

EFFICIENT AND TRANSPARENT DATA VISUALISATION FOR AVALANCHE FORECASTERS AND OBSERVERS

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ABSTRACT: Improving the daily routine of avalanche forecasting is a continuous process for everyone involved. Handling all available data is certainly one of the primary tasks. More data becomes available through technological and organizational improvements, but the increased amount of information can also make the process of filtering and interpreting more challenging. The goal of xgeo.no is to meet these needs and be an efficient and favorable tool in daily avalanche forecasting.

KEYWORDS: Avalanche forecasting, map centric tool, observations, weather stations, snow model.

1. INTRODUCTION

Xgeo.no is a web-portal used for geohazard forecasting such as flooding, landslides and avalanches. Its aim is to present all available data, such as from automatic measurement stations, field observations, satellite images, webcams and model output, in an easy accessible and meaningful way. Therefore, xgeo.no is a key tool for the Norwegian avalanche forecasting service, enabling the forecaster to get a quick overview of the conditions or access relevant data in detail.

Xgeo.no is a map centric tool for visualizing temporal and spatial data. At its core lies a simple snow model that provides information of the state of the snow pack all over Norway based on interpolated temperature and precipitation observations. All maps can be combined with other geographical information, such as roads and county borders.

In Barfod et al. 2013, we presented xgeo.no with a focus on opportunities and data availability. Since then the focus has shifted to efficiency, and more specifically to reduce the number of mouse-clicks to prevent repetitive strain injuries. The challenge with xgeo.no is to present and set a huge amount of information from different sources and of different type in context and thereby making data interpretation easy and efficient.

Xgeo.no has been continuously improved with regard to forecasters' needs. Different working hab-

its among forecasters require a flexible tool.

This paper will focus on the latest functionality added to xgeo.no; an efficient report viewer and improved graph application. In addition, we will present new data sets that were or will be added in the near future.

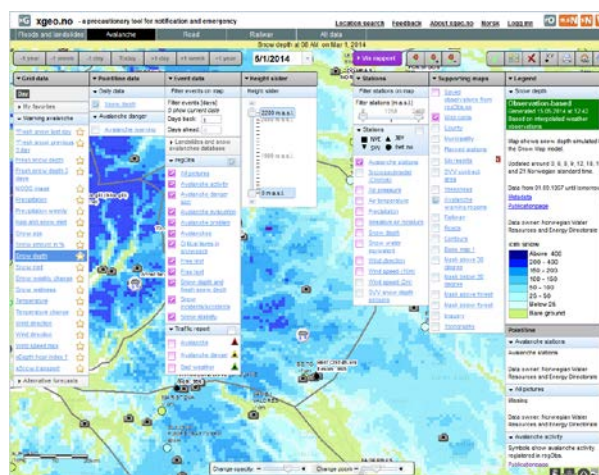


Fig. 1: Showing all data available on xgeo.no.

2. RECENT IMPROVEMENTS

The most time consuming task for the forecaster over the last season was to sort, find and combine relevant data in an efficient way without too many mouse-clicks. Earlier the forecasters needed to open each graph, picture or observation by clicking on each icon. Details of point-observations could not be viewed in context, but only in succession.

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2.1 Report viewer

The new implemented report viewer is the biggest recent improvement. By drawing a polygon over an area of interest, all data is grouped and displayed in the report viewer (Fig. 2-4). In that manner valuable data, such as the latest avalanche observations, traffic alerts, weather data and web camera pictures can be easily compared and evaluated by the forecaster.

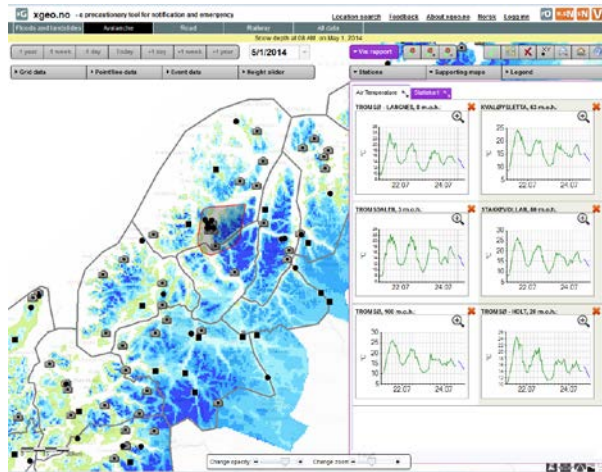


Fig. 2: Comparing temperature variations over the last three days at different weather stations near Tromsø.

