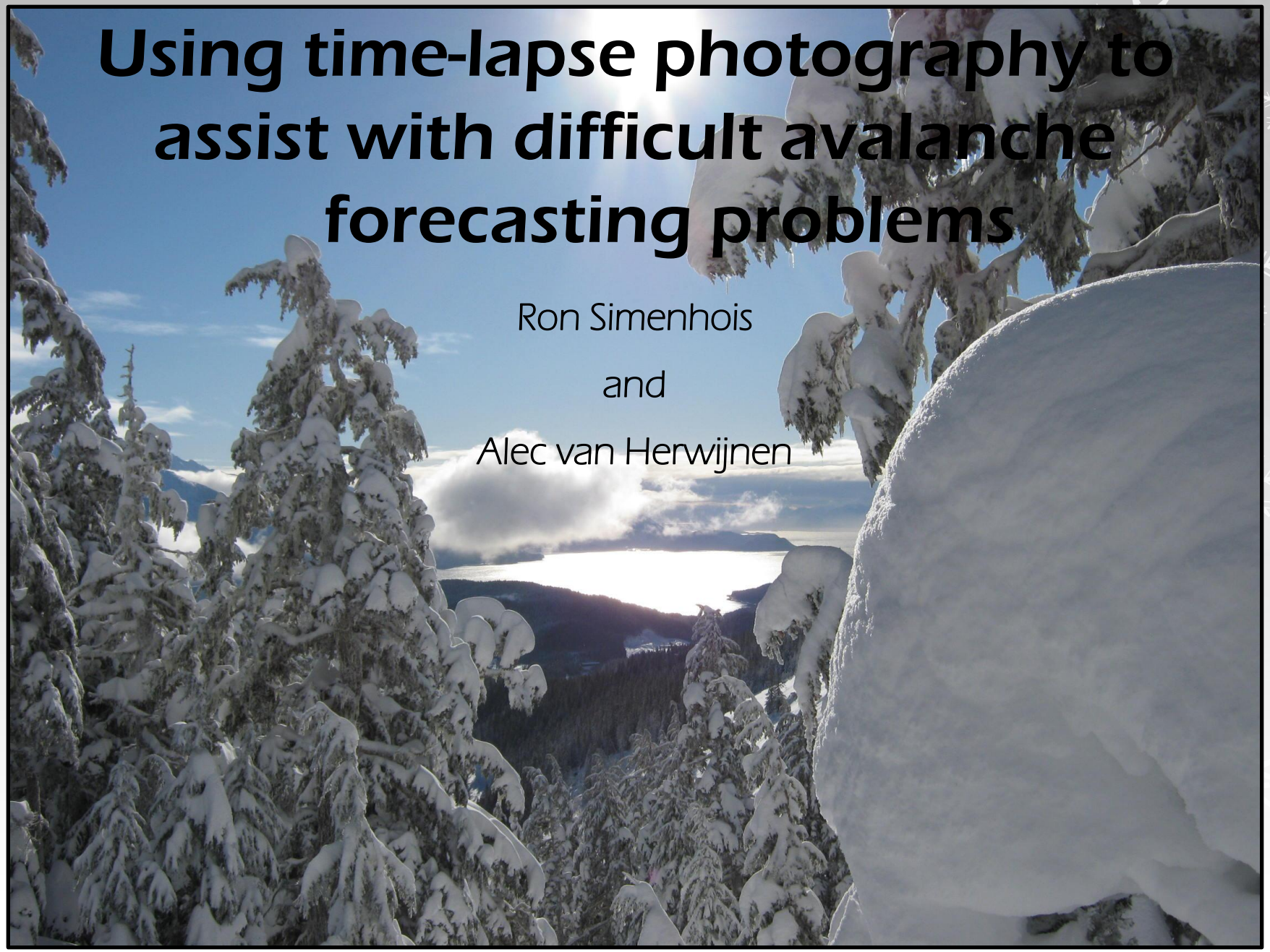


# Using time-lapse photography to assist with difficult avalanche forecasting problems

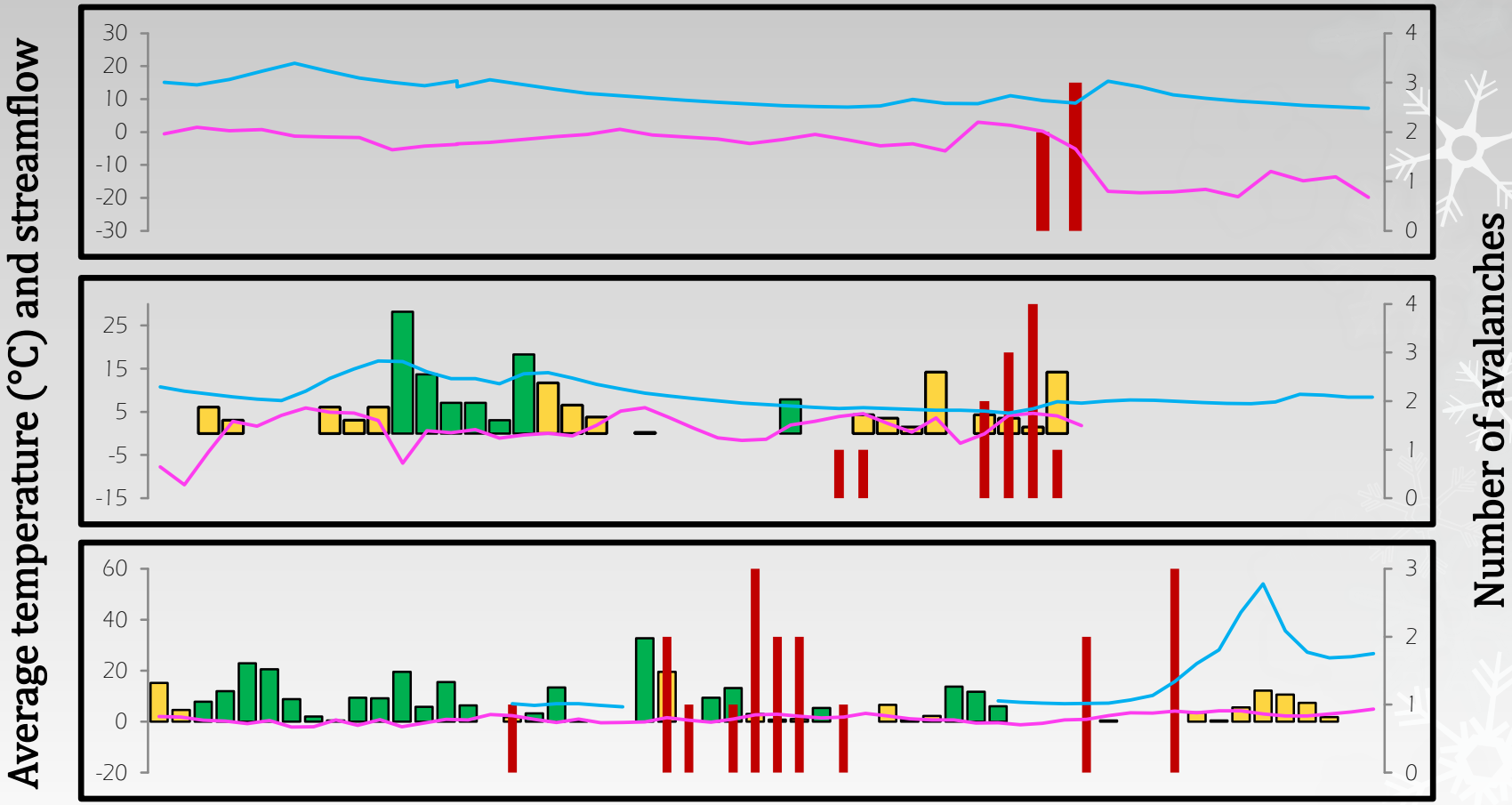
Ron Simenhois

and

Alec van Herwijnen

# Background:

# Forecasting considerations:



# The challenges of researching natural avalanches:

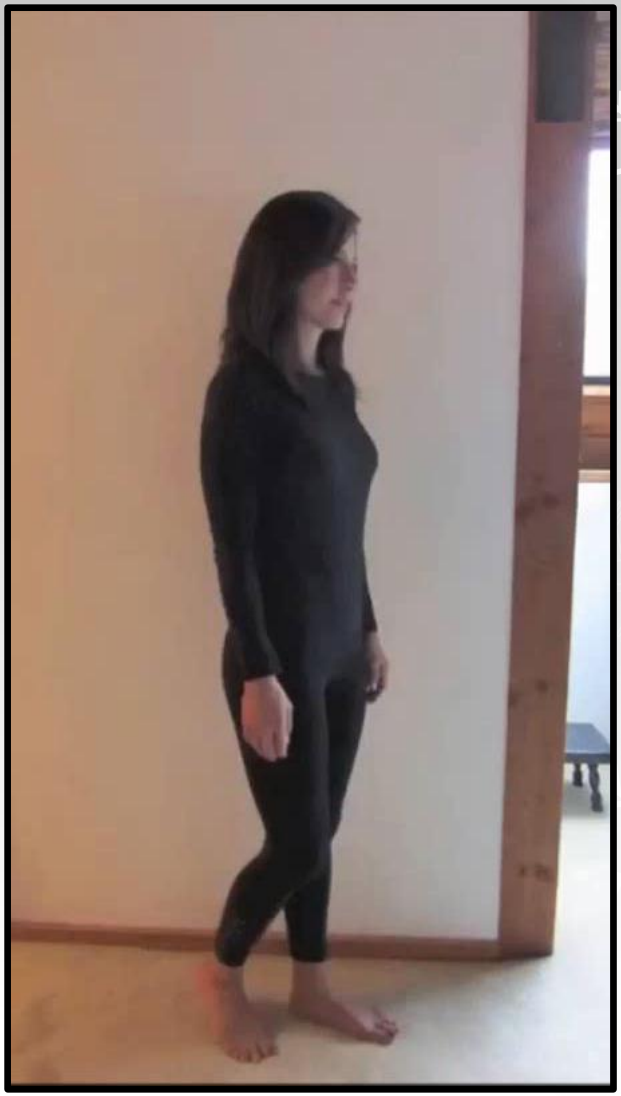
- Personal observations
  - Exact timing
  - Limited remote locations observations
  - Bias toward large avalanches

# In this presentation:

- What is time-lapse photography
- How can we use it and what it takes
- Examples:
  - Glide avalanches – measuring glide rate and timing
  - Wet slide avalanches – timing
  - Cornice fall – measuring cornice deformation

