SMARTPHONES AS SUPPORT FOR OUT-OF-BOUNDS SKIER DECISIONS

A pilot study of how information about terrain and avalanche danger in mobile application affects behaviour in off-piste terrain

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OUTLINE

1. Introduction
2. Method
3. Results
4. Conclusions
5. Discussion

1. INTRODUCTION

Background

- **How should avalanche safety information be best communicated to tomorrow's off-piste skiers?**

- **Initial survey in 2013 with 53 backcountry skiers about what they bring on backcountry ski tours:**

  Map = 47 %
  Compass = 58 %
  Food = 74 %
  Mobile Phone = 98 %

Background

- As part of the National Avalanche Program by the Swedish Environmental Protection Agency's Mountain Safety Council

- Explore the possibilities of *one* future-oriented communication platform for *both* Avalanche Danger and Avalanche Terrain (ATES)

Problem

- **Many authors have identified out-of-bounds skiers as a category to focus on as they grow in numbers and differ from traditional backcountry skiers**

- **Martensson et al. (2013) showed that Swedish skiers despite risk insight, experience, previous incidents, training and equipment still were willing to take risks to ski off-piste**

Problem

- It is obvious that avalanche information has been successful in spreading knowledge about of avalanches

- Few people who get caught in an avalanche are unaware of the danger, even if they do not expect that the accident will hit them there and then

Problem

- What happens if we accept human factors and seek to develop information systems, which are robust and lead to safer behaviours, despite them?

- What happens if we see biases and errors as not something negative, but rather as neutral properties of off-piste skiing?

Research Question

- Our hypothesis was that skiers would be more likely to follow recommendations of where and when they can ski, rather than following general warnings

- Our research question was formulated as:
  How can we effectively communicate information about avalanche danger and avalanche terrain so that it is perceived as an opportunity of good skiing instead of a warning of avalanches?
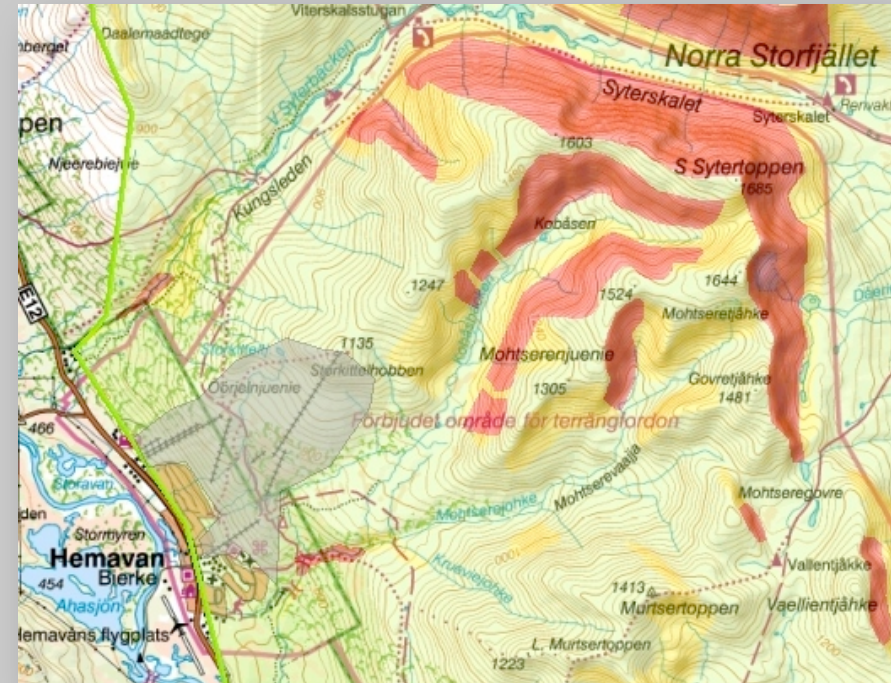
2. METHOD

