GLACIARCH: APPLYING GLACIOLOGICAL METHODS FOR GAUGING ARCHAEOLOGICAL POTENTIAL USING GIS

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GLACIAL ARCHAEOLOGY

- Warming climate leading to an increase in the discovery of artifacts

- The archaeology of frozen environments – permafrost, glaciers, ice/snow patches

- Frozen environments generate some the of most complete archaeological remains to date

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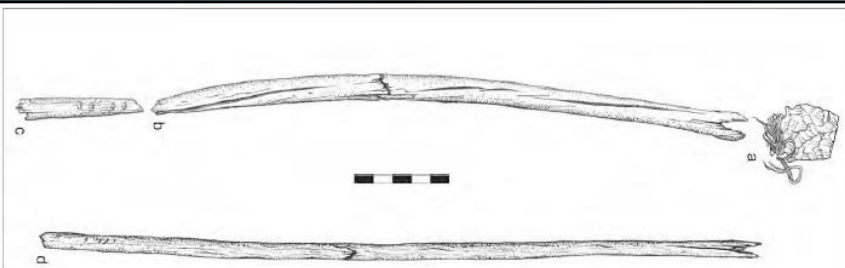
PROBLEMATIC

- Until recently, most glacial archaeological discoveries have been accidental

- High risk of losing invaluable objects due to decomposition of organic materials (mummies, wood, leather and textiles)

- Urgency to locate sites of archaeological potential before the ice melts away completely

- Need for predictive methodologies in glacial archaeological research

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KhTe-2   2009

2010

2011

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PROJECT INTRODUCTION

▶ SNF project "Modeling archaeological potential of high altitude passes and trails in the Pennine Alps using GIS tools"

▶ Use a multidisciplinary approach to **protect and conserve cultural heritage**

▶ Partners
  ▷ **Archaeology**: Philippe Curdy and François Wiblé, Canton of Valais
  ▷ **History**: Muriel Eschmann-Richon and Pierre Dubuis, University of Lausanne
  ▷ **Geography**: Stephanie Rogers, Claude Collet, Reynald Delaloye, Ralph Lugon, Mauro Fischer

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STUDY AREA
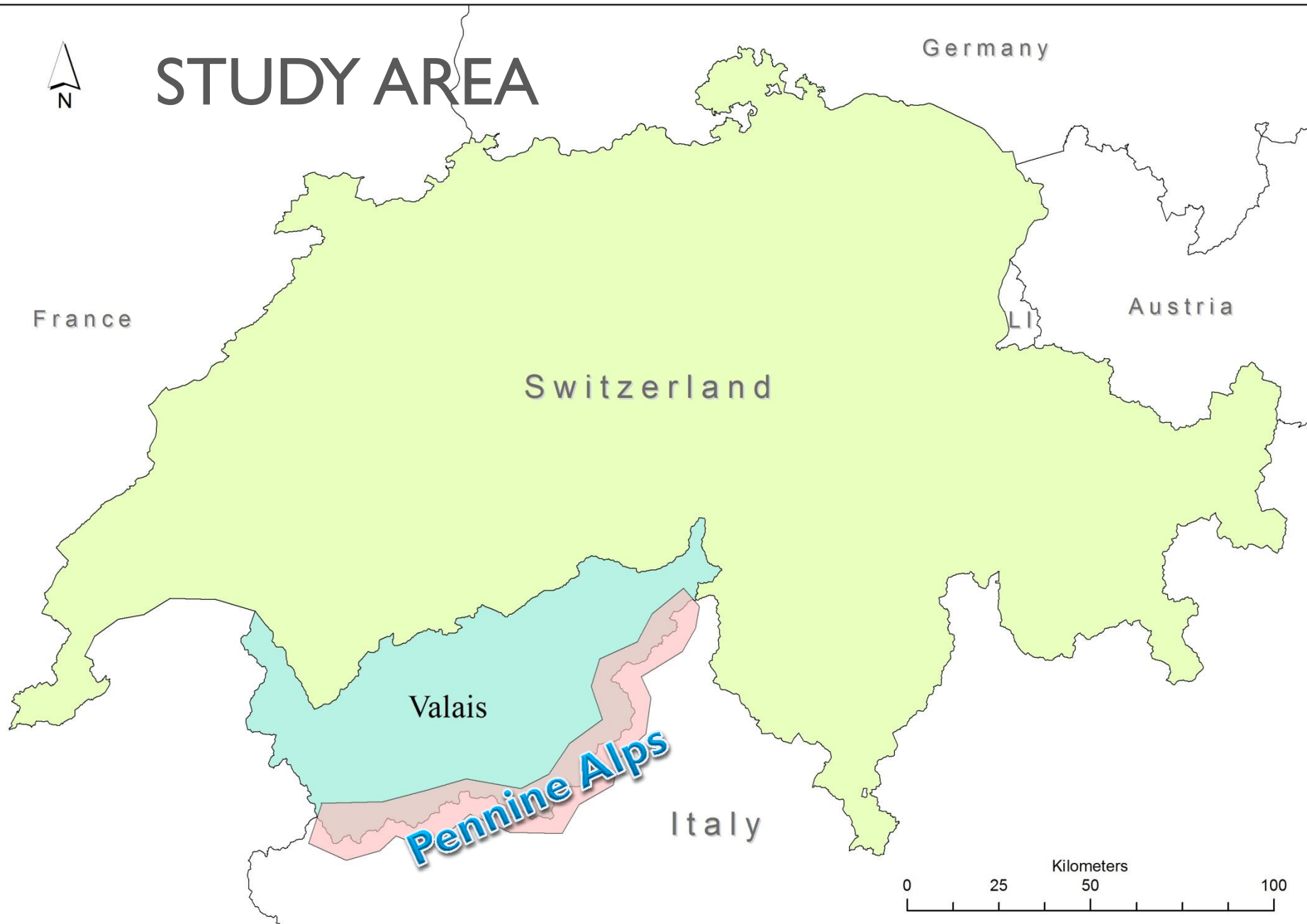
THE PENNINE ALPS