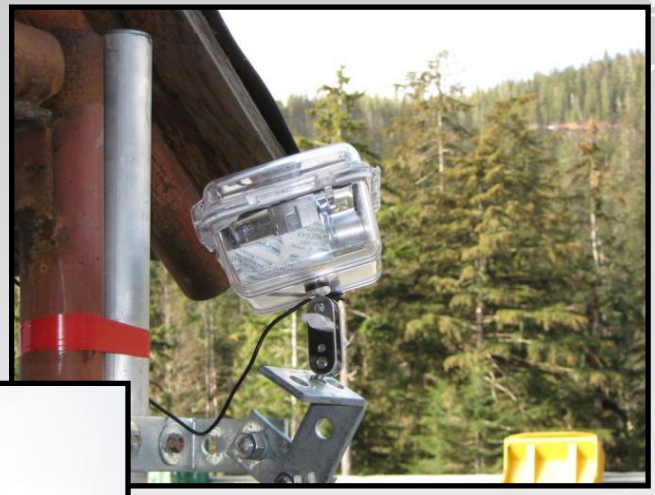
# What is time-lapse photography?

- Time-lapse photography *is a technique whereby the frequency at which film frames are captured (the frame rate) is much lower than that used to view the sequence. When played at normal speed, time appears to be moving faster and thus lapsing.*



# Equipment:

- Time-lapse camera
- a mount

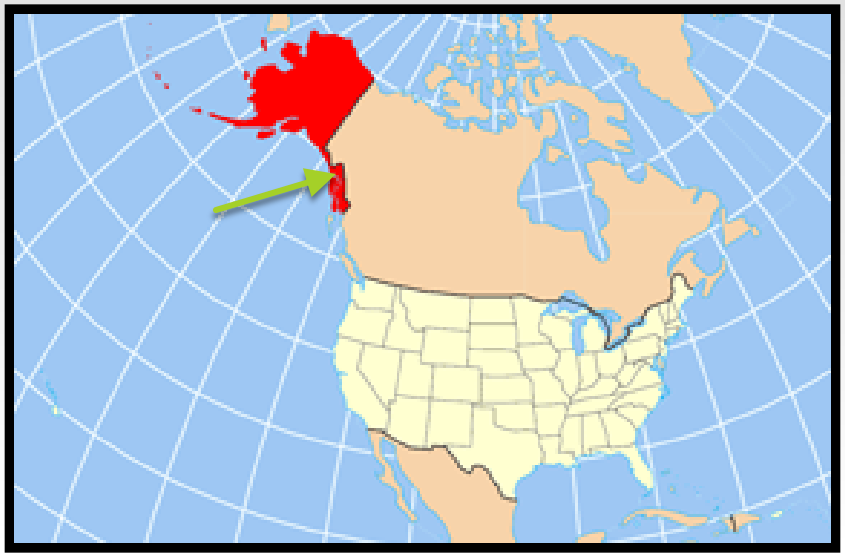


# Examples:

- *Measure and monitor glide crack expansion*
- *High time resolution correlations of avalanche occurrences and meteorological data*
- *Measure an increase in cornice deformation before two cornice fall events*

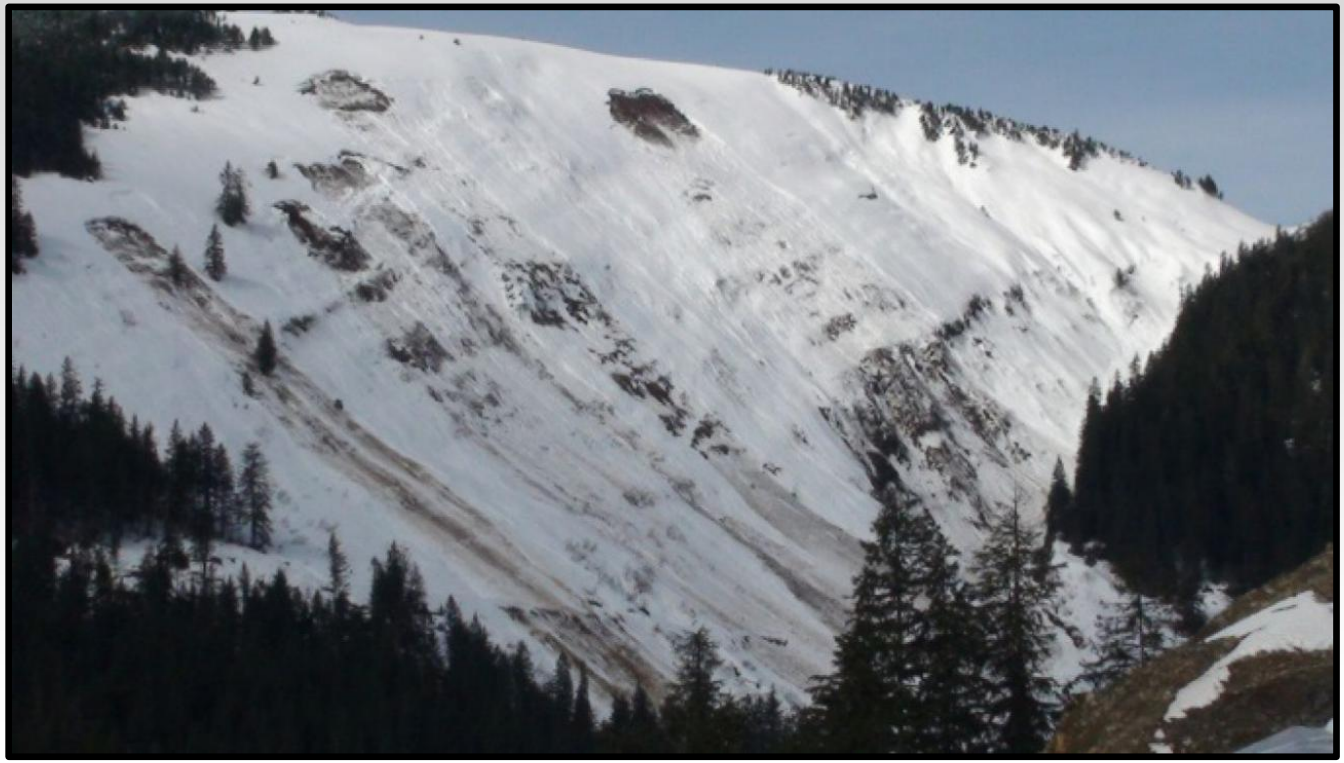
# Glide rate measurements:

- Southeastern Alaska
- Coastal climate
- 2 slopes affecting infrastructures
- Well-documented glide avalanche activity



# Glide avalanche test site

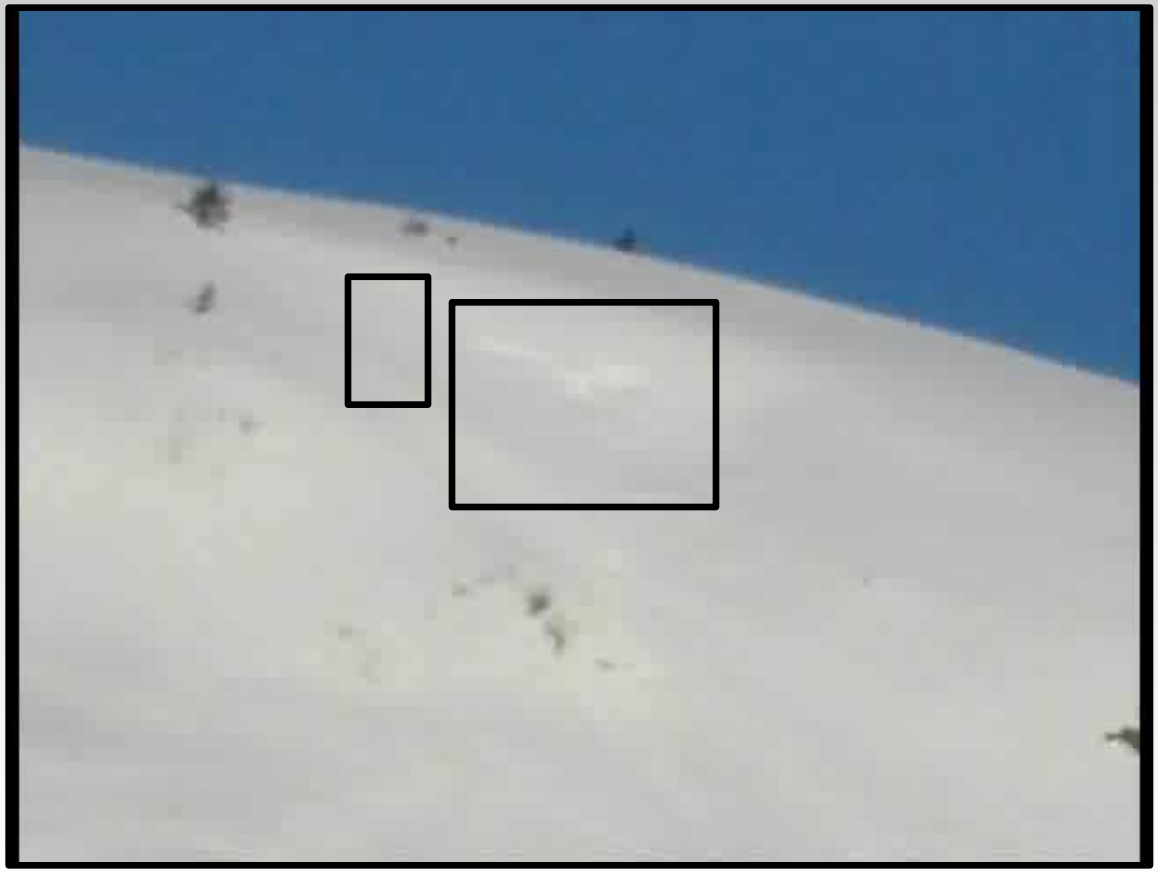
- East slopes, 300 to 800 m a.s.l.
- Start zones between 45° and 55°
- Ground cover: alders and rock slabs



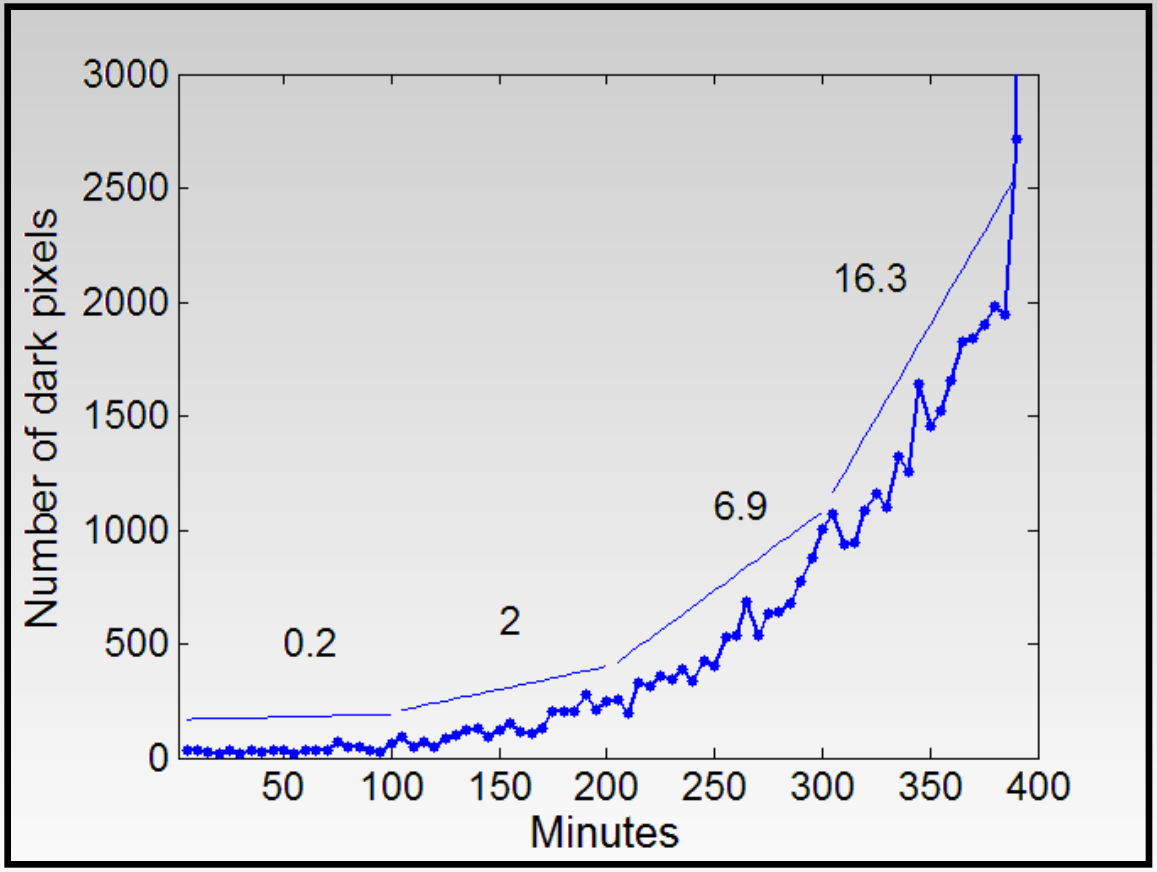
# Glide rate: dark pixel count

- Counting dark pixels
- Increases in number of dark pixels → glide crack opening
- Adaptive pixel intensity threshold required

