Scott Polar Research Institute
University of Cambridge

UNIVERSITY OF CAMBRIDGE

Glacial lakes in High Mountain Asia: climate response and feedback

Evan Miles
Dr. Ian Willis and Dr. Francesca Pelliciotti (ETH-Zurich)
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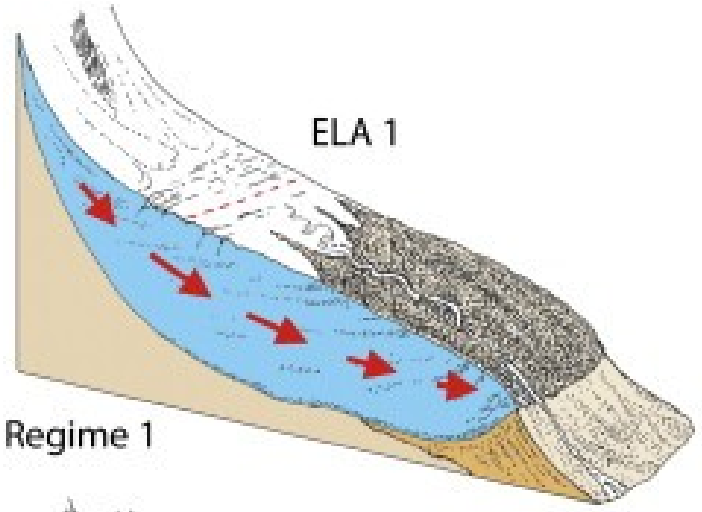
Glaciers in HMA

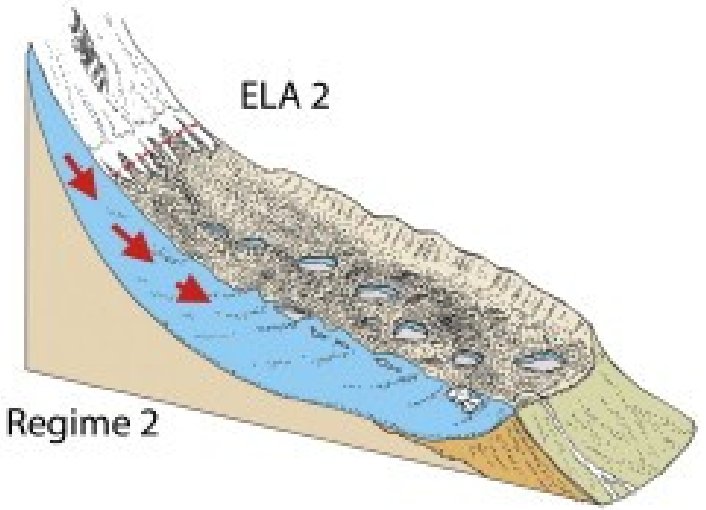
Langtang Lirung (7234m) and Lirung Glacier, Nepal

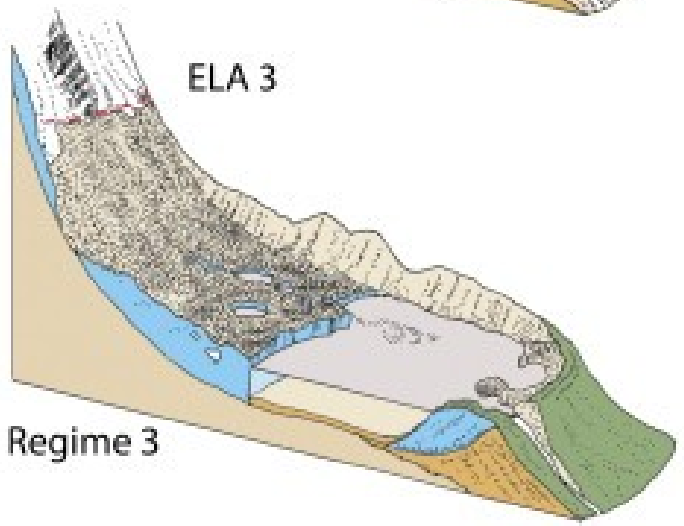
Glacier response to warming: lakes as indicators of health