▸ High altitude passes between Switzerland and Italy have been used as communication and local commerce routes for thousands of years (Harriss 1970; 1971)

 ▸ Earliest indication of people in high altitudes in this region is from 7,000 yrs B.P.

▸ Area rich in cultural history with a rapid rate of glacier retreat

RESEARCH QUESTIONS

- What is the relationship between glacier extent, topography, and artifact retrieval location?

  - Database analysis: combine glacier extents, archaeological findings, and historical information in GIS to gain a better understanding about how people interacted with frozen environments in the recent past

- Based on glacier melting rates and patterns, which areas have the highest archaeological priority?

  - Glaciological modeling: to determine areas of high archaeological potential in the future based on melting rates

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DATABASE ANALYSIS

- Compare:
  - Glacier outlines from the years 1850, 1973, and 2010
  - Topographic properties
  - Archaeological database
  - Historical database

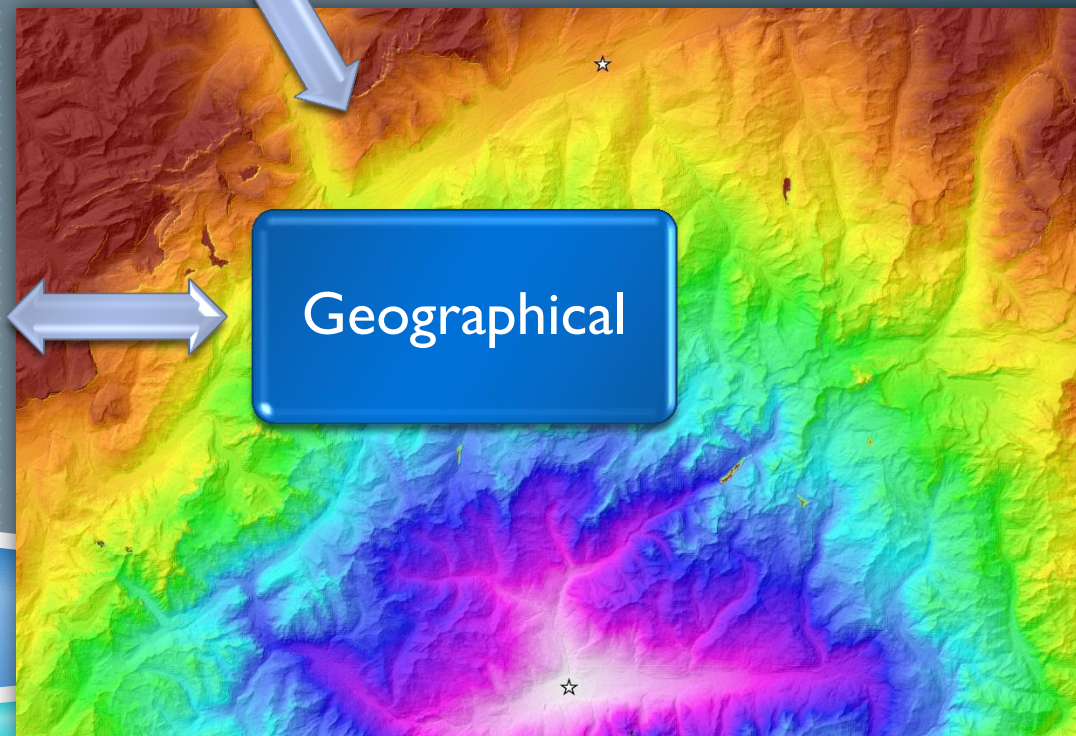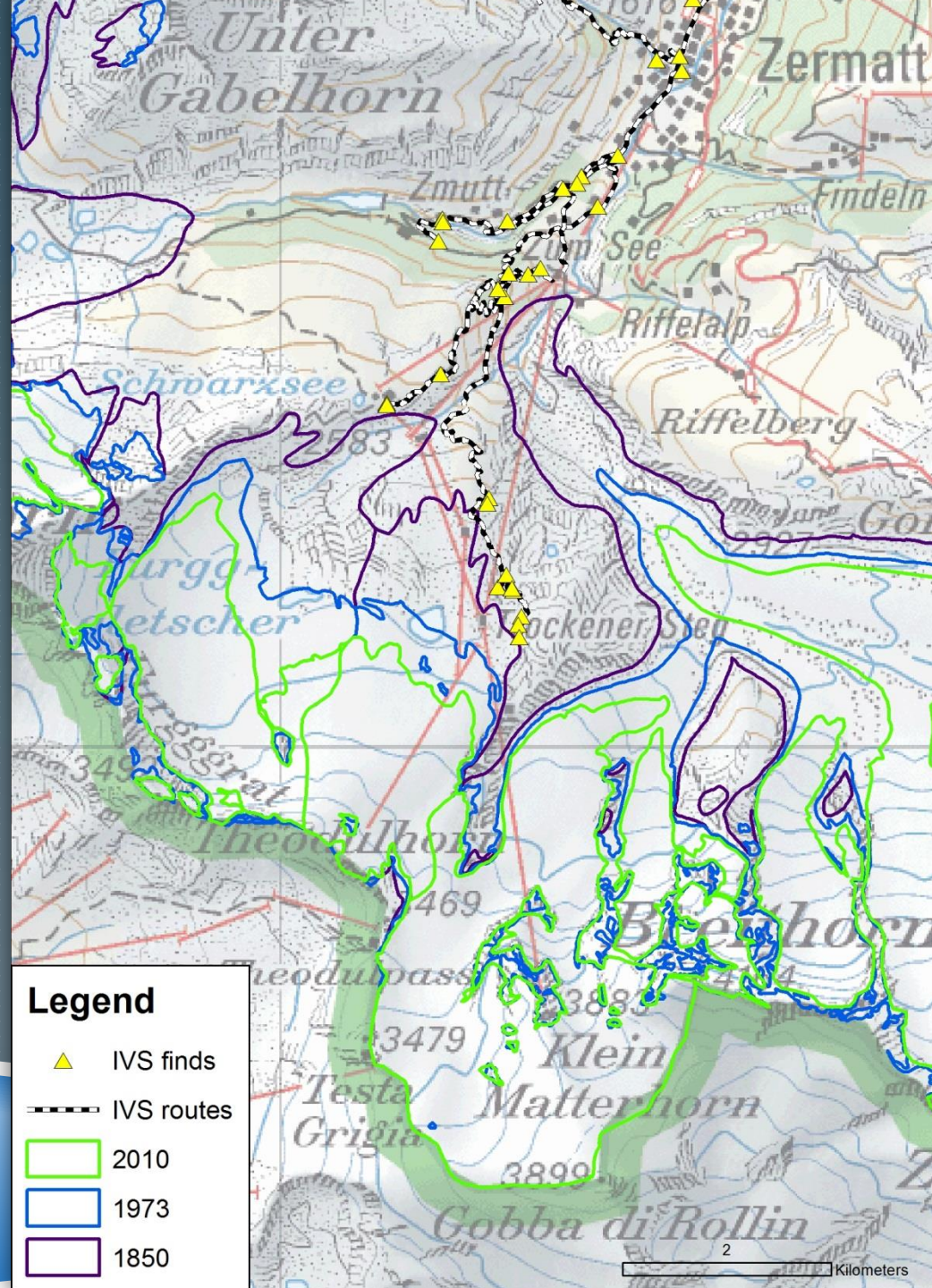…to investigate and validate the relationship between artifacts and glacier extents