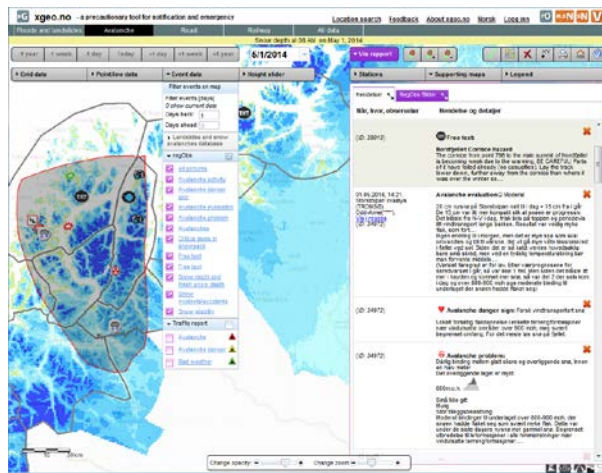


Fig. 3: The report viewer allows the user to select and filter field observations reported through regobs.no (Ekker et al. 2013).

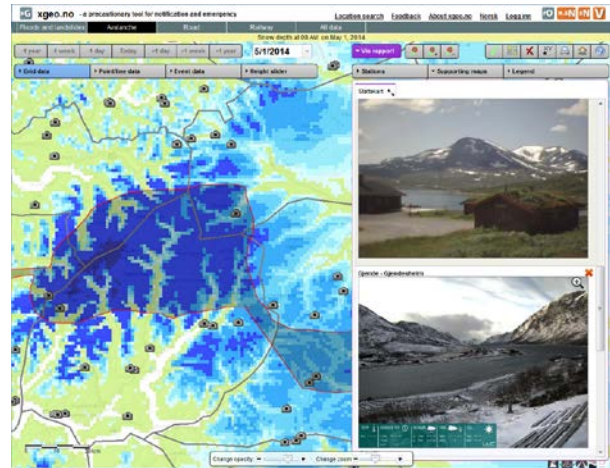


Fig. 4: The web camera roll provides a quick overview over current weather conditions.

2.2 Graph application

Data from automatic gauging and weather stations are accessible via a graph application (Fig. 5). Here, the user has quick access to several predefined graphs most common in the forecaster's daily tasks. These predefined graphs include for example short- and long-term meteograms and wind roses. Stations are marked by icons indicating, which parameters and thereby graph options are available. Further, it is possible to analyze historical data, mix different parameters and stations, or overlay statistics. Users can choose from different time resolution for the full observation period.

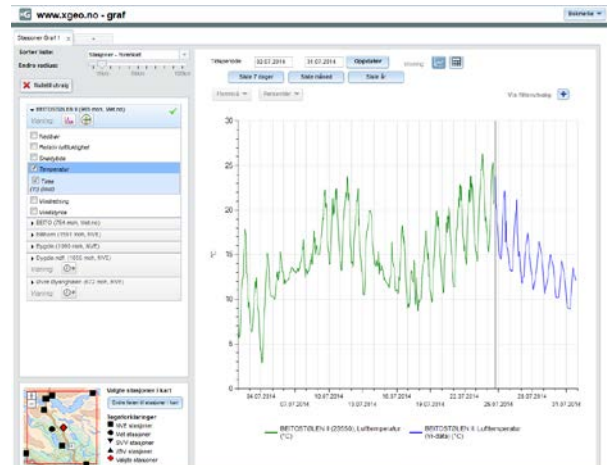


Fig. 5: Viewing hourly temperature data for July at the station Beitostølen II using the graph application.

3. WORK IN PROGRESS

It is essential to evaluate the importance of new data. Does the new data give improvements for the forecaster or does it make it harder to find the most important data?