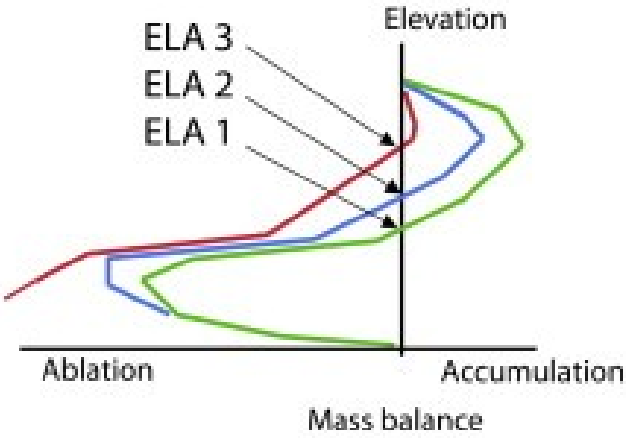
1: Pseudoequilibrium



2: Initial thinning



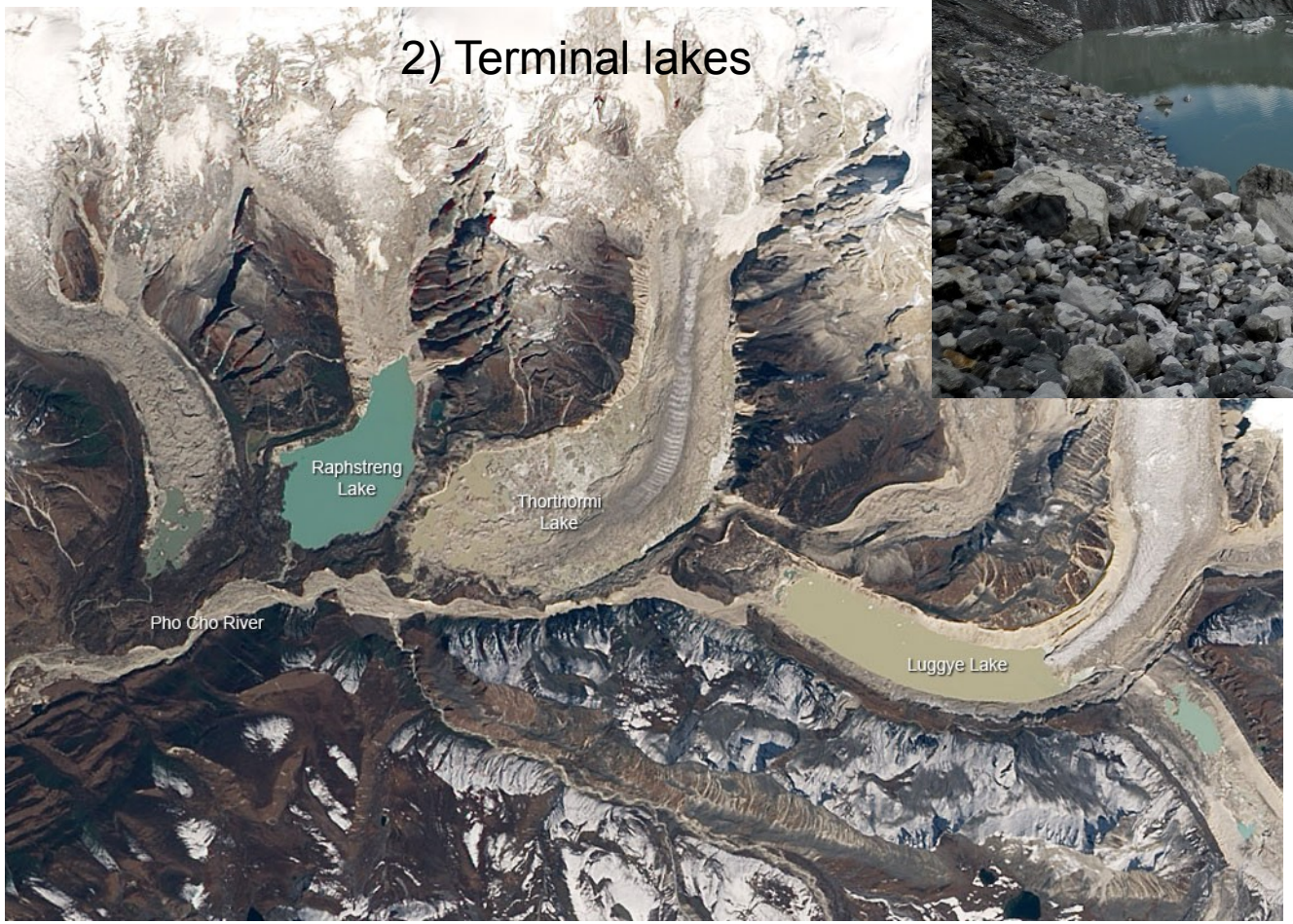




