

# Glacial erosion

A photograph of a glacier with large blue icebergs floating in a stream, set against a backdrop of rocky, eroded terrain. The glacier is a massive wall of white and blue ice, with numerous cracks and ledges. The icebergs are large, angular blocks of ice that have calved from the glacier. The surrounding landscape is rugged and rocky, with visible signs of glacial erosion such as smoothed rock surfaces and U-shaped valleys.

Processes

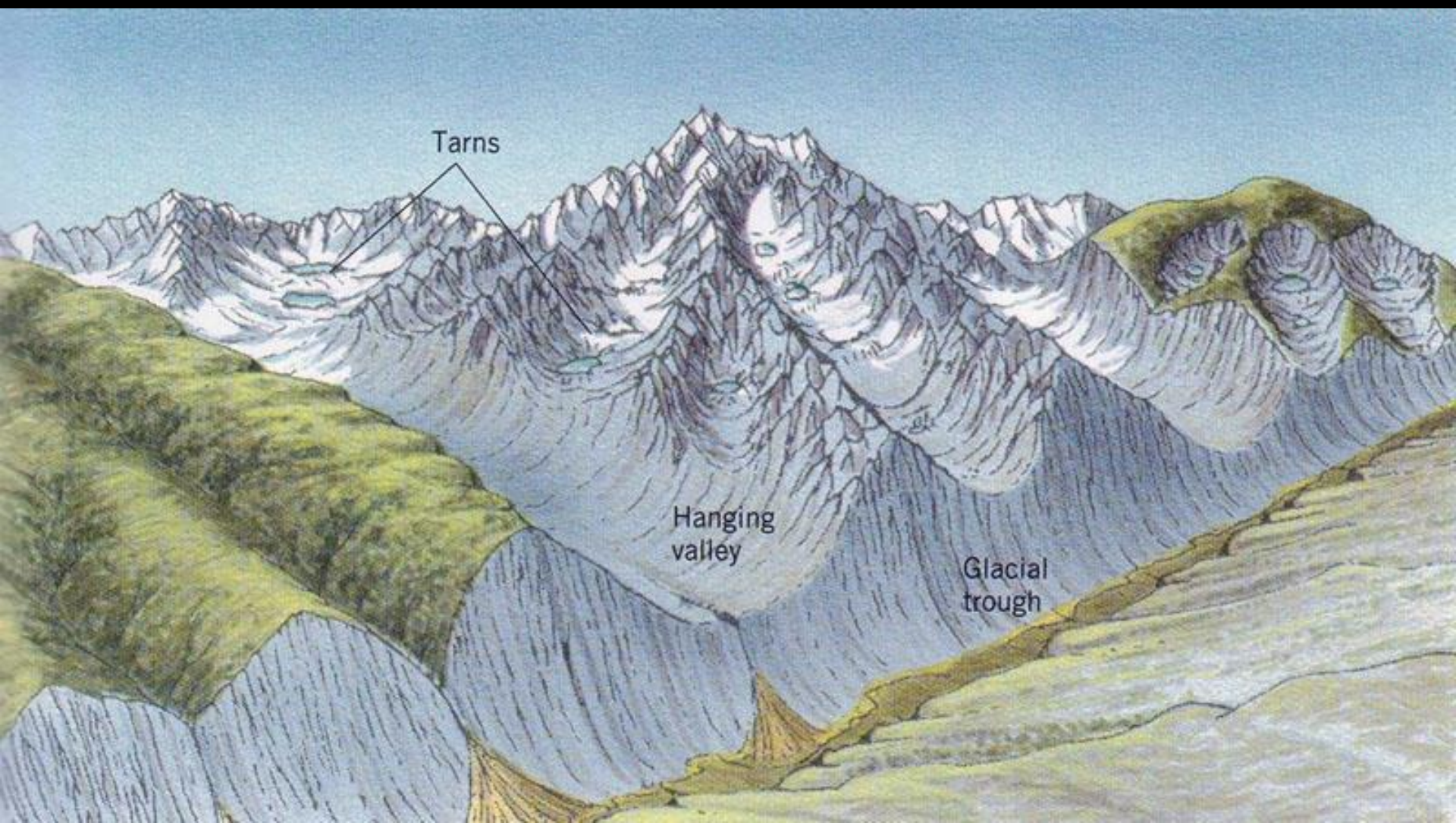
# **Glacial erosion**

**1: Thermal controls on glacial erosion**

**2: Mass balance controls on glacial erosion**

**3: Basic erosional processes**





Tarns

Hanging valley

Glacial trough

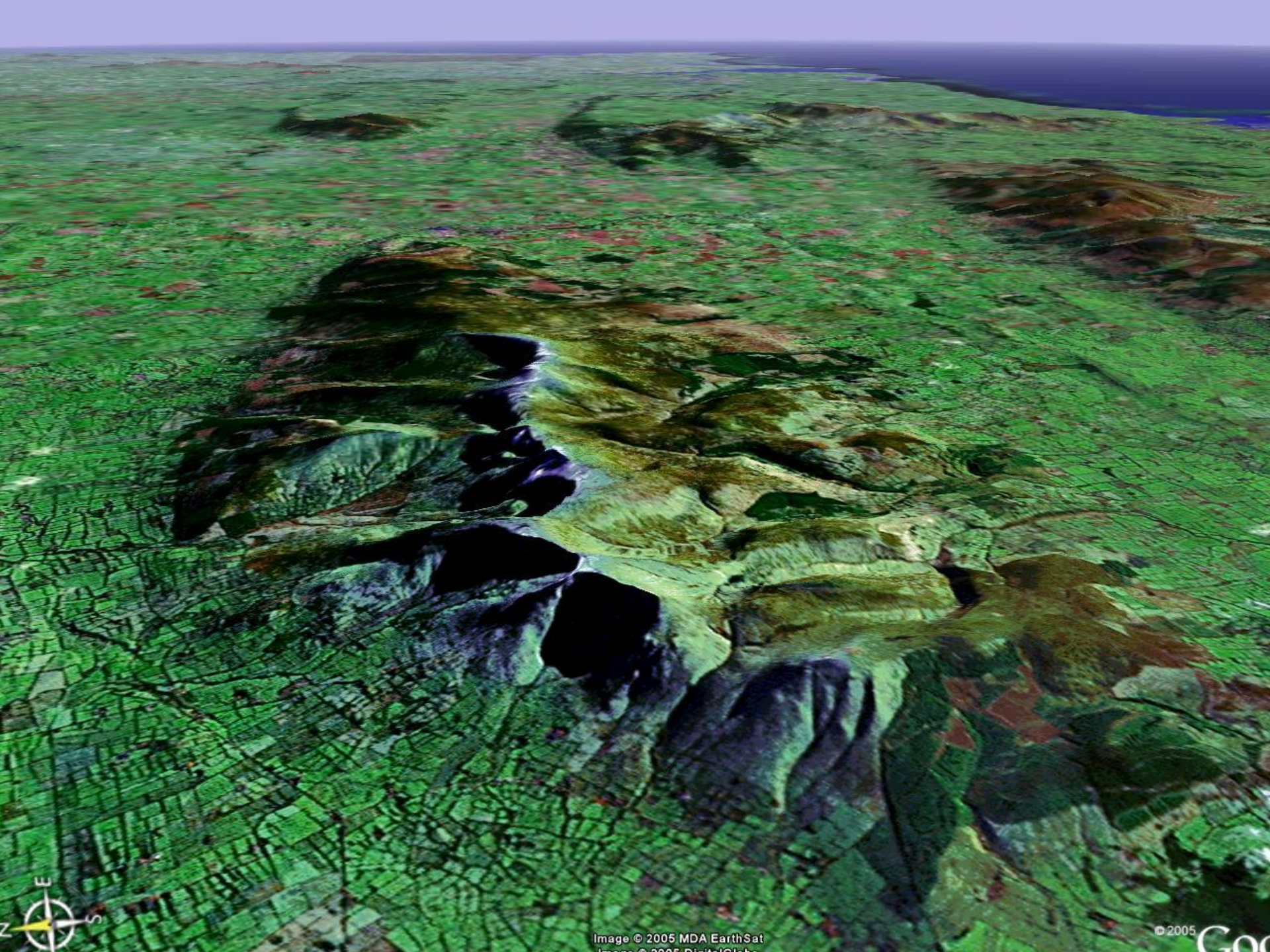












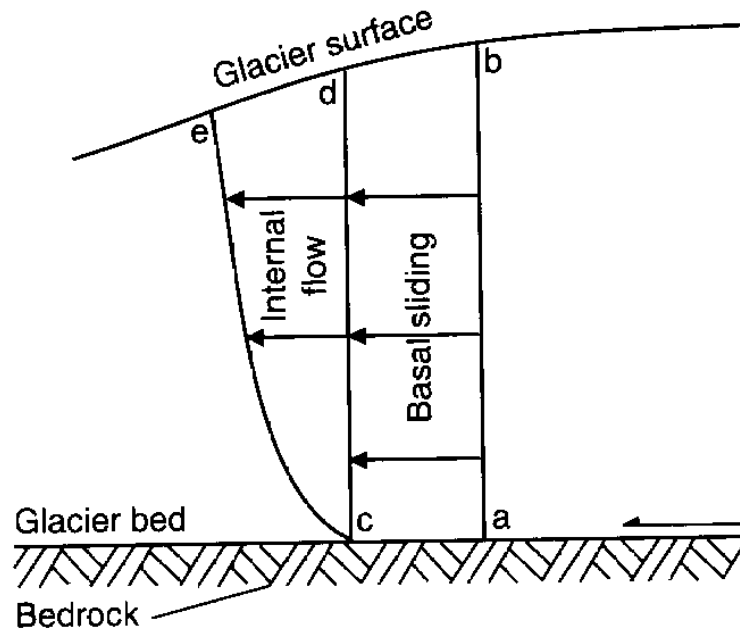




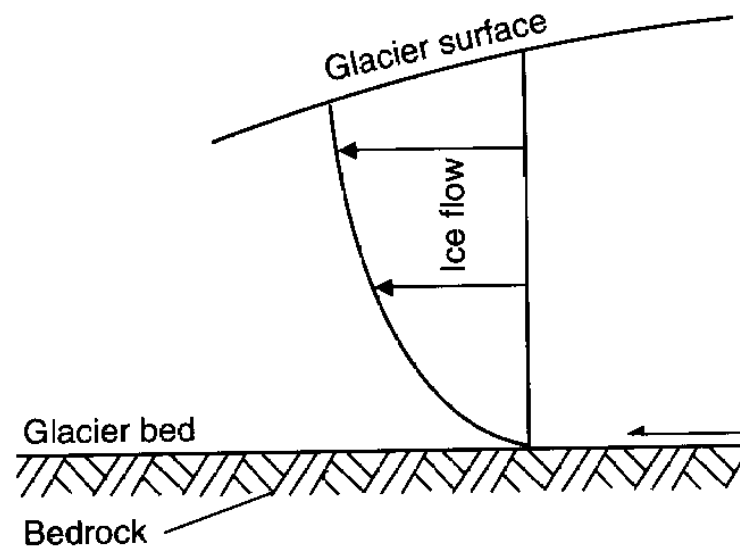
**Thermal glacier type**



**A** Warm-based glacier resting on bedrock