# Glide rate measurements:

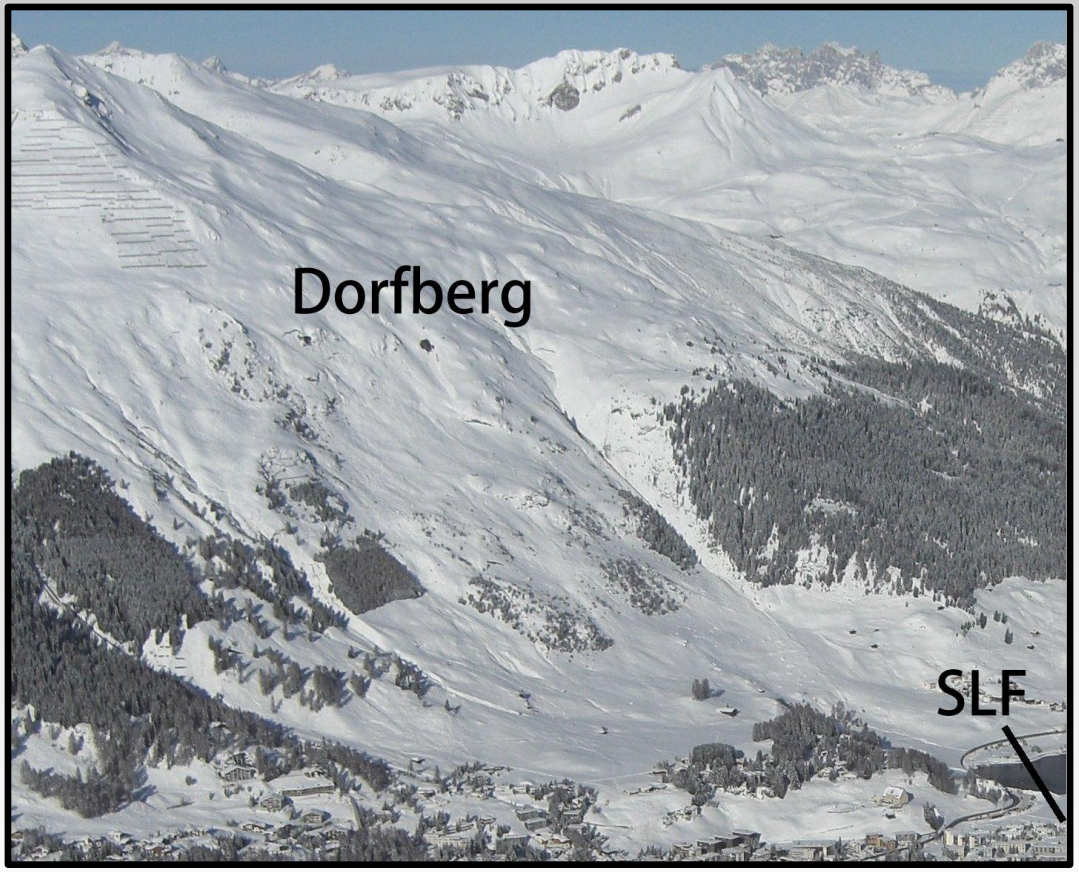


# Glide rate measurements:



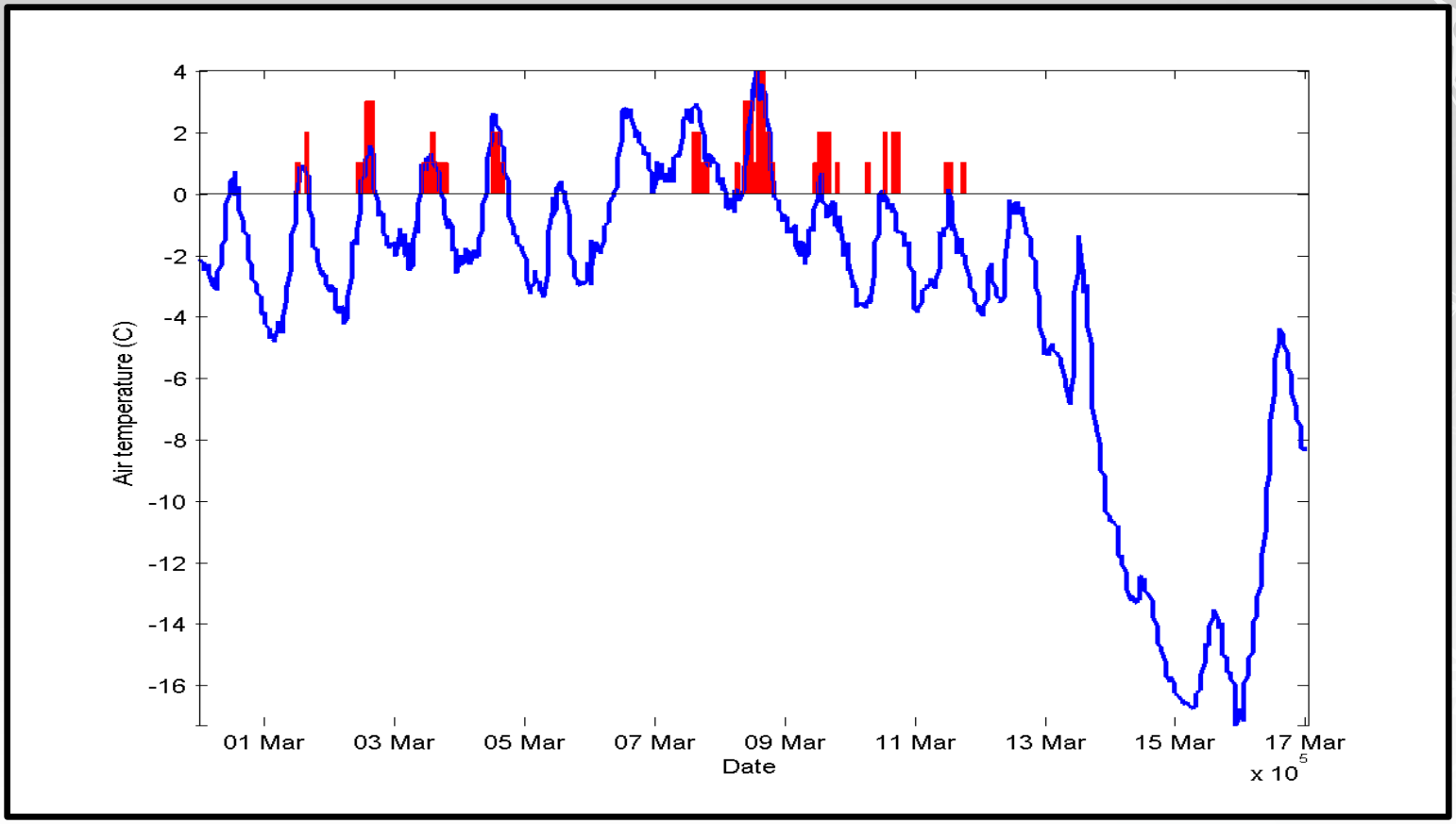
# Wet Slab avalanches and Cornice Falls:

Correlating exact time of avalanche occurrences with weather observations:

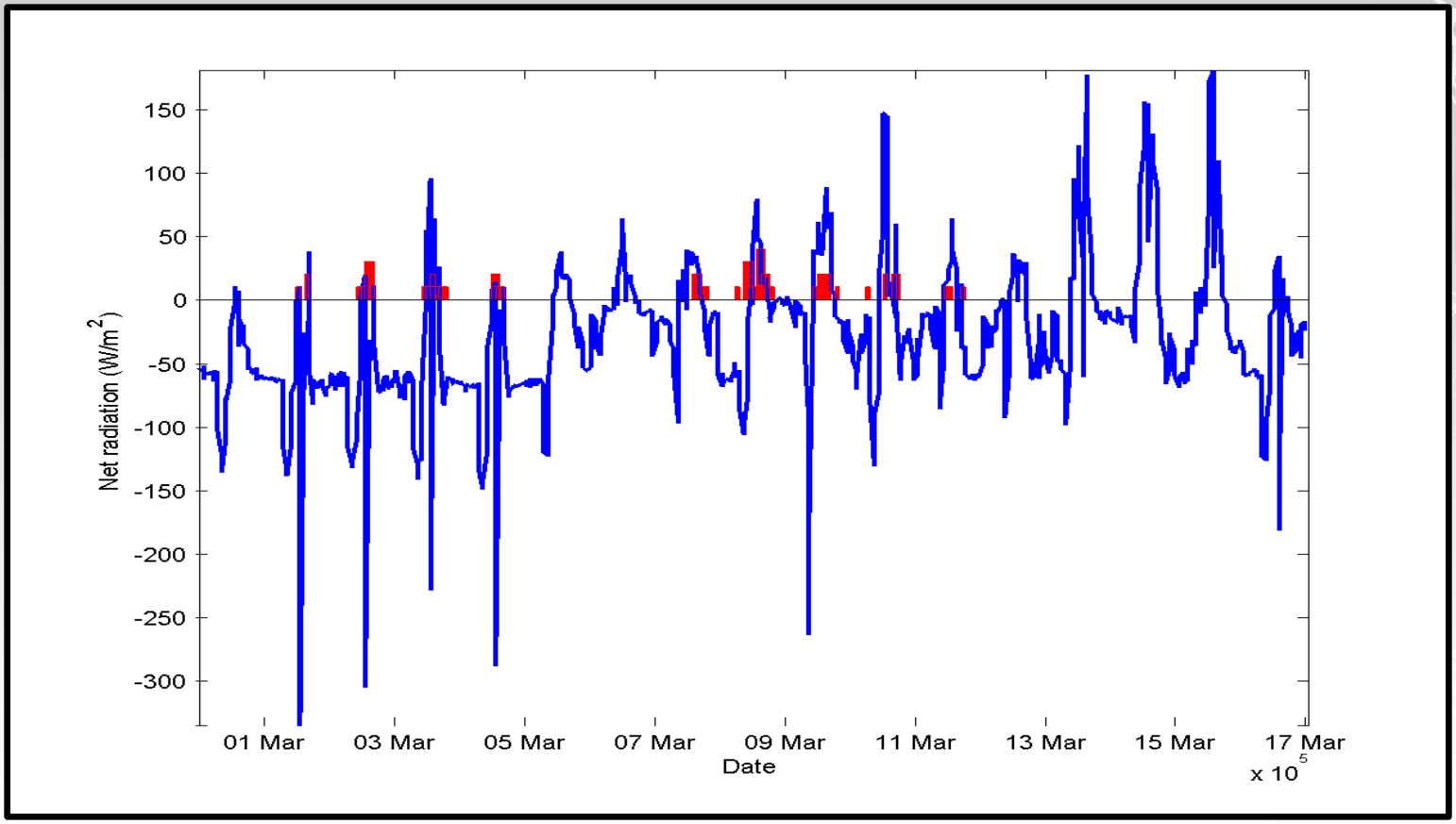


Correlating exact time of avalanche occurrences with weather observations:

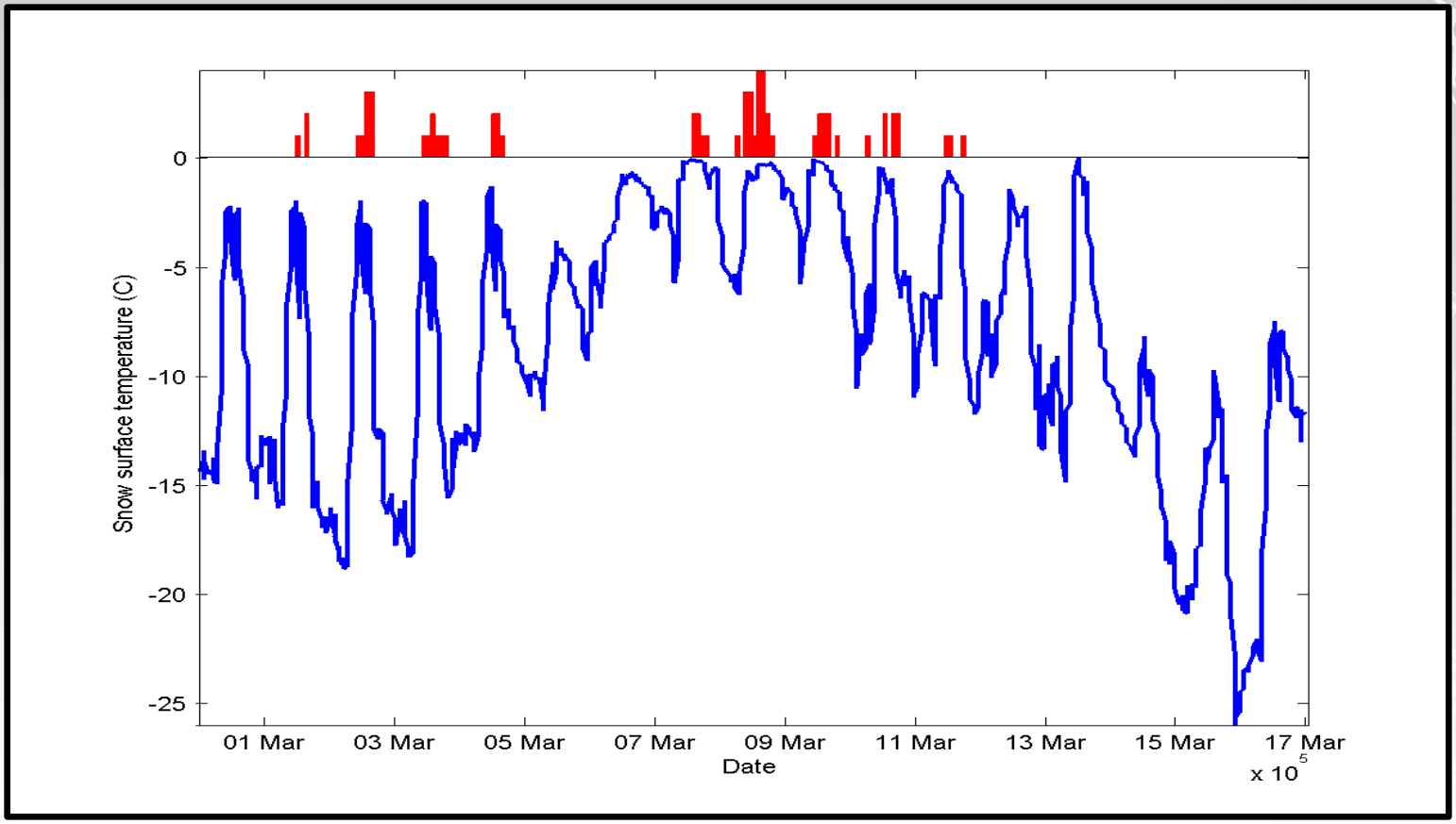
# Correlating exact time of avalanche occurrences with weather observations (Air temperature):