Test Area

- **Popular off-piste area**

- **Access by one top ski-lift**

- **All terrain classified as Avalanche Terrain Exposure Scale (ATES)**

Participants

- **20 skiers**

- **Permanent residents or seasonal workers**

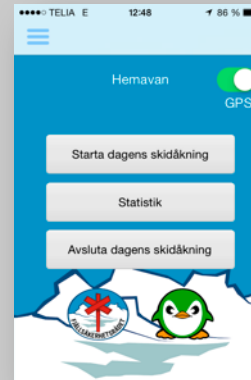- **iPhone owners**

- **All movements were logged**

The Mobile App

- **Zoomable high resolution map**

- **Questions during the day**

- **Avalanche danger downloaded every morning**
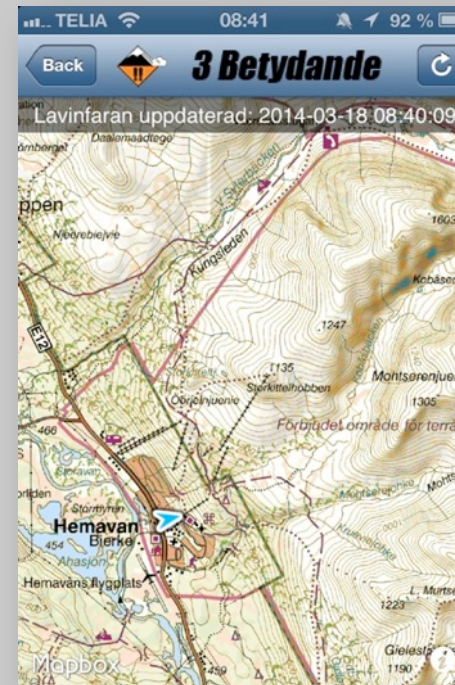
- **Data uploaded every evening**

- **Autonomous during the day**

Experiment design

- *Initial survey*
  about experience, knowledge, preferences, and more

- *Four week control phase*
  with only a basic map service and the current avalanche danger rating

Experiment design

- *Four week effect phase*
  with danger and ATES ratings
  combined to visual Avaluator
  colours directly on the map:
  Green = Normal Caution
  Yellow = Extra Caution
  Red = Not Recommended

+ **=**

ATES Terrain:
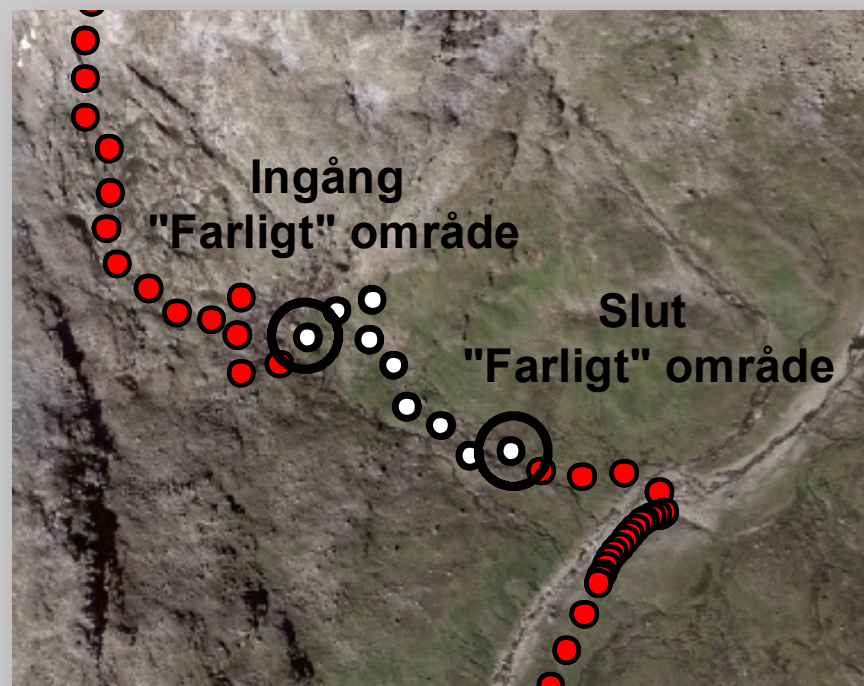- Simple
- Challenging
- Complex
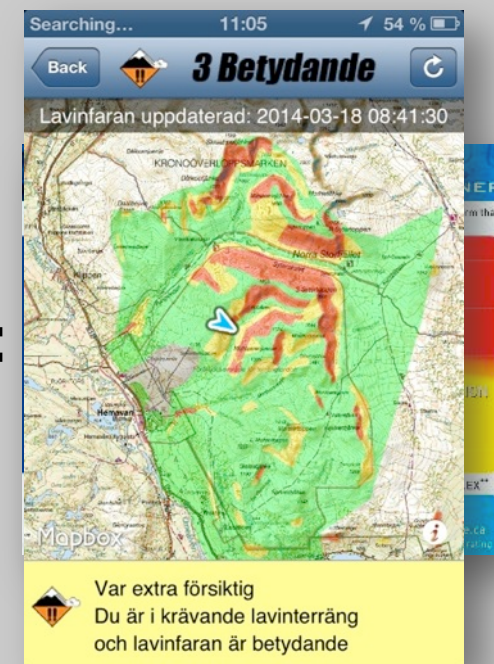
Experiment design