**B** Cold-based glacier resting on bedrock

















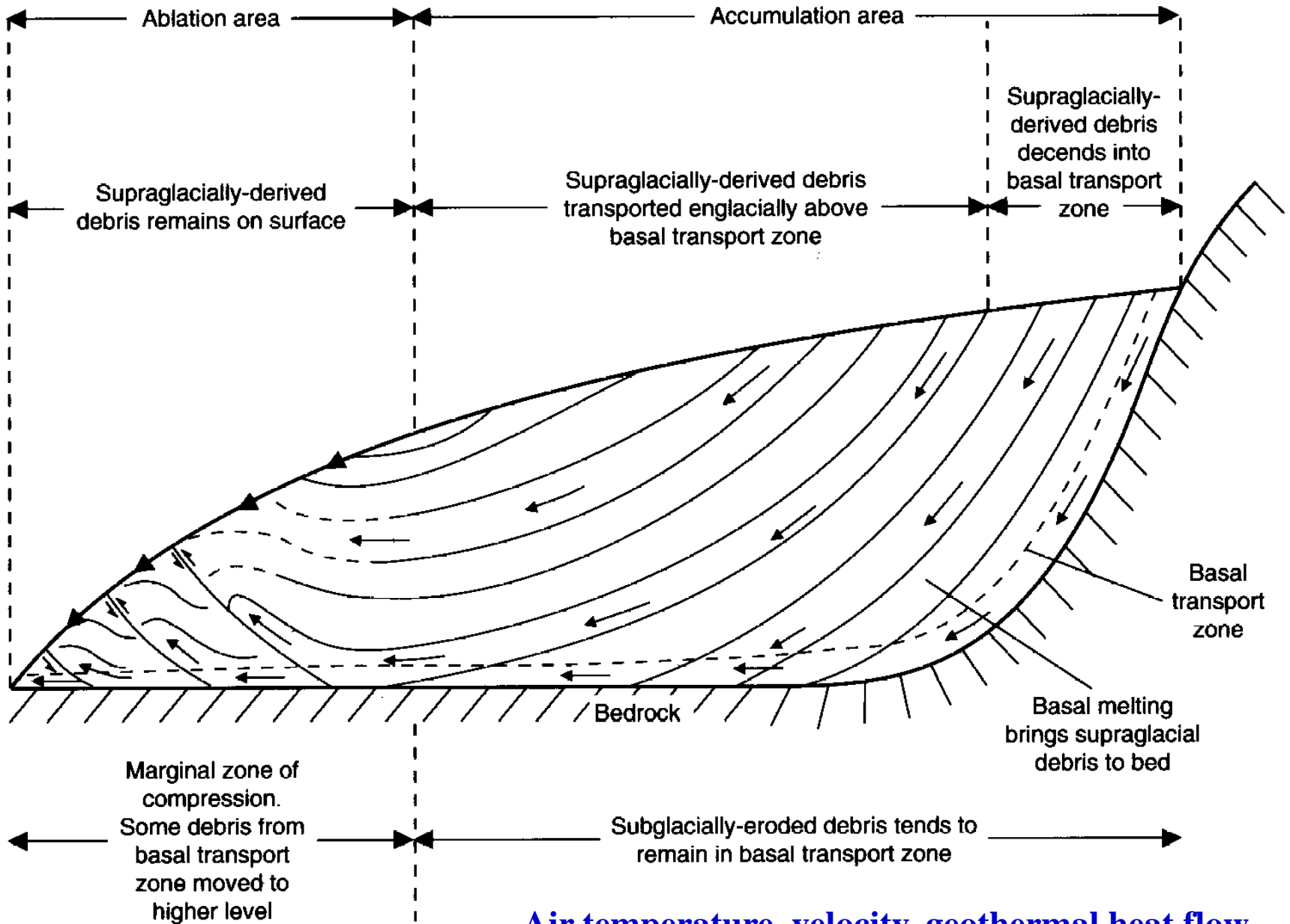








# Controls on glacier temperatures ?



**Air temperature, velocity, geothermal heat flow**





**Flow velocity and crevasses**

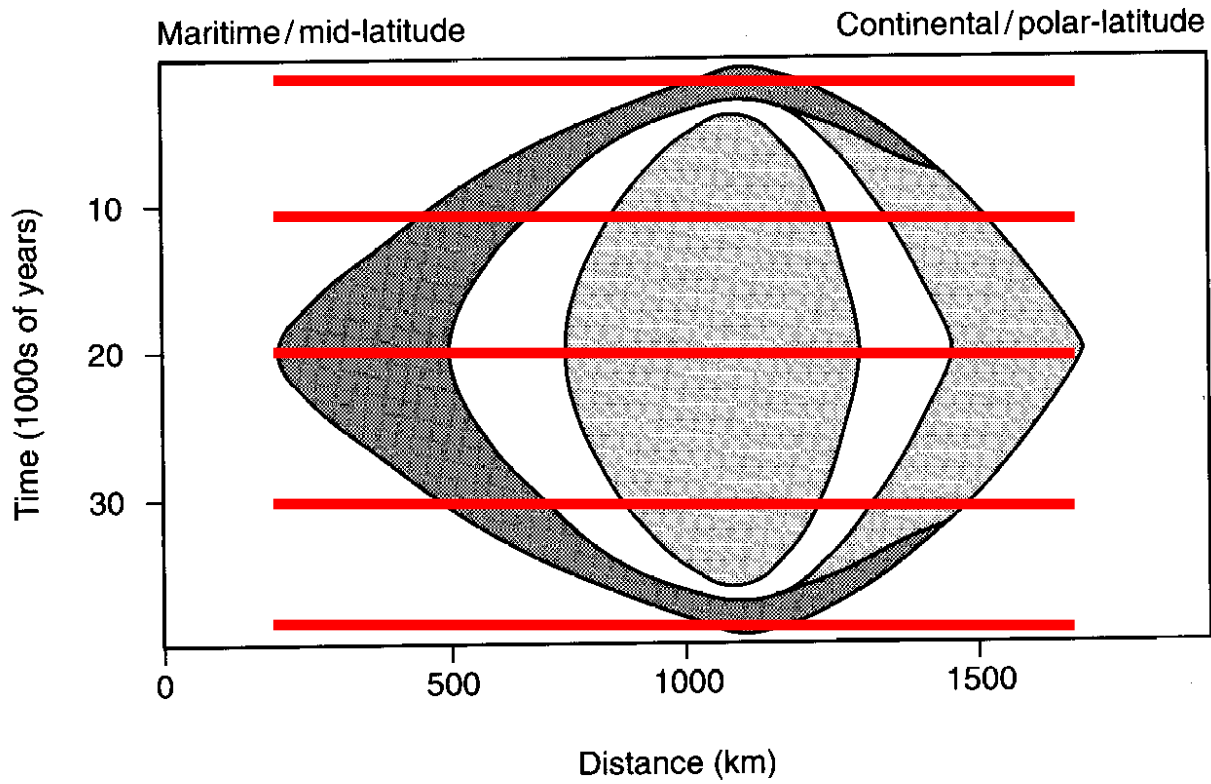







Courtesy USGS

**Highest velocity near ELA**

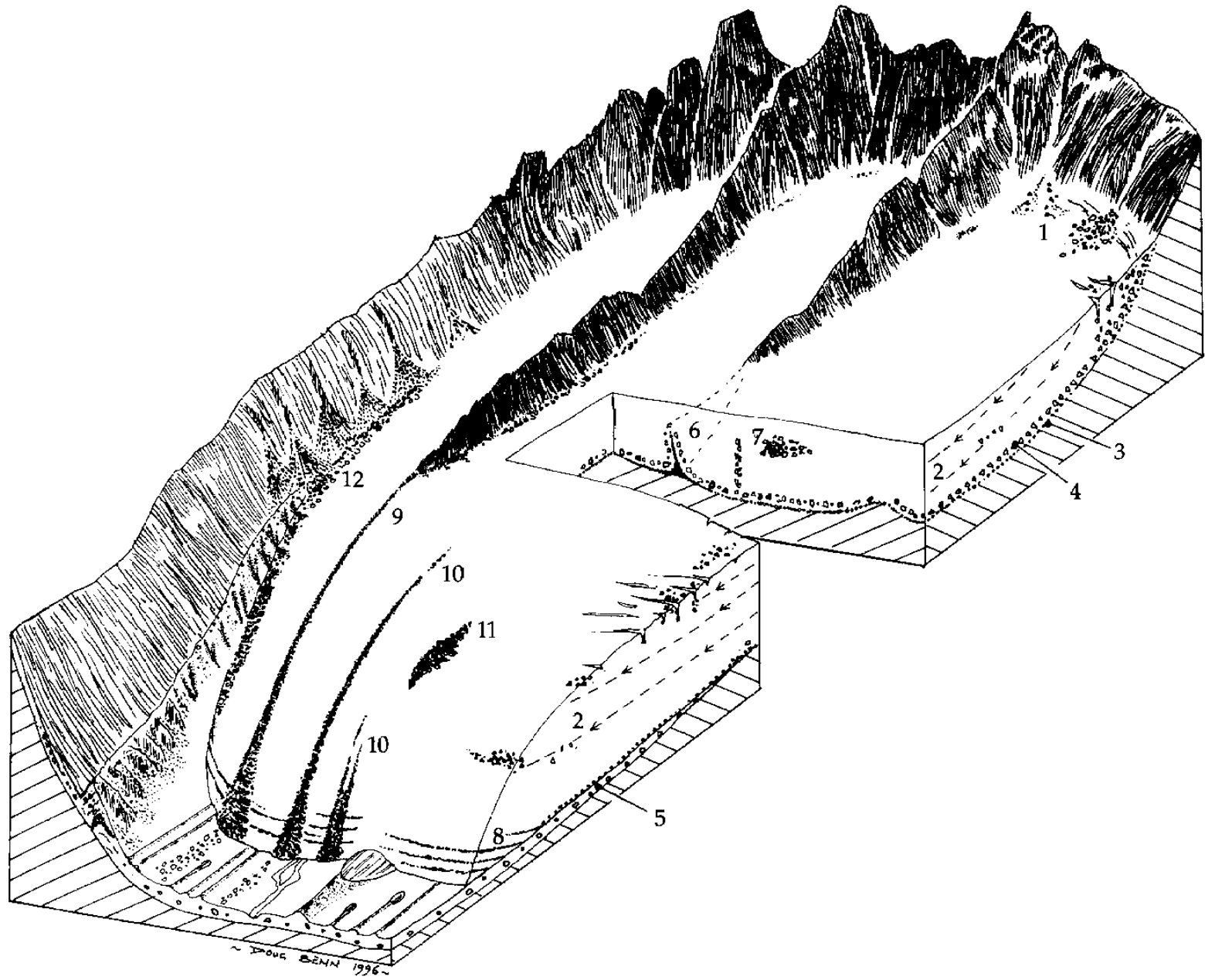




-  Condition A, warm ice
-  Condition B, thermal equilibrium
-  Condition C, cold ice