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Historical

Archaeological

Geographical

Legend

△ IVS finds

▪▪▪ IVS routes

2010

1973

1850
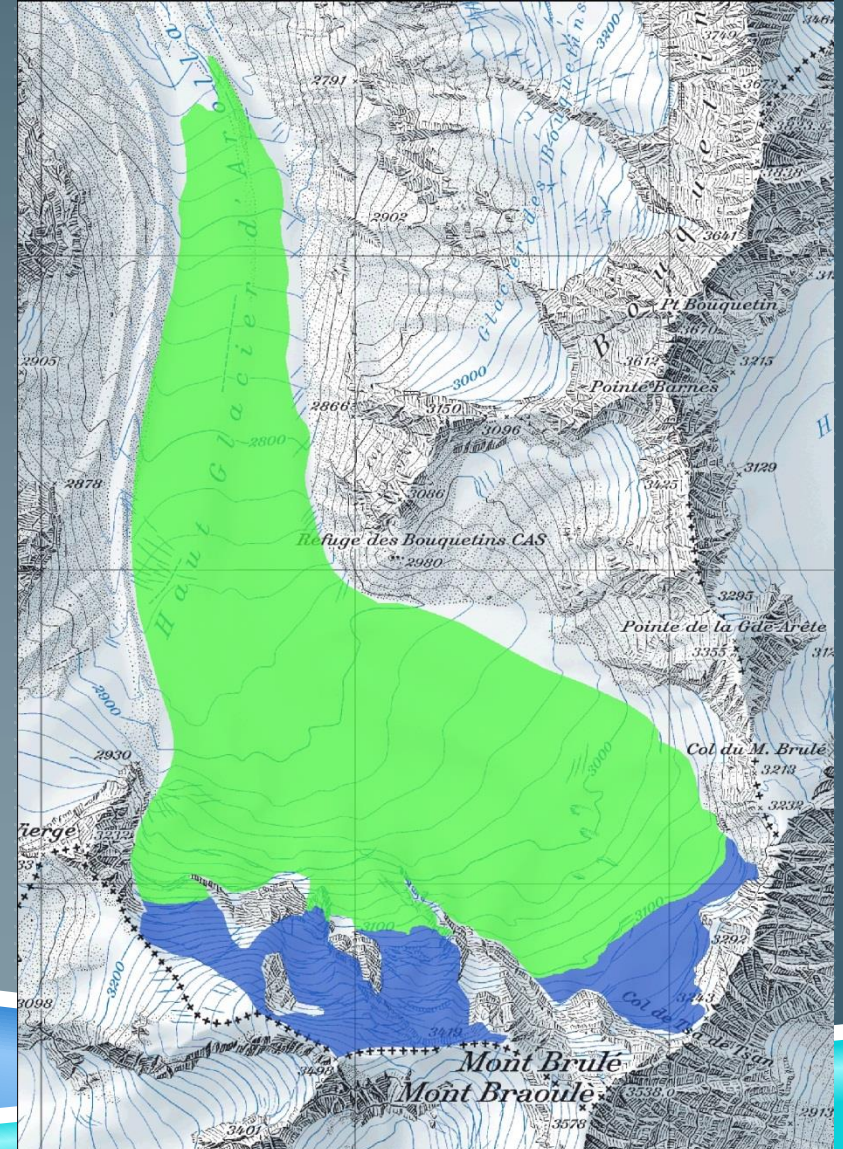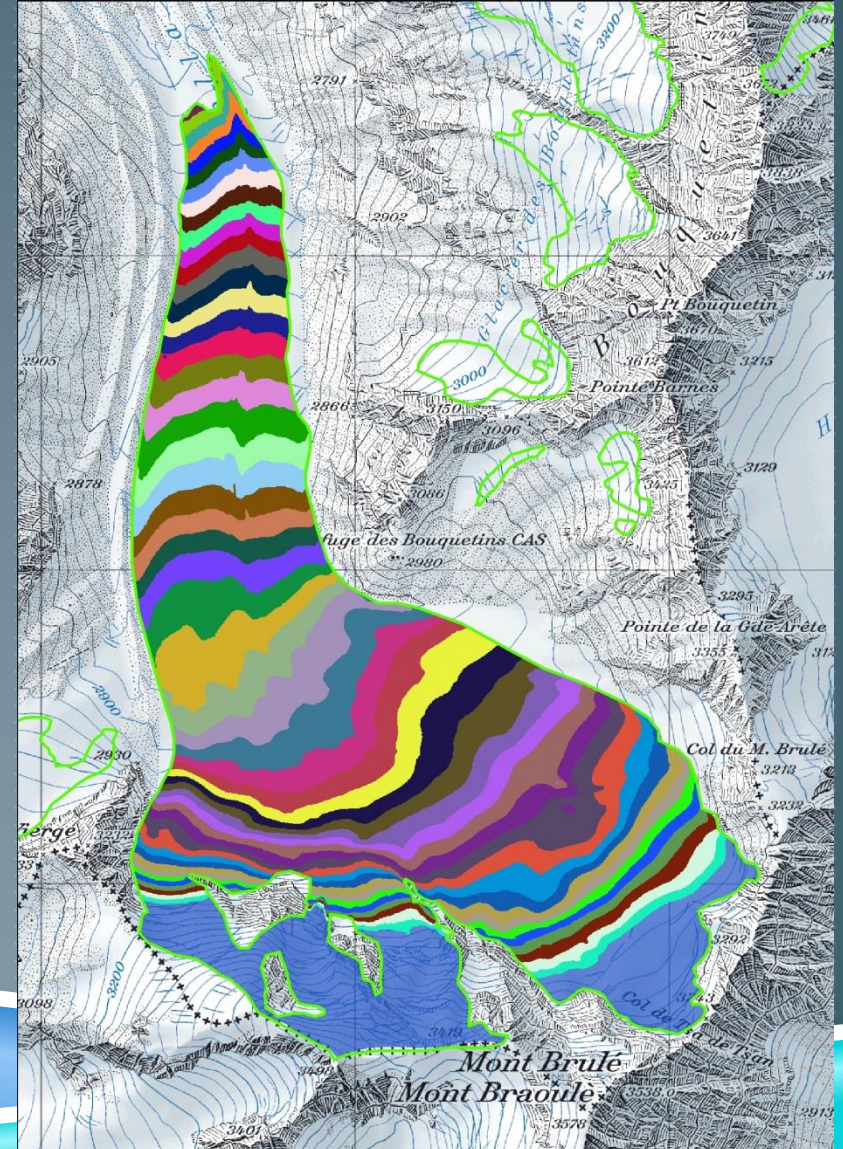
GLACIOLOGICAL MODELING (I)

▶ Broad-scale

  ▶ Hypsometric glacier recession model (Paul et al. 2007) will be employed along with several climate change scenarios for the entire Pennine Alps region

 ▶ Based on Equilibrium Line Altitudes (ELA) and current glacier extents

GLACIOLOGICAL MODELING (I)

