

MAPPING OF AVALANCHE ACCIDENT IN FRANCE: BUILD A GIS TOOL

Michael Deschatres^{1*}, Frédéric Jarry², Dominique Létang², François Rapin¹, Didier Richard¹, Nicolas Eckert¹, Sébastien Escande² and Eric Maldonado¹

¹Irstea, Unité de Recherche Erosion Torrentielle Neige et Avalanches, France

²ANENA, Association Nationale pour l'Étude de la Neige et des Avalanches, France

ABSTRACT: The French National Association for the Study of Snow and Avalanche, called ANENA, makes prevention on avalanche accidents in France. ANENA manages a database of the French avalanche accidents over 40 years, and notes that the global average is 21 fatal avalanche accidents and 30 deaths per year.

But information on accident sites is sometimes difficult to obtain and there is no map to accompany the data collected. Nevertheless, from many years, pictures, diagrams or GPS points are often transmitted and can be used to locate events.

It is proposed to create a first annual localization map of the avalanche accidents, available to the public. It will be built with an open source GIS software –Qgis–, and will be broadcast by webmapping.

KEYWORDS: Avalanche, avalanche accident, GIS, geographic information system, map, localization.

1. INTRODUCTION

Founded in 1976, the ANENA aims to advance safety in mountain by preventing risks associated with snow and avalanches. Recognized for promoting the public interest, it now has nearly 900 members (www.anena.org). It includes all persons or organizations interested in the problems posed by avalanches, such as:

- Professionals -Ski resorts, mountain guides, ski instructors, ski patrollers, safety authorities, administrations, private companies, research institutes, universities, etc...-
- Users -Ski tourers, off-piste skiers and snowboarders, mountaineers, snowshoers, everybody who wants to know more about snow and avalanches to be safer in mountain environment.-

One way to organize campaigns to raise public awareness is to study avalanche accidents. The ANENA publishes an annual review of avalanche accidents in France which is posted on the website and in the magazine "Neige et Avalanches". The accidents testimonies are also analyzed by

snow, weather and behavior experts.

Software for surveys and statistical -"Sphinx"- is currently used to:

- Collect data via an online questionnaire
- Analyze of the data (quantitative/qualitative studies)
- Produce graphic tables and generate of reports

In this paper we will show interest of create an annual localization map of the avalanche accidents in France and interest to use a geographic information system (GIS). Work is in progress.

1.1 *Interest to build a map of avalanche accidents*

The first of the identified needs is to create maps for these annual reviews. For example convert graphic of accidents distribution in a map. In the following figure (Fig. 1) we have represented the statistics of the winter 2005-2006 (Jarry, 2006). All events are located by the town. It is possible to create maps by town, mountain massif or region.

At the map scale site, geographic information is sometime difficult to obtain. Even if from many years, pictures, diagrams or GPS points are often transmitted and can be used to locate events. The first annual localization map will also be created for motivate people to provide data.

* *Corresponding author address:*

Michaël Deschâtres, Irstea, BP 76, 2 rue de la Papeterie, 38402 Saint Martin d'Hères, France;
tel: +33 (0) 4 76 76 27 90;
email: michael.deschatres@irstea.fr

In addition to the role of communication and feedback, the data will be crossed with weather data or other data to refine knowledge.

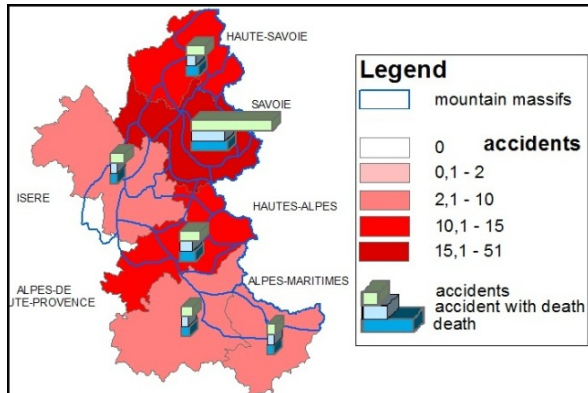


Fig. 1: Avalanche accidents, winter 2005-06 in six regions of French Alps

1.2 Choice of software

GIS give us ability to create access, integrate, and publish large amounts of geographically information. It's a tool to query, analyze and map data. To manage data, ANENA choose open source software -Qgis-, chosen for friendly of use and free license. Irstea will use ESRI solution for spatial analysis.

2. DATA AND METHOD

Irstea was tested in 2009 and 2010 the location of accident sites and integration of data in a first GIS.

- Retrieve data from the last winter : Results show that it is very difficult to map. It appears differences between the testimonies. A check of the reliability and validation is required.