3: Terminal retreat

Benn et al 2012

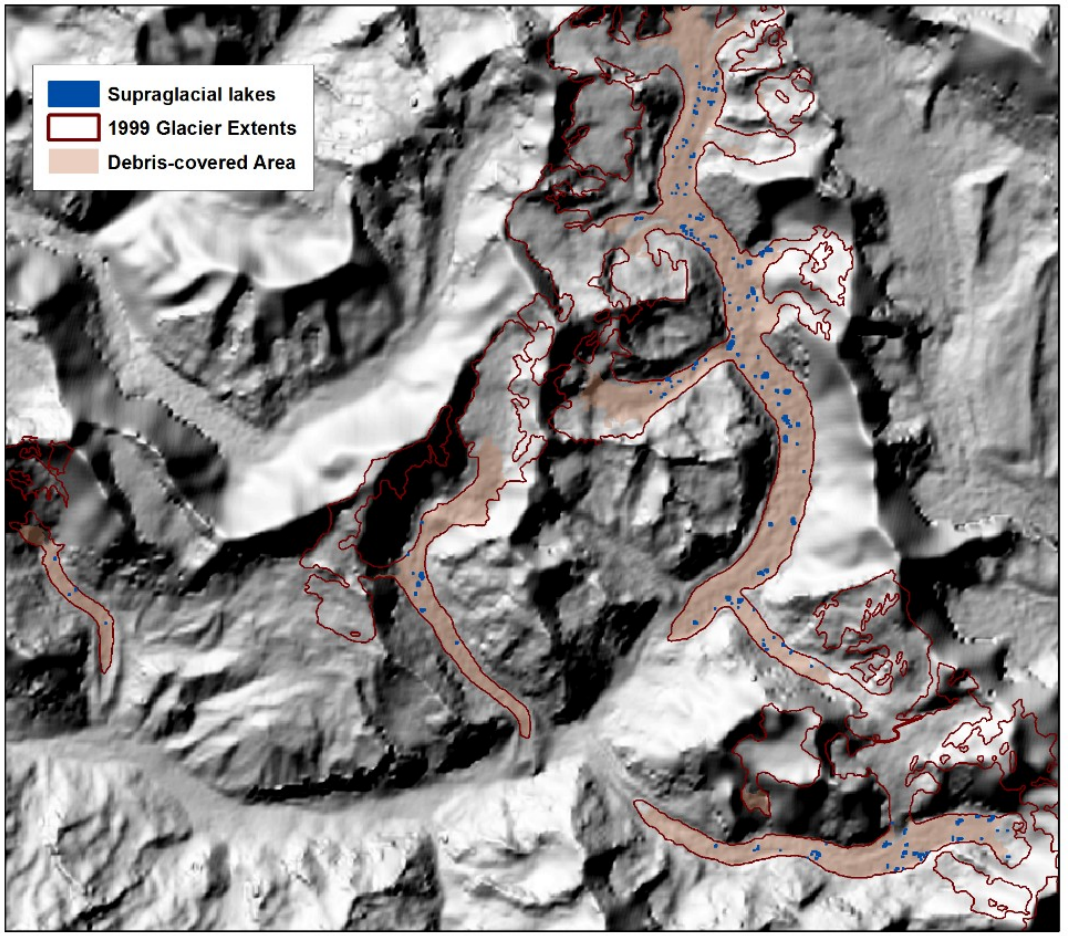
Melt enchancement,
meltwater routing,
intermediate response

