole season and on-line enquiries on the comprehension of the bulletins.

In future we will continue using improved xml versions which include the older ones, allowing the creation of a unique database.

Other media products will be generated and improved, such as rss, website adapted for handheld devices or sms. Backoffice forms to enable better communication with weather forecast office are also scheduled.

7 ACKNOWLEDGEMENTS

We want to express our grateful to the users for their feedback and comments and in special to the observers of the IGC avalanche network for their comments and suggestions.

8 REFERENCES

EAWS, 2005. Report of the 13th Meeting of European Avalanche Warning Services, Davos, Switzerland, 26-27 May 2005. http://www.avalanches.org/Davos2005/-E--results.pdf

EAWS, 2007. Report of the 14th Congress of European Avalanche Warning Services, Starᴰ Smokovek, Slovakia, 21-23 June 2007. http://www.avalanches.org/Slovakia2007/Report%20on%2014th%20EAWS%20Congress.pdf

EAWS, 2009. Report of the 15th Meeting of European Avalanche Warning Services, Innsbruck, Austria, 16-17 June 2007. In preparation.

Gavaldà, J. and García, C., 1996. La predicción del peligro de aludes en el Pirineo de Catalunya. In: Chacón, J. and Irigaray, C. (Editors), Proceedings of VI Congreso Nacional y Conferencia Internacional de Geología Ambiental y Ordenación del Territorio, Granada, Spain, 22-25 April 1996, pp. 605-614.

Gavaldà, J. and Moner, I., 2008. Mountaineer-oriented local avalanche forecasting system in a graphical format in the Aran Valley (Eastern Pyrenees). Proceedings of the International Snow Science Workshop. Whistler, BC, Canada, 21-27 September 2008, pp. 669-673.

SLF, 2008. Avalanche Bulletins and other products. Interpretation Guide. Davos, Switzerland.40 pp.

Staudinger, M., 2008. Reflexiones sobre la comprensión de la escala y de los boletines de peligro de aludes en Europa. Proceedings of 3ª Jornada Tècnica de Neu I Allaus, Vielha, Spain, 18-20 June, 2008. http://www.igc.cat/web/gcontent/pdf/allaus/jortec/jortec3/seguretat_4MStaudinger_ppt.pdf.

Tremper, B. and Conway, J., 2006. Grahic avalanche information for the new media. Proceedings of the International Snow Science Workshop. Telluride, Colorado, USA, 1-7 October 2006, pp. 505-509.