**Changes over time**





**Basic erosional processes**



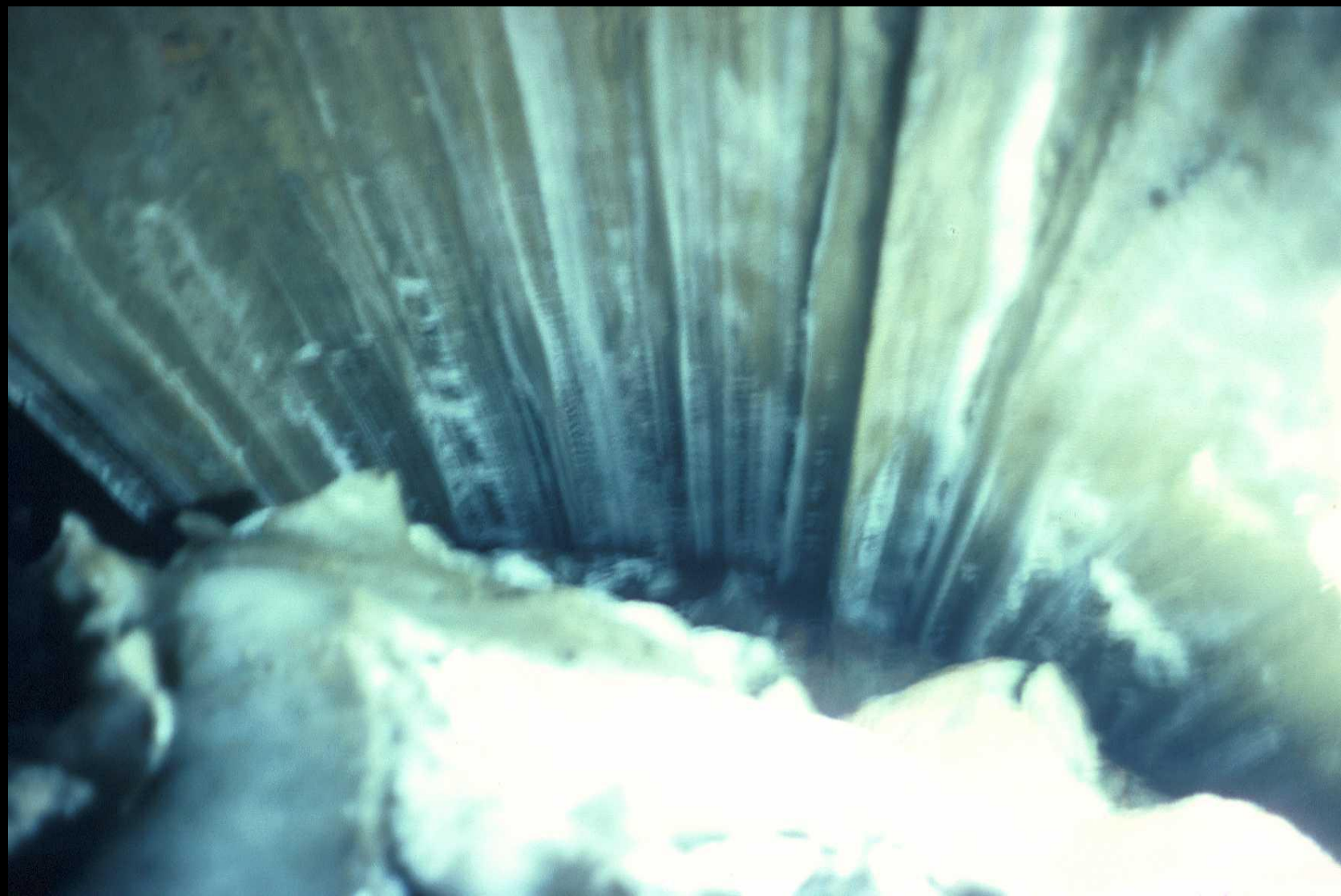
**Basal sliding**







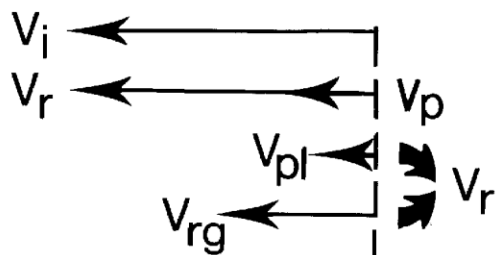




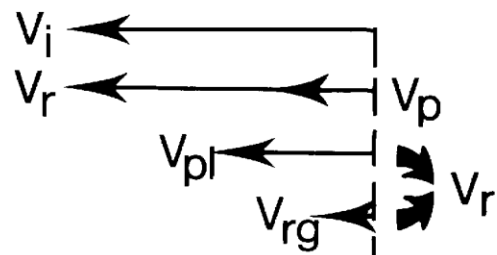




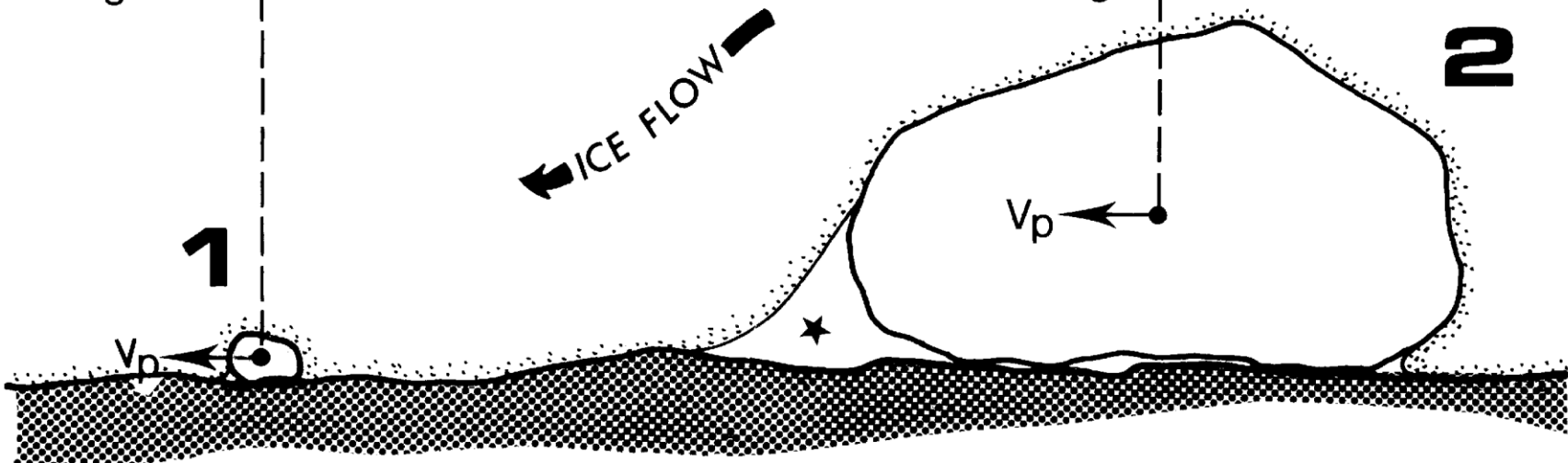




ICE FLOW