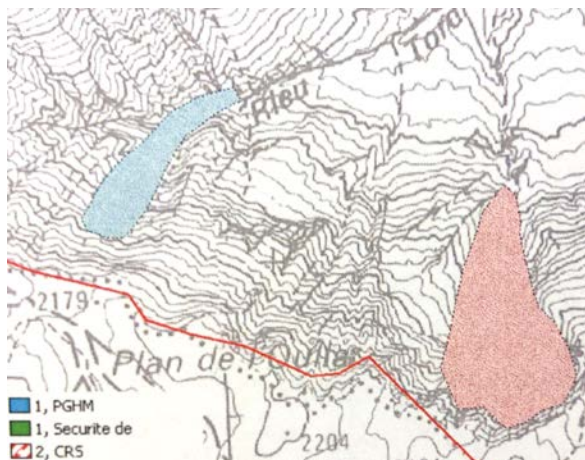


Fig. 2: source of divergent testimony

Figure 2 shows a difference in the location of the same accident in December 2005 from two trusted sources -Safety authorities-.

Most often it is possible to check the conflicting information and validate the right (Fig. 3) (España 2009).

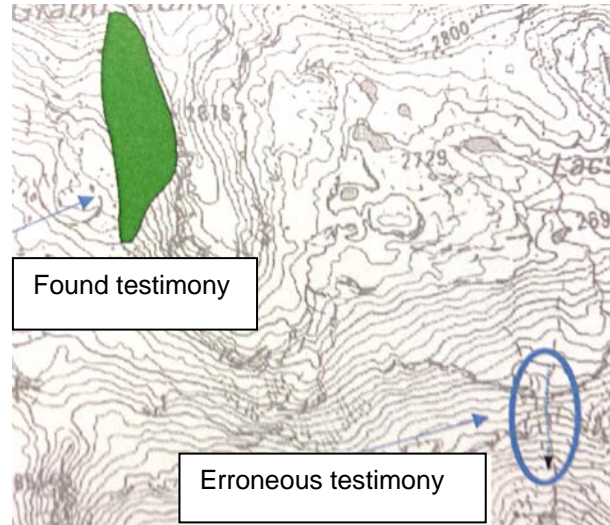


Fig. 3: Validation of an accident location data after control

- Retrieve data during the current winter: We arrive at the same results. But the difference is we found all accidents with fatalities (Bailliard 2010).

3. CONCLUSION AND OUTLOOK

It was investigated whether we could locate the events of the past. The fact sheets contain a variety of geographic components. ANENA thinks that is achievable in part on the last four winters. But it's very difficult in previous winters.

The historical work is long and asked to look for funding. The way we take is to create a GIS in 2014 and will begin recording the events of this winter 2014-2015.

After collecting the data, we believe ultimately disseminate to the public the data on the interface webmapping developed by Irstea and the ministry of Ecology - www.map-avalanches.fr - (Deschâtres 2010).

Before that we will:

- write warnings on the use of data
- write metadata
- develop symbology based on the scale of the mapping

- have a debate about assignation of three quality rating to each accident (Logan, 2012), and index of the data (Espagna 2009).

Soon in spatial analysis, we will work on accidents that occur in the same place, “killer paths” (Logan, 2012). We have selected and localized six sites where at least three accidents occurred with a same practice of the mountain. We will cross avalanche layers to other layers (topography, type of snow, level of risk, distance to ski resort, etc..).

ACKNOWLEDGEMENTS

We would like to acknowledge all persons of French snow safety service and users who provide data on avalanche accidents in Anena

REFERENCES

- Bailliard, A., directed by Rapin, F., 2009: Les accidents d'avalanche de l'hiver 2008/09 : enquête sur un phénomène pas toujours localisé. *Rapport de stage Irstea*.
- Deschâtres, M, E. Parisot, E. Ancelet, E. Maldonado, D. Richard, L. Barral, N. Eckert, 2010, Dissemination of avalanche maps around French territory based on webmapping, Proceedings of the *International Snow Science Workshop*, Squaw Creek' Squaw Valley
- España, J., directed by Rapin, F., Deschâtres, M. and Escande S., 2006, les accidents d'avalanche de l'hiver 2005/06. *Rapport de Master 1 Irstea*
- Greene, E., T. Wiesinger, K. W. Birkeland, C. Coleou, A. Jones, and G. Statham, 2006: Fatal avalanche accidents and forecasted danger levels: Patterns in the United States, Canada, Switzerland and France. Proceedings of the *International Snow Science Workshop*, Telluride, CO, 640-649.
- Jarry, F., 2006, Bilan des accidents d'avalanches 2005-2006, *Neige et avalanches*, 116, 15-21.
- Logan, S., F. Witmer, 2012, Spatial, temporal, and space-time analysis of fatal avalanche accidents in Colorado and the United States, 1991 to 2011, Proceedings of the *International Snow Science Workshop*, Anchorage, Alaska, 479-486
- Scott, D., E. Greene, 2010, A GIS database for avalanche forecasting in Colorado, Proceedings of the *International Snow Science Workshop*, Squaw Creek' Squaw Valley, CA, 502-506