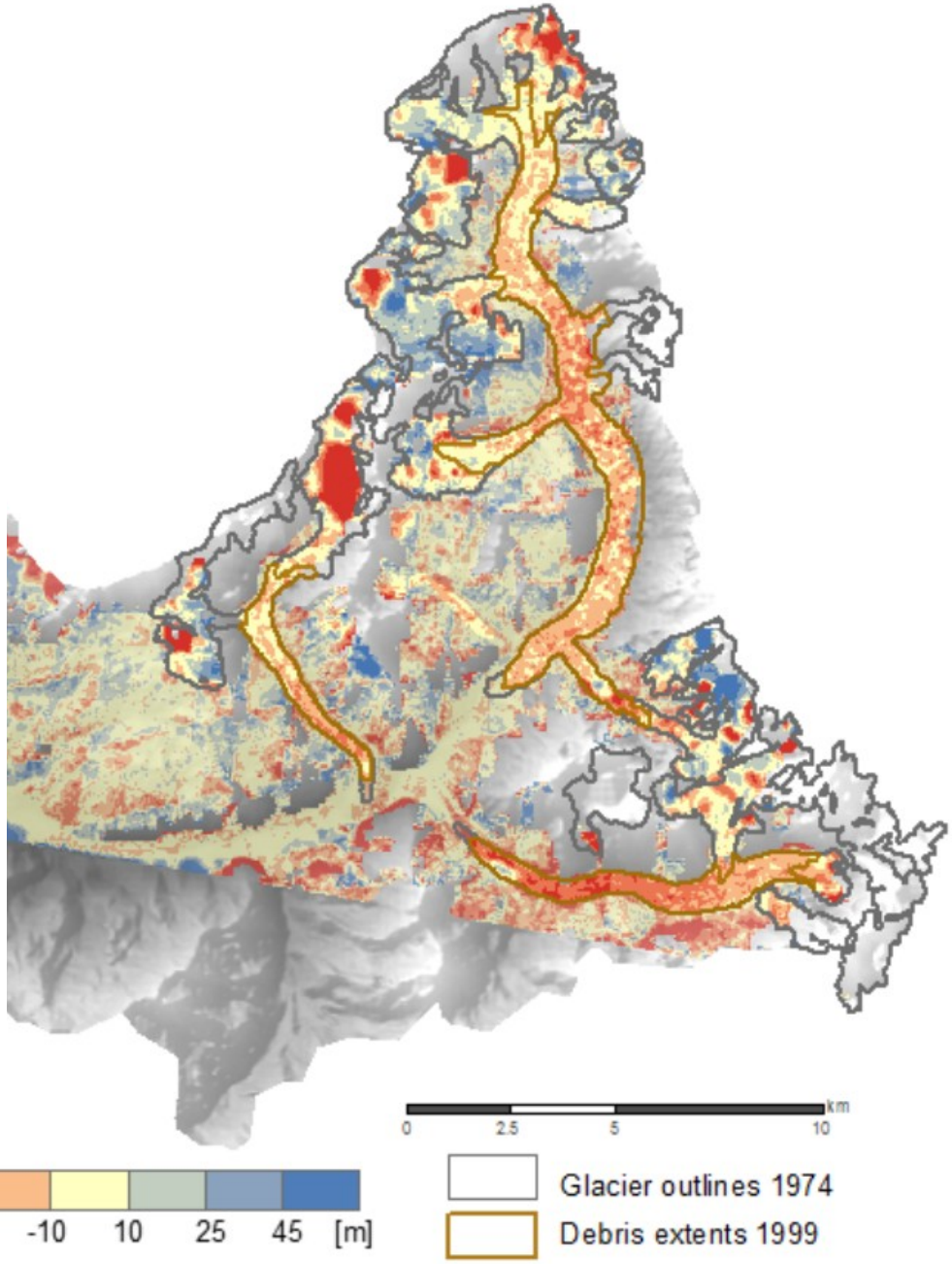


Large outburst floods,
Severe impacts

Goal: Study processes at (1) to understand when (2) will occur

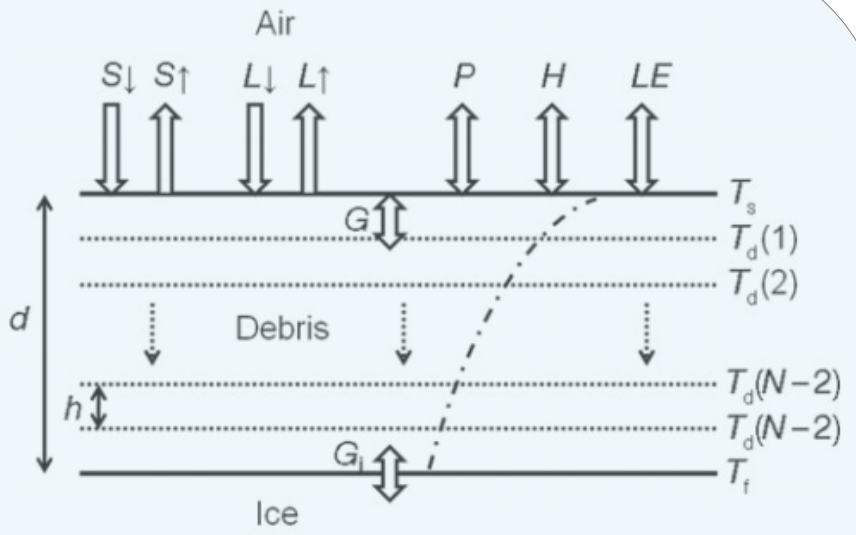
Supraglacial lakes as hot-spots of melt

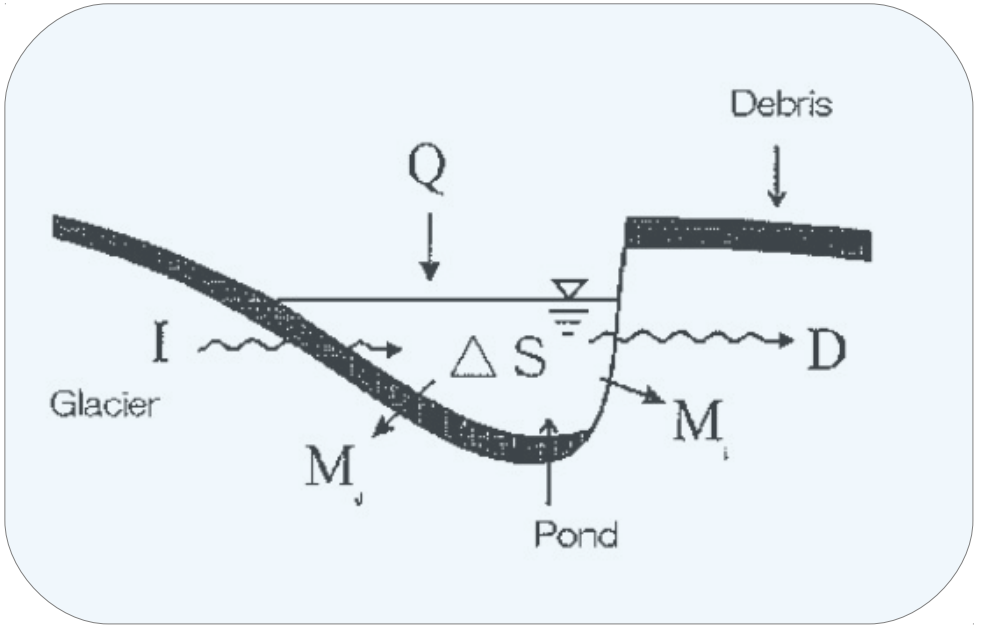


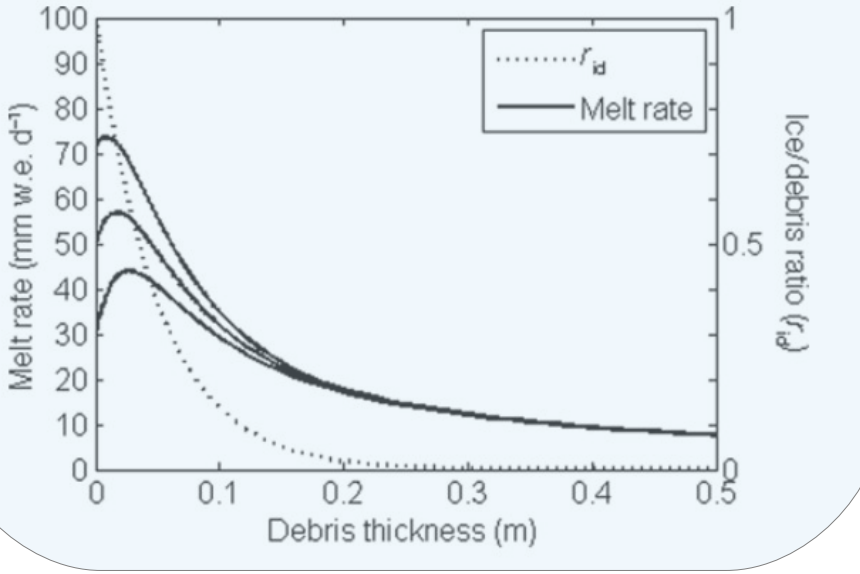