2





# Basal debris concentration





# Bedrock hardness









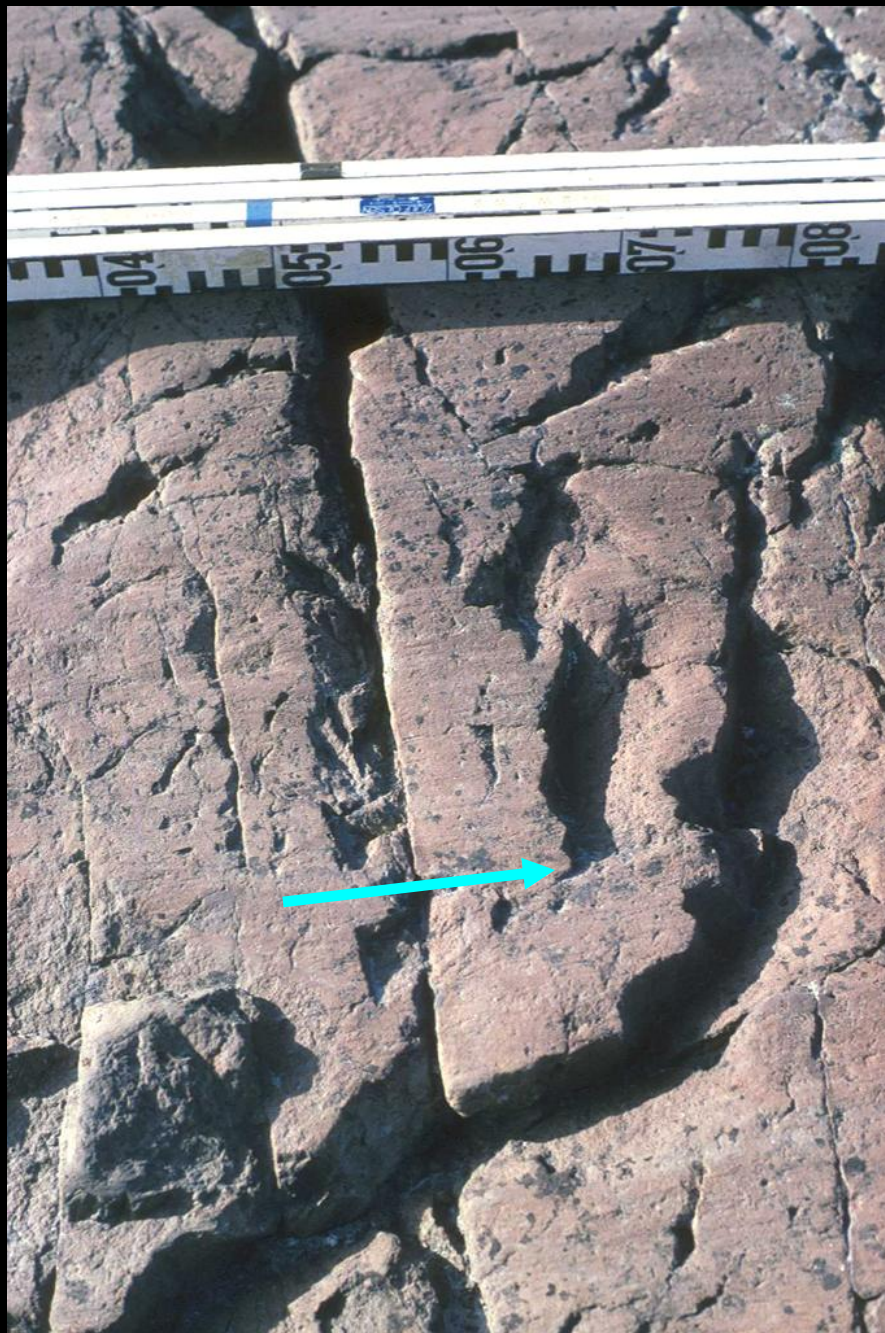
# Bedrock structures













Chatter marks





Crescentic gouge

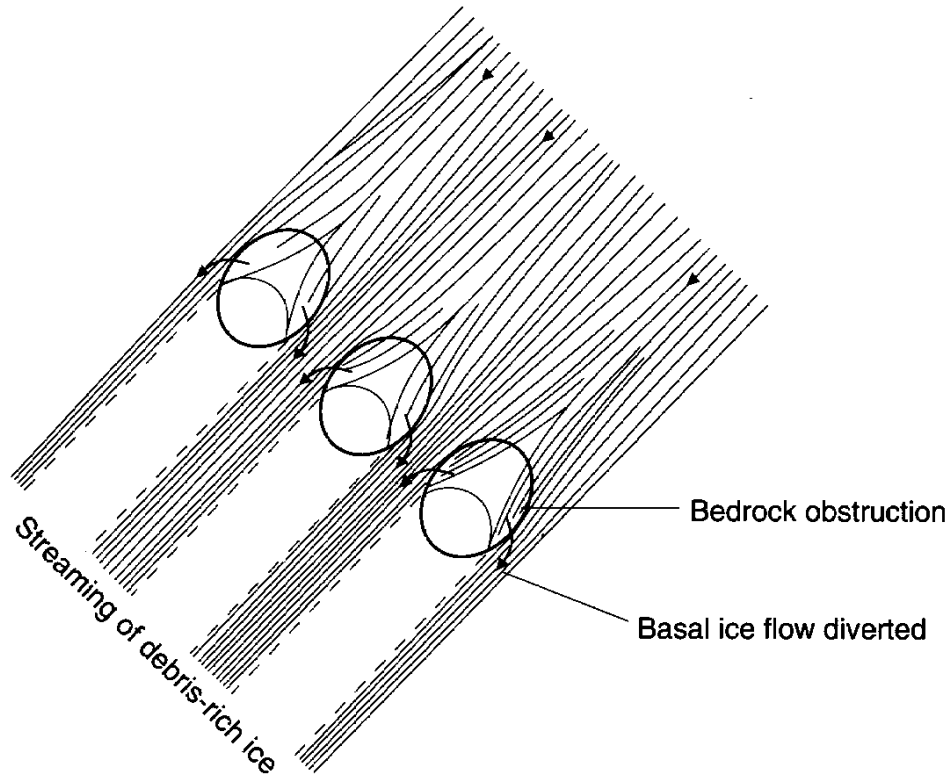
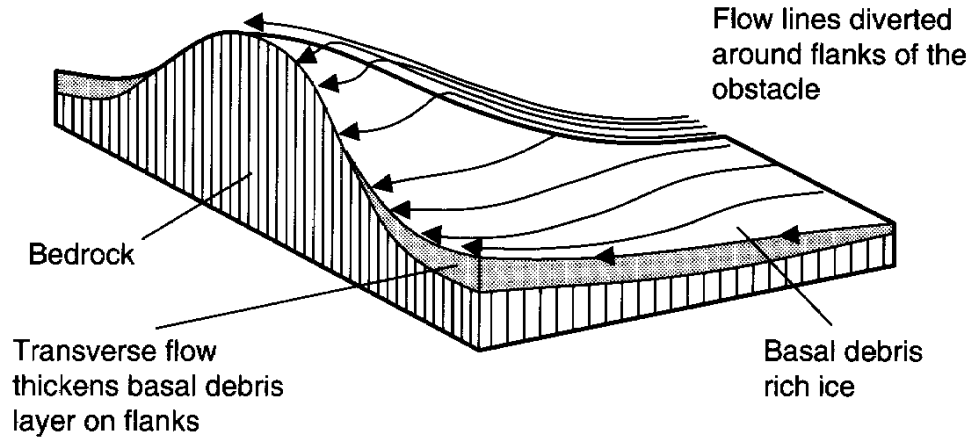