- Breakdown into individual runs

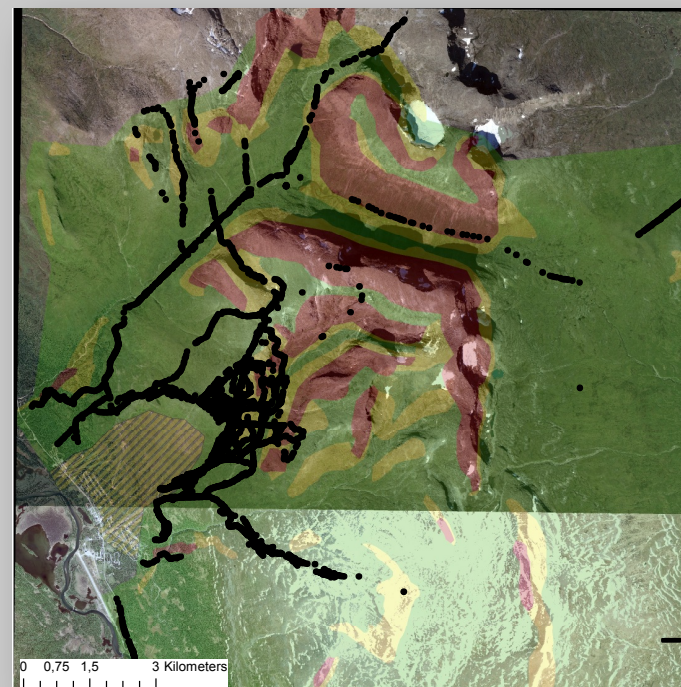- Quantification of risk exposure in minutes by measurement of time spent in different conditions

3. RESULTS

Control Phase

- Runs overall concentrated to "Simple Terrain" and/or "Normal Condition"
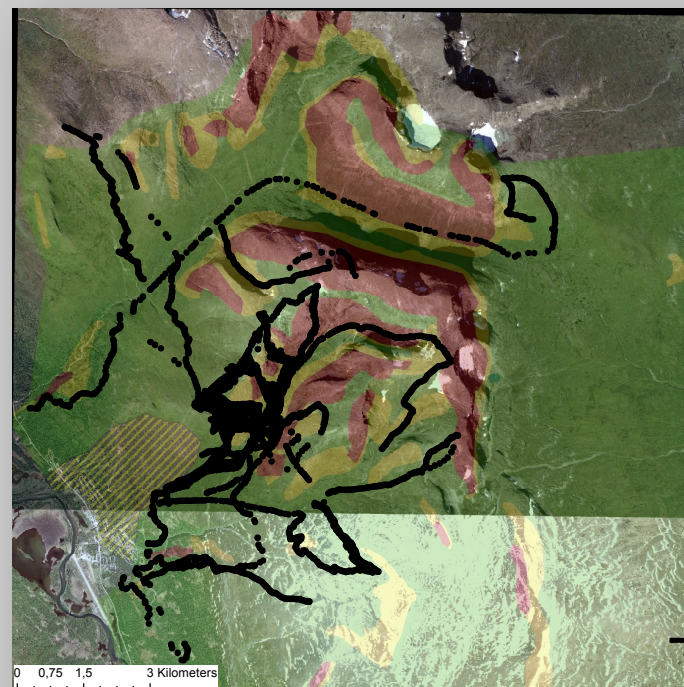
- A few runs in "Complex Terrain"

Effect Phase

- **Generally more aggressive skiing**

- **More runs skied in "Challenging Terrain"**

- **Several runs in "Complex Terrain"**

Example Run

1. Skis through "Extra Caution"

2. Realises that he/she is about to enter "Not Recommended"

3. Traverses into "Normal Caution"

4. CONCLUSIONS

Research Question

How can we effectively communicate information about avalanche danger and avalanche terrain so that it is *perceived as an opportunity of good skiing* instead of a warning for avalanches?