Pellicciotti et al 2014

Numerical modeling of glacier melt: surface energy balances



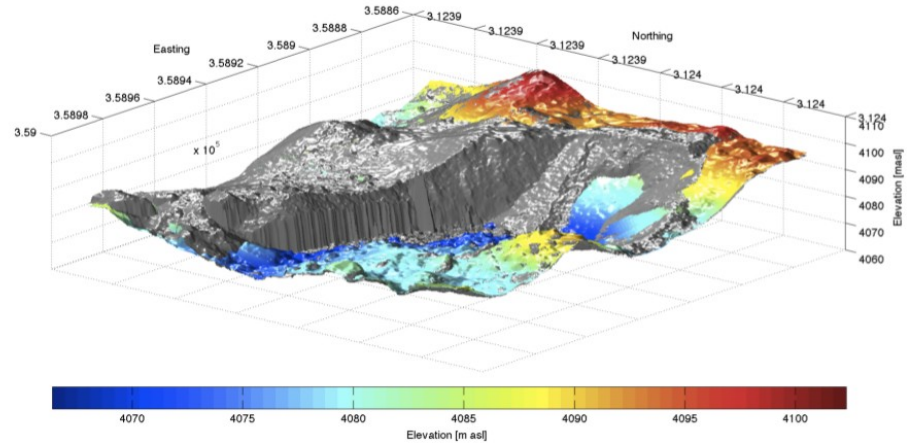


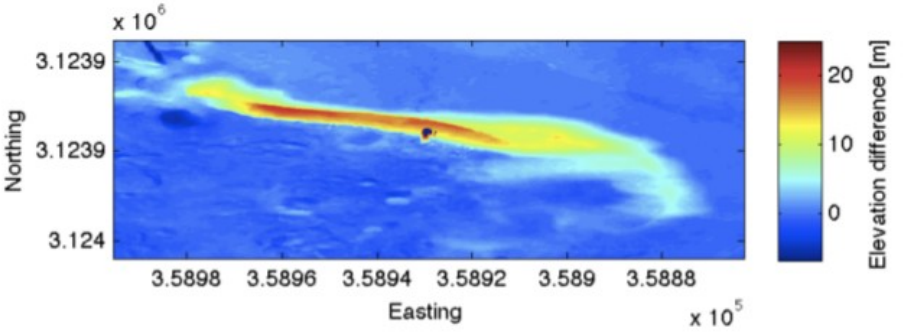


1) Debris acts as a blanket
2) Water increases efficiency of atmosphere-ice energy transfer:
-overturning
-saturated debris pore-space
-direct contact with ice

Results in melt rates of 7-10x that of debris (in prep)

Secondary effects - cliffs of exposed ice





Accounts for 10-20% of debris area melt (with 1-2% of area)

Steiner et al (prep)

Next: distributed, integrated modeling of cliffs and lakes