# Basal debris streaming









# Sichelwannen











**Roches moutonne's**



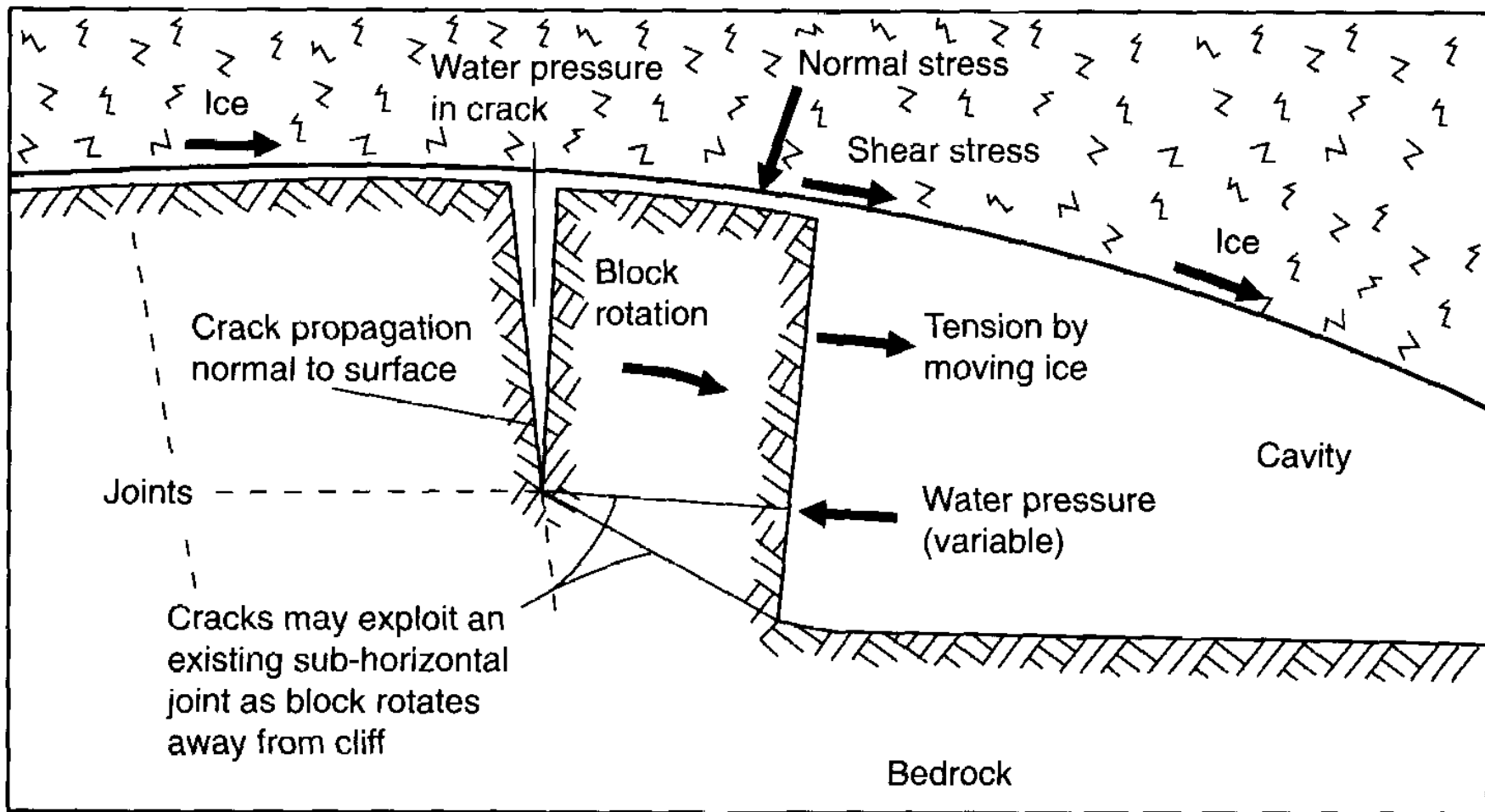
# Lodgement boulder























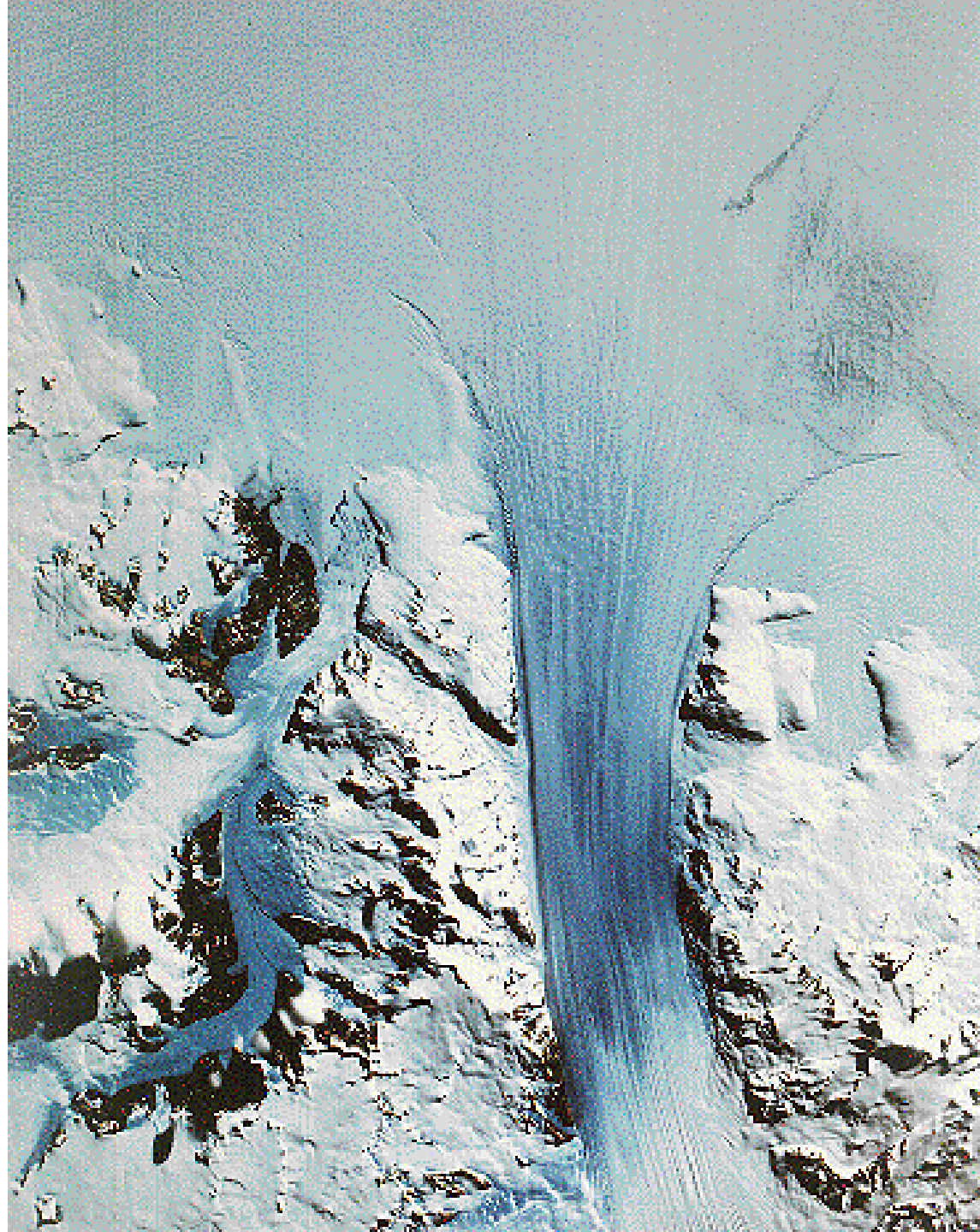




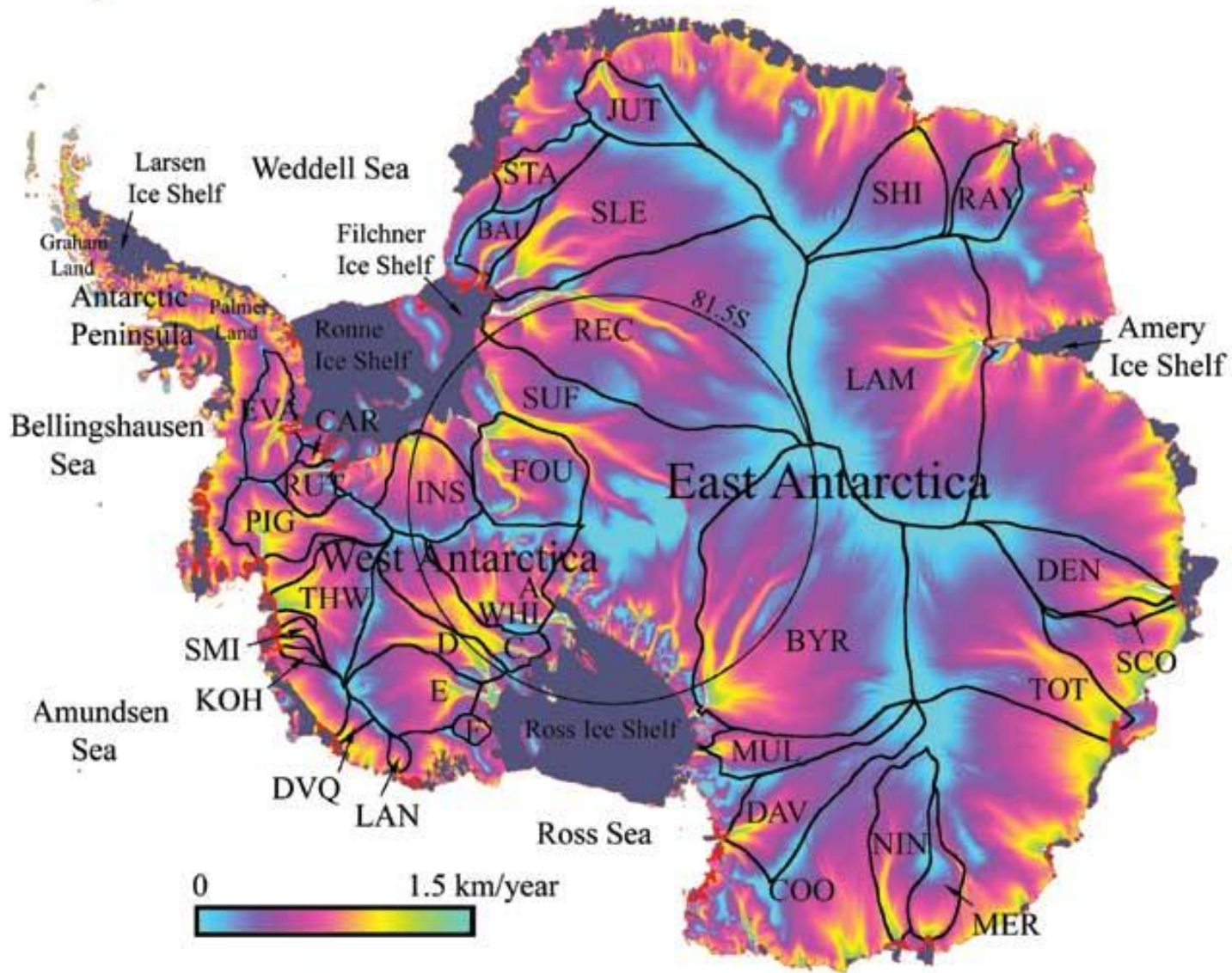
**Fast flowing glaciers**



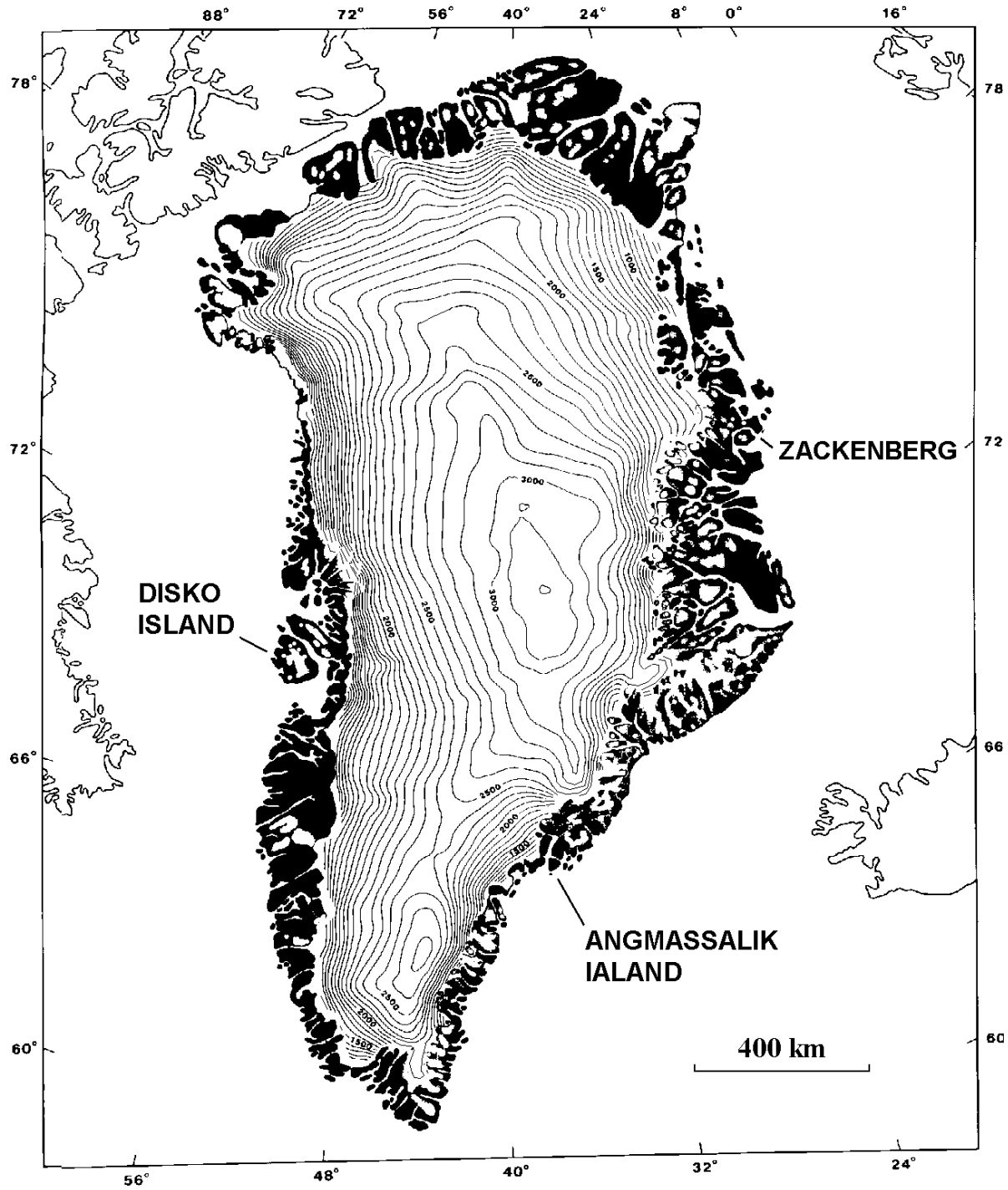