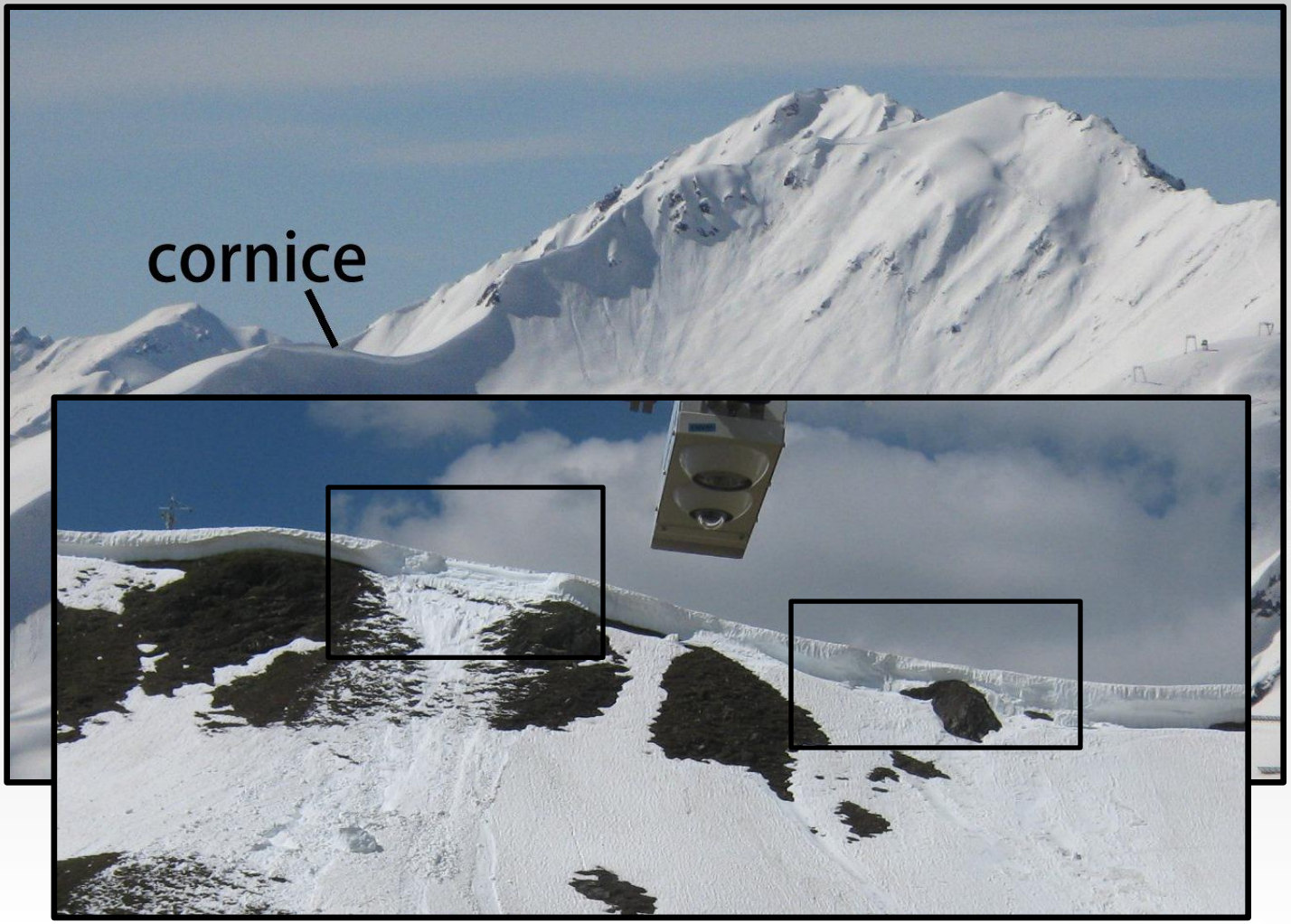
# Correlating exact time of avalanche occurrences with weather observations (Net radiation):



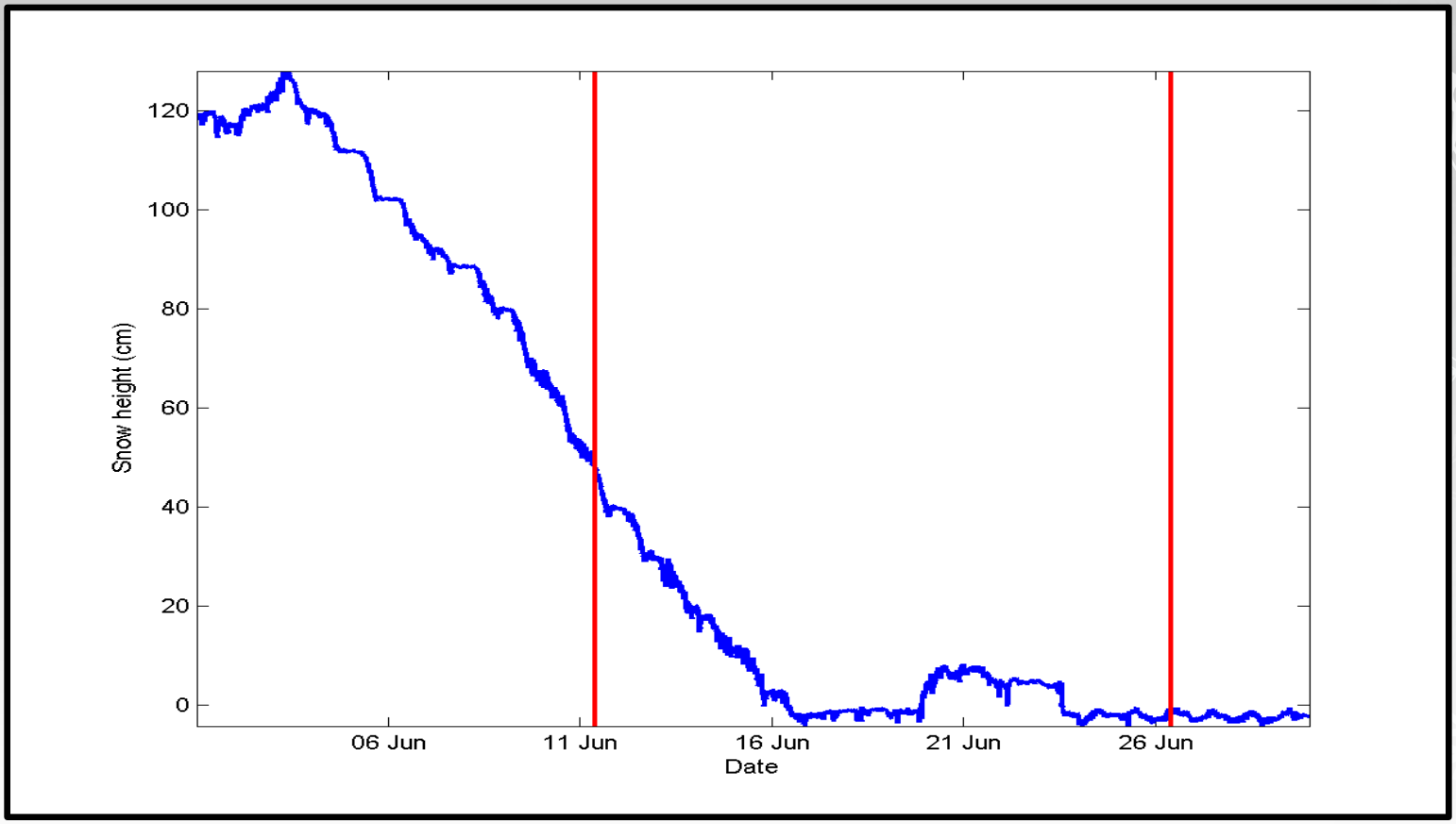
# Correlating exact time of avalanche occurrences with weather observations (Snow surface temperature):



