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 of the most complete archaeological remains to date
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.
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
STUDY AREA

Valais

Pennine Alps
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
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
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
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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