Bird Icestream joins  
the Ross Ice Shelf































































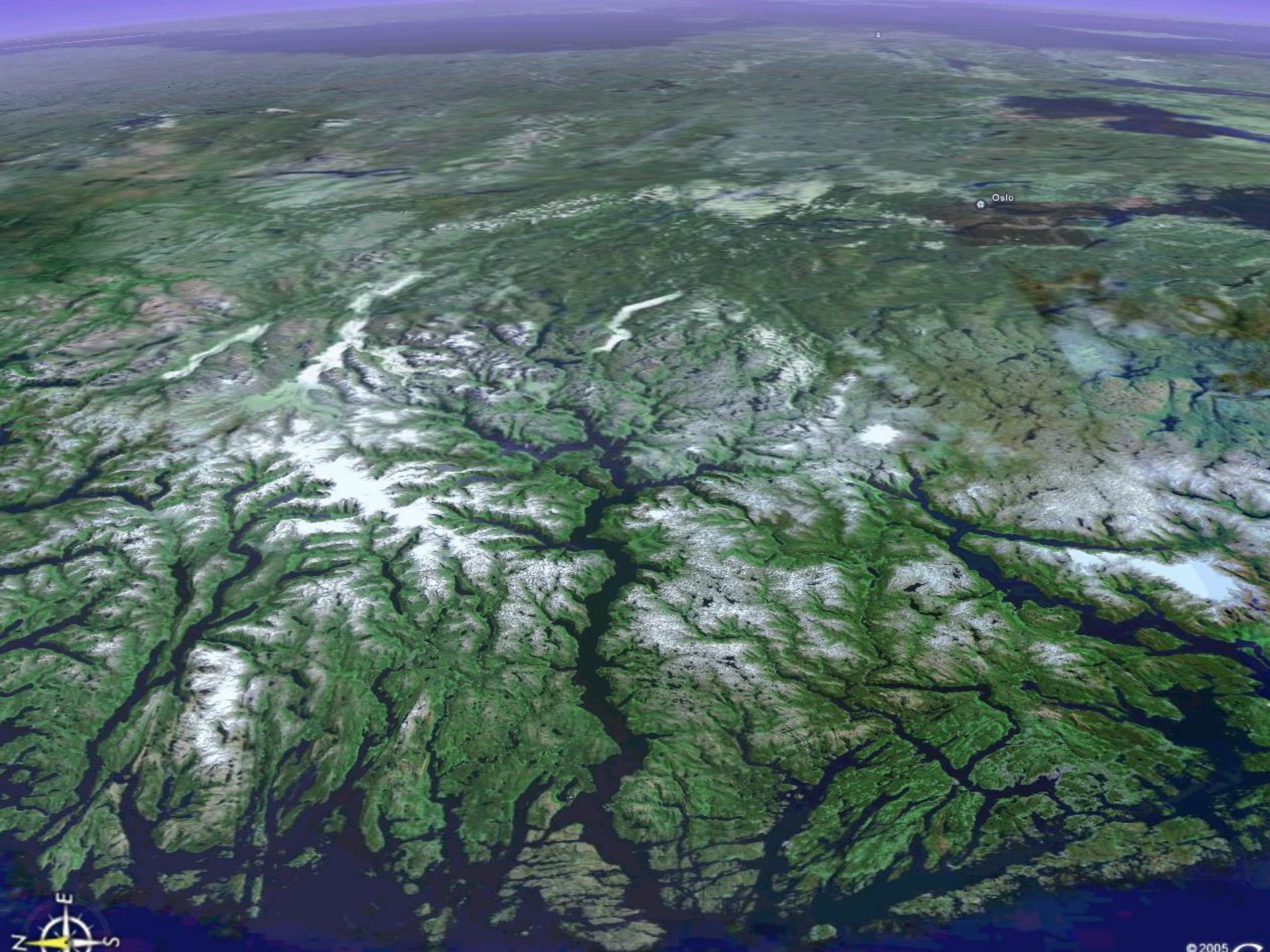












Oslo





# **A theoretical approach to glacier equilibrium-line altitudes using meteorological data and glacier mass-balance records from southern Norway**

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PERMAFROST AND PERIGLACIAL PROCESSES  
*Permafrost Periglac. Process.* **12**: 255–266 (2001)  
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## **Physical Modelling of Bedrock Brecciation by Ice Segregation in Permafrost**

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### **ABSTRACT**