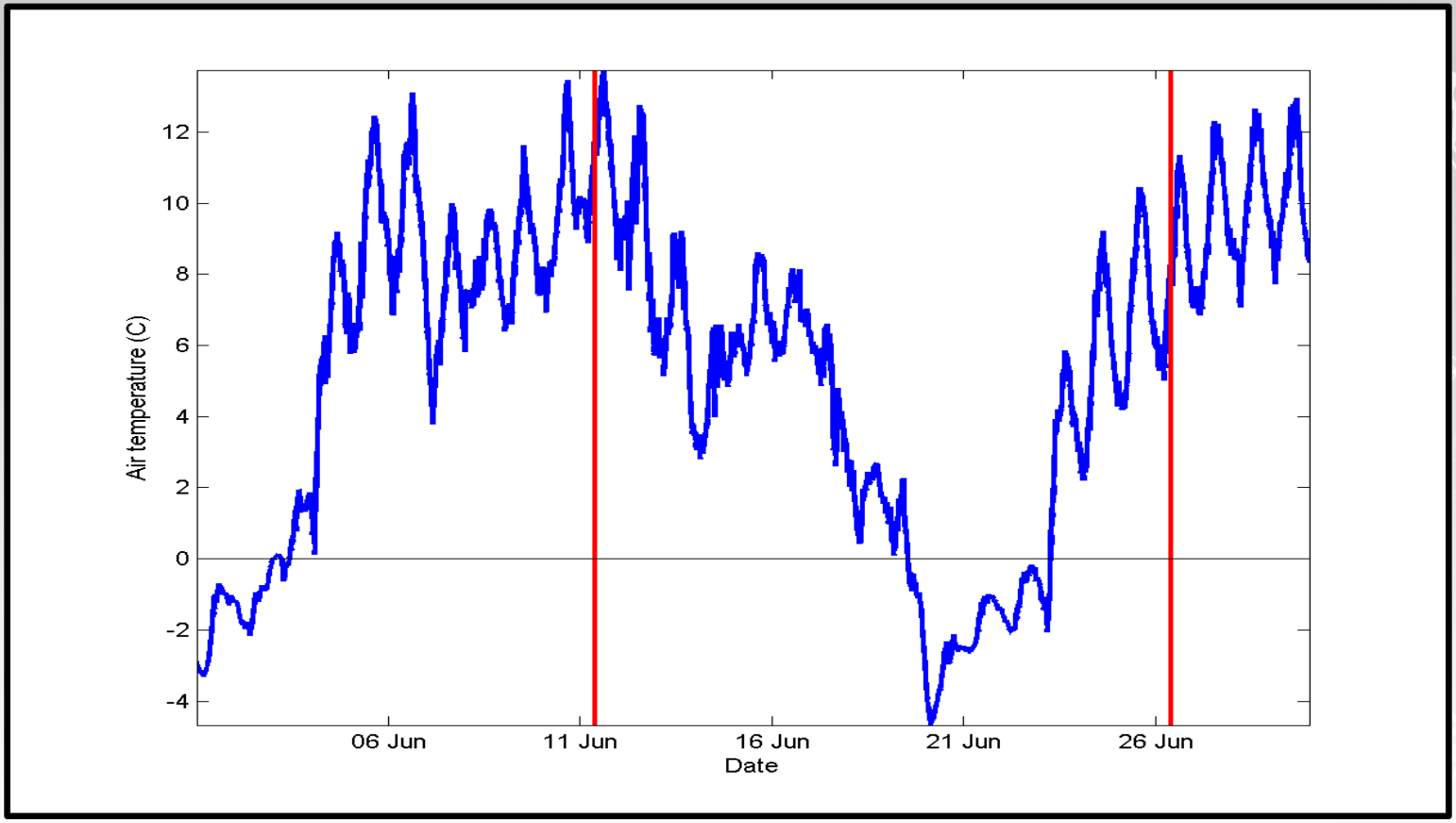
# Monitoring Cornice Fall:



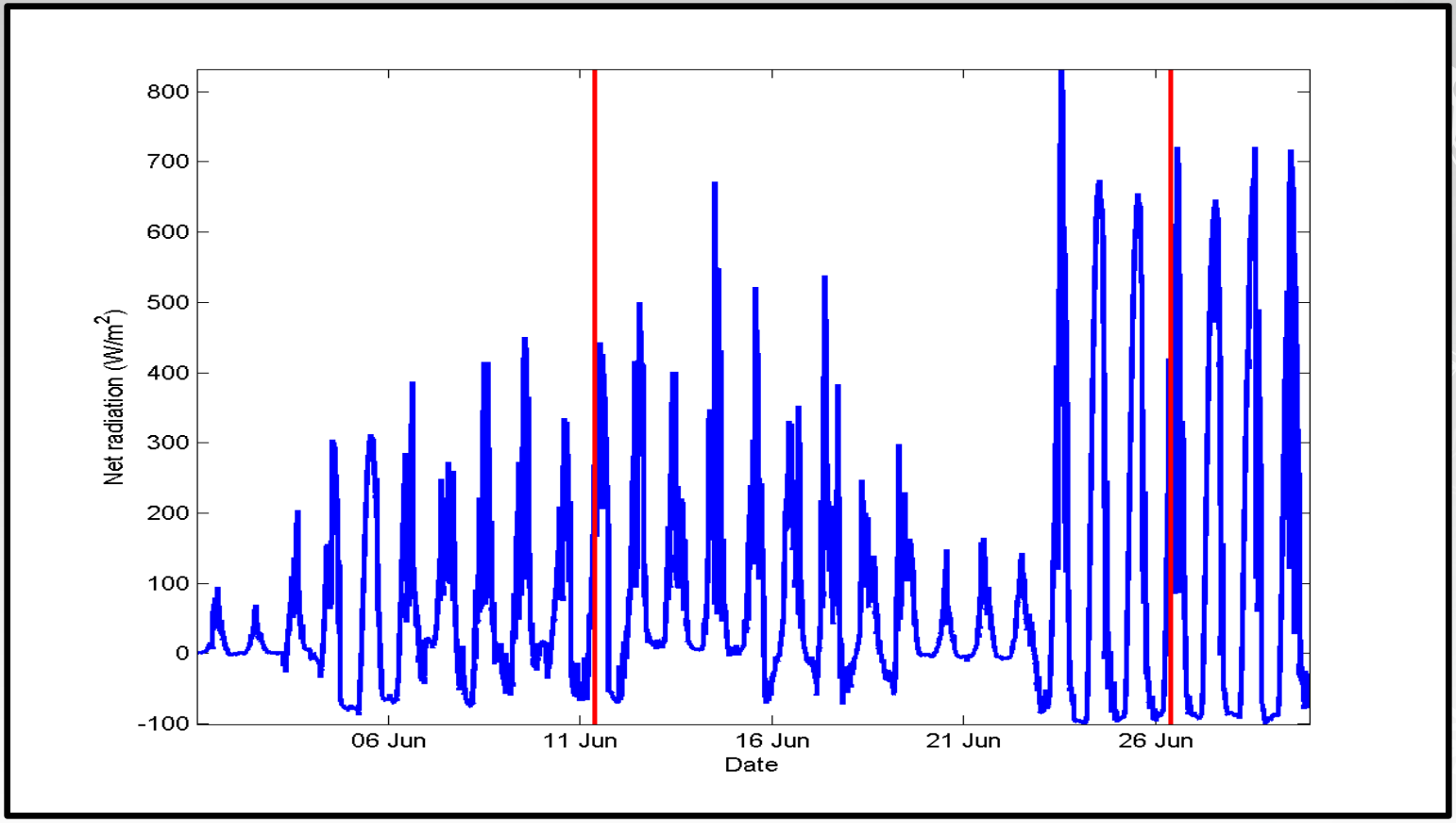
# Monitoring Cornice Fall (Snow depth):