Preliminary Answers

- Mobile apps are probably the best tools to use

- A combination of avalanche danger and terrain is probably a better appearance than presenting them separately

- To communicate where you can ski is probably better than saying where you can't

- It is probably better with real-time, geolocated information, as it is likely that skiers make their decisions on-the-go
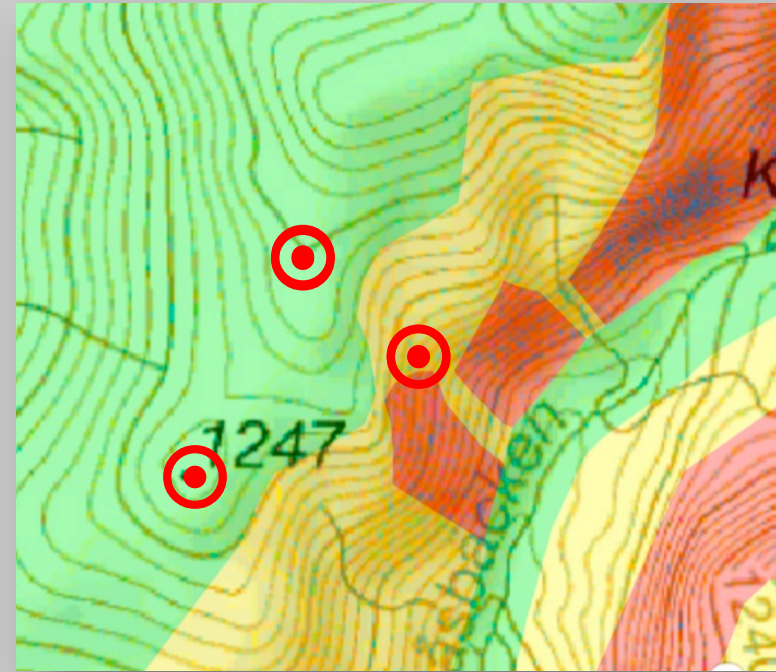
Preliminary Answers

- We showed it's possible to develop a mobile app that combines avalanche danger and avalanche terrain in an attractive and easy to use map service

- We revealed a huge potential in collecting data on off-piste skier's behaviour and decisions in real time

**Helmet Cam Synchronized with...** **...the Avaluator Map**

5. DISCUSSION

- **Just a pilot study, but with promising early results**

- **Much more work to be done. Level 2 experiments and development of the app winter 2016/2017 in Sweden**

- **Development of tools for spatial statistics**

- **Everyone is more than welcome to follow up and develop from our study**

- **Final Question: Have we opened "Pandora's App"?**
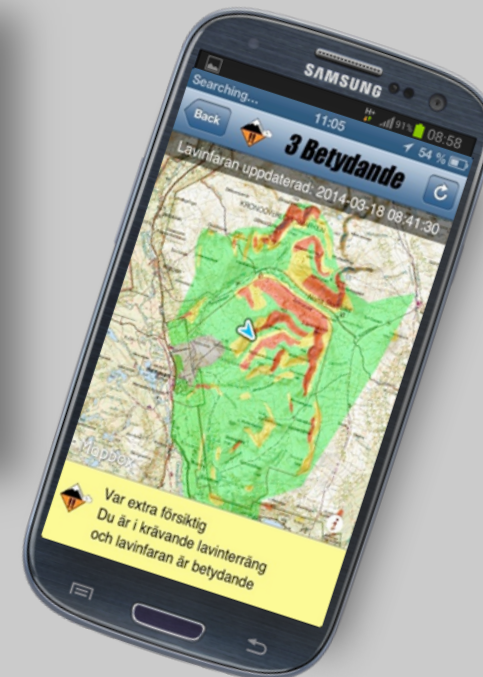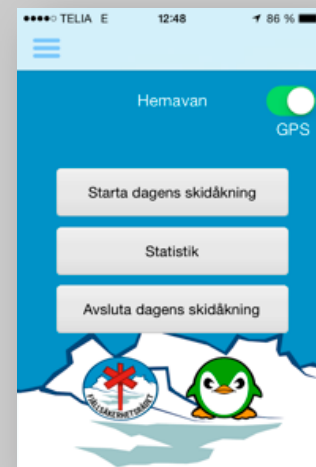
THANKS FOR YOUR ATTENTION

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