3.1 *Comparing point observations and gridded data*

Single measurements and observations, e.g. the latest temperature measurement from an AWS, are displayed directly on the maps. The used icons and color codes relate to those used for the gridded data, easing comparison between observation and interpolated/modelled data (Fig. 6). So far, this was only available for snow depth. Prior to the next forecasting season the following parameters will be available: daily new snow amounts and precipitation, maximum and minimum daily temperatures and maximum wind speed.

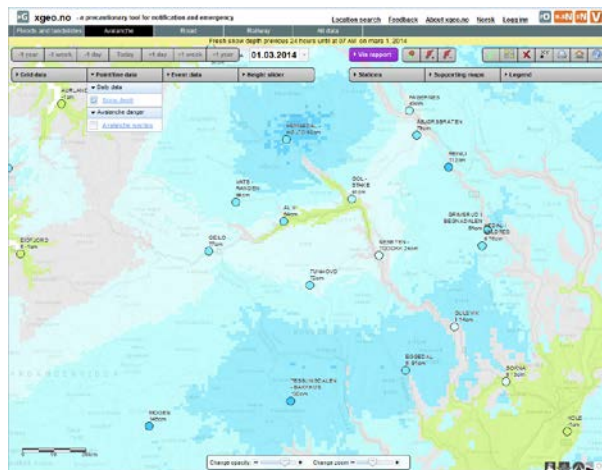


Fig 6. Comparing snow depth observations with the gridded model output as background map around the Hemsedalsfjella Mountains.

3.2 *Hourly grid data*

Until 2014, grid data was only available with a daily resolution. Now also data with hourly resolution is available. However, making these data accessible via xgeo.no makes navigating along the time axis much slower. Several options are discussed: one idea is making an animation function to play through the days every hour or every three hours, another idea is an hour-slider, but also a combination could be possible (Fig. 7).

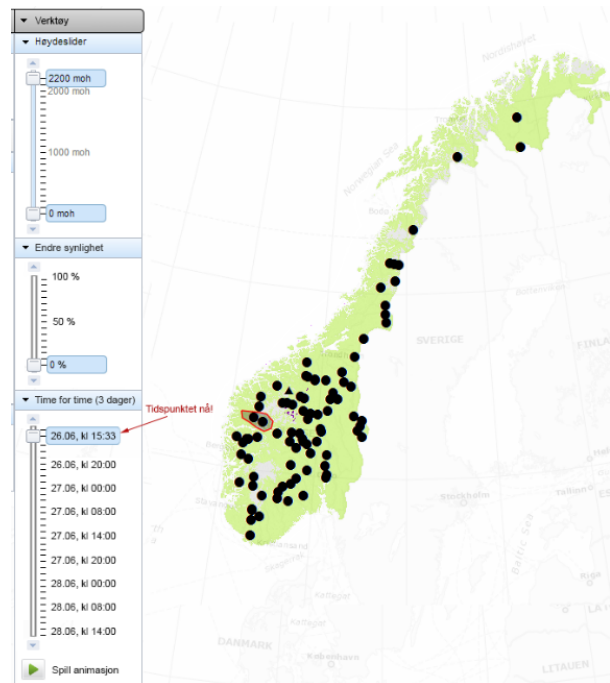


Fig. 7: Presenting hourly-data in xgeo.no requires a slight redesign of the temporal navigation.

3.3 *Road and railroad information*

The Norwegian public road and railroad authorities also use xgeo.no for preparedness towards landslides and avalanches. Adding information about important avalanche paths or potential landslides and their metadata will give benefits to both, the forecasters and the road and railroad authorities. By the start of the upcoming season, some of these data will be available as a prototype.

3.4 *The need for a login function*

As most of the tools developed at NVE, xgeo.no follows an open data policy. Thus, a login has not been required so far. However, sometimes forecasters wish to save the application in a current state or with customized settings including frequently used stations or searches. For this task, a login function is required. On the other hand, this may complicate the tool and in such not necessarily represent an advantage.

4. CONCLUSION

The web portal xgeo.no is a key tool for the Norwegian avalanche forecasting service and other users that deal with geohazards in Norway. It allows access to a wealth of data. To ensure efficient use of xgeo.no a well-designed user

interface providing easy data comparison is necessary. An improved graph application and a newly implemented report viewer have improved the efficiency enormously. More data will be added to xgeo.no in the near future, which also require thorough design to make it beneficial to the main user groups.

5. REFERENCES

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