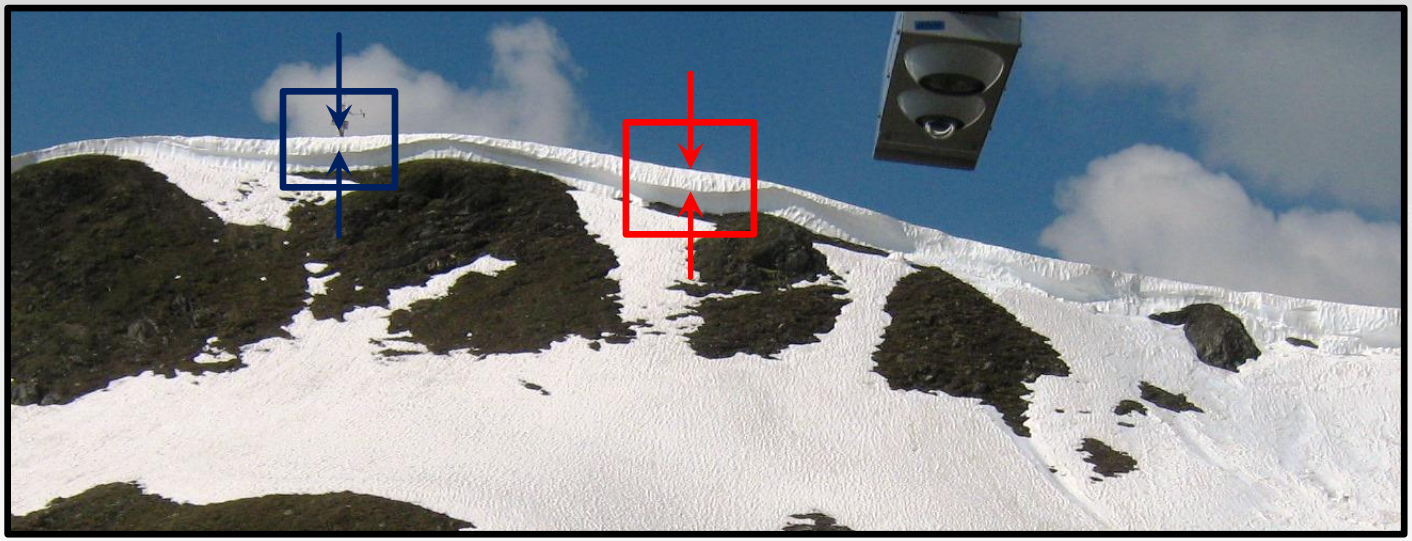
# Monitoring Cornice Fall (Air temperature):



# Monitoring Cornice Fall (net radiation):



# Cornice deformation measurements:



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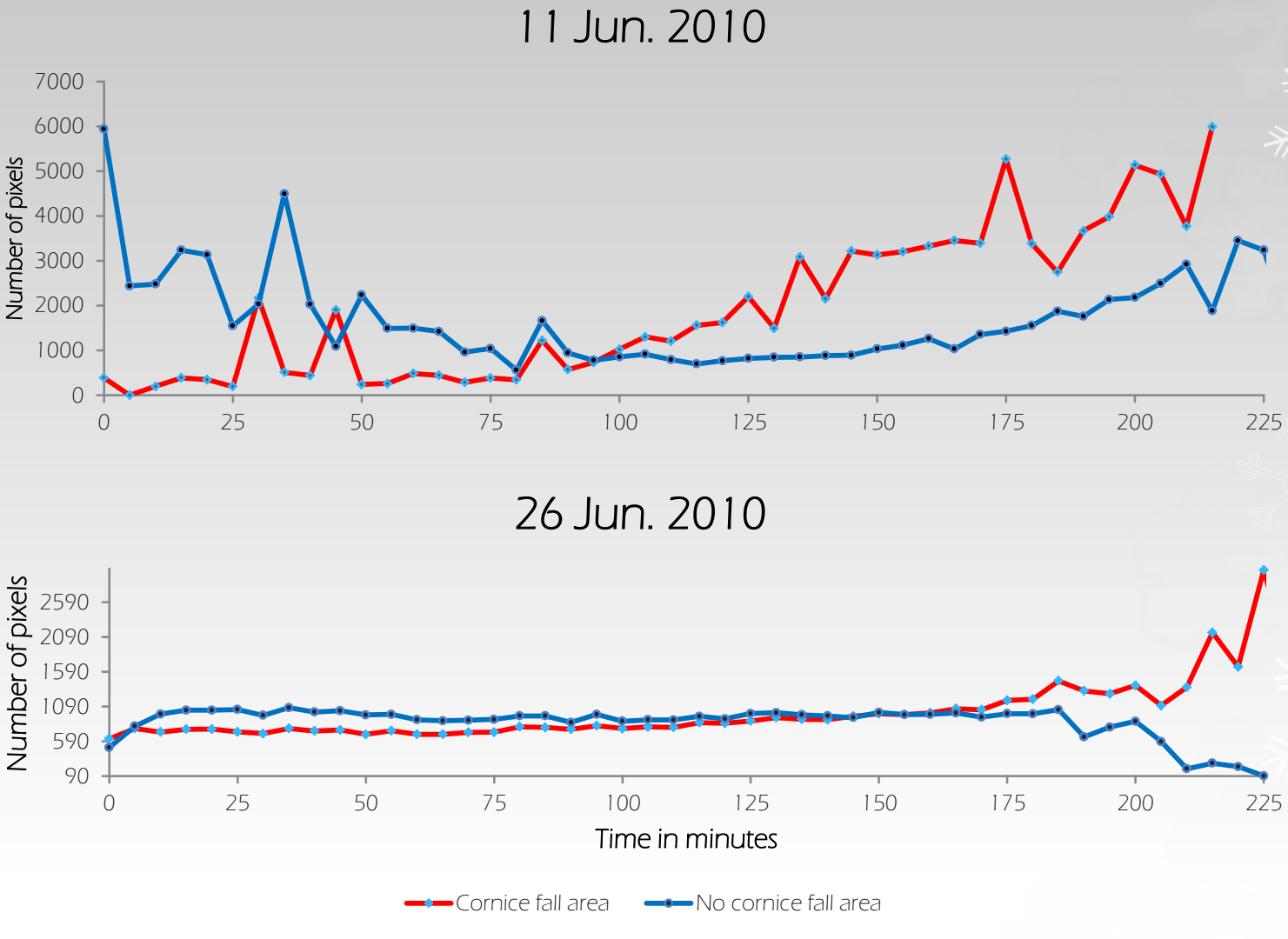
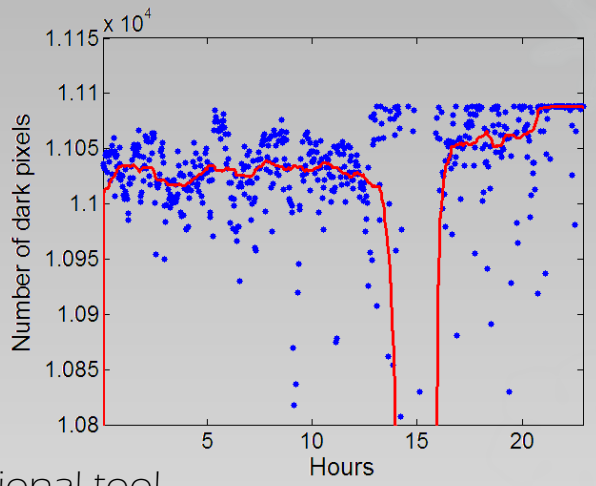


# Conclusions:




- Promising results and benefits
  - Safe
  - Cheap
  - Powerful observational and educational tool
  - Nonintrusive
  - Can be used to monitor several avalanche paths simultaneously
- Can be used to help with operational forecasting

- But there are a few issues still left to tackle:
  - New technology – need to develop everything
  - Depend on visibility

# *Thanks!*

- American Avalanche Association
- Nicole Berthod
- Christoph Mitterer
- Coeur Alaska
- My wife Jenny