- Broad-scale
    - Predict extents for the future (10 year increments) to determine where archaeological investigations should be conducted first

GLACIOLOGICAL MODELING (II)

▶ Local-scale

- ▶ Use Ground Penetrating Radar (GPR) data and mass balance to calculate a high resolution glacier evolution model (Huss et al. 2008) for Theodule glacier and the Haut glacier d'Arolla

- ▶ Use these control sites to check the accuracy of the broad-scale model
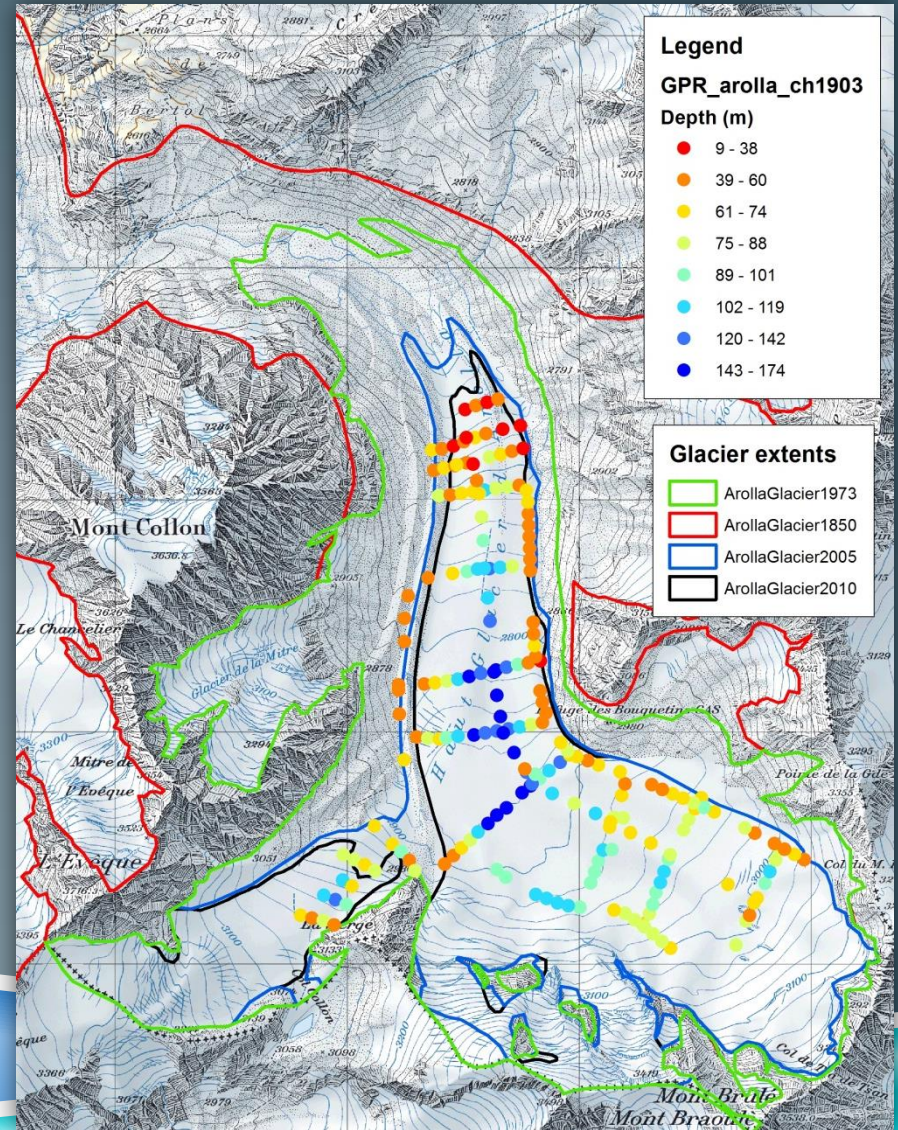
SUMMARY

- Variations in glacier dynamics between sites makes it difficult to predict where archaeological remains might be located…we hope database investigation along with broad- and local-scale glacier modeling will provide insight into patterns of artifact location and retrieval to aid in archaeological prospection and investigation in the future

Thank You!

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