

# Glacial erosion processes 1



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**1: Thermal controls on glacial erosion**

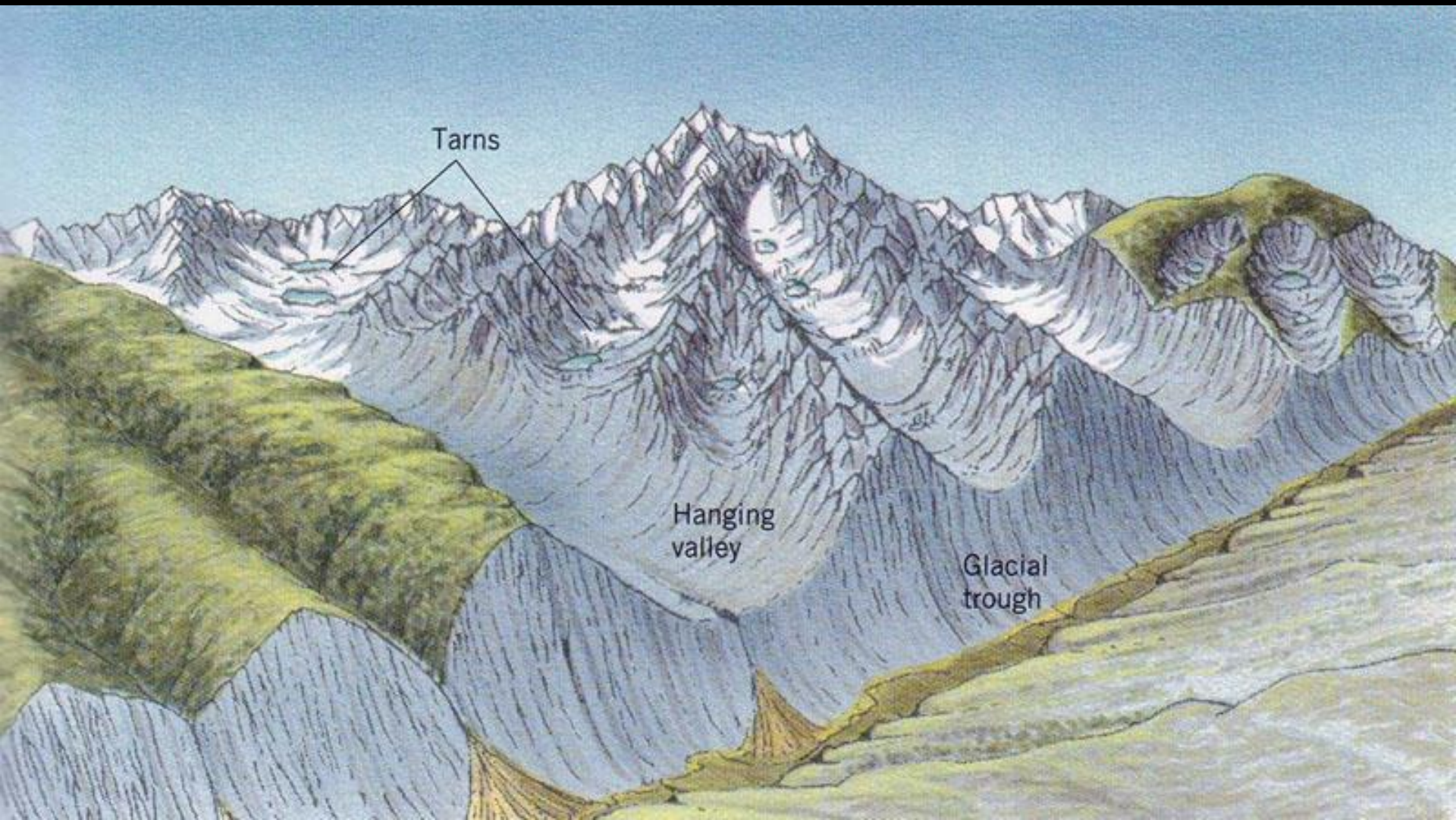
**2: Mass balance controls on glacial erosion**

**3: Basic erosional processes**

# Glacial versus non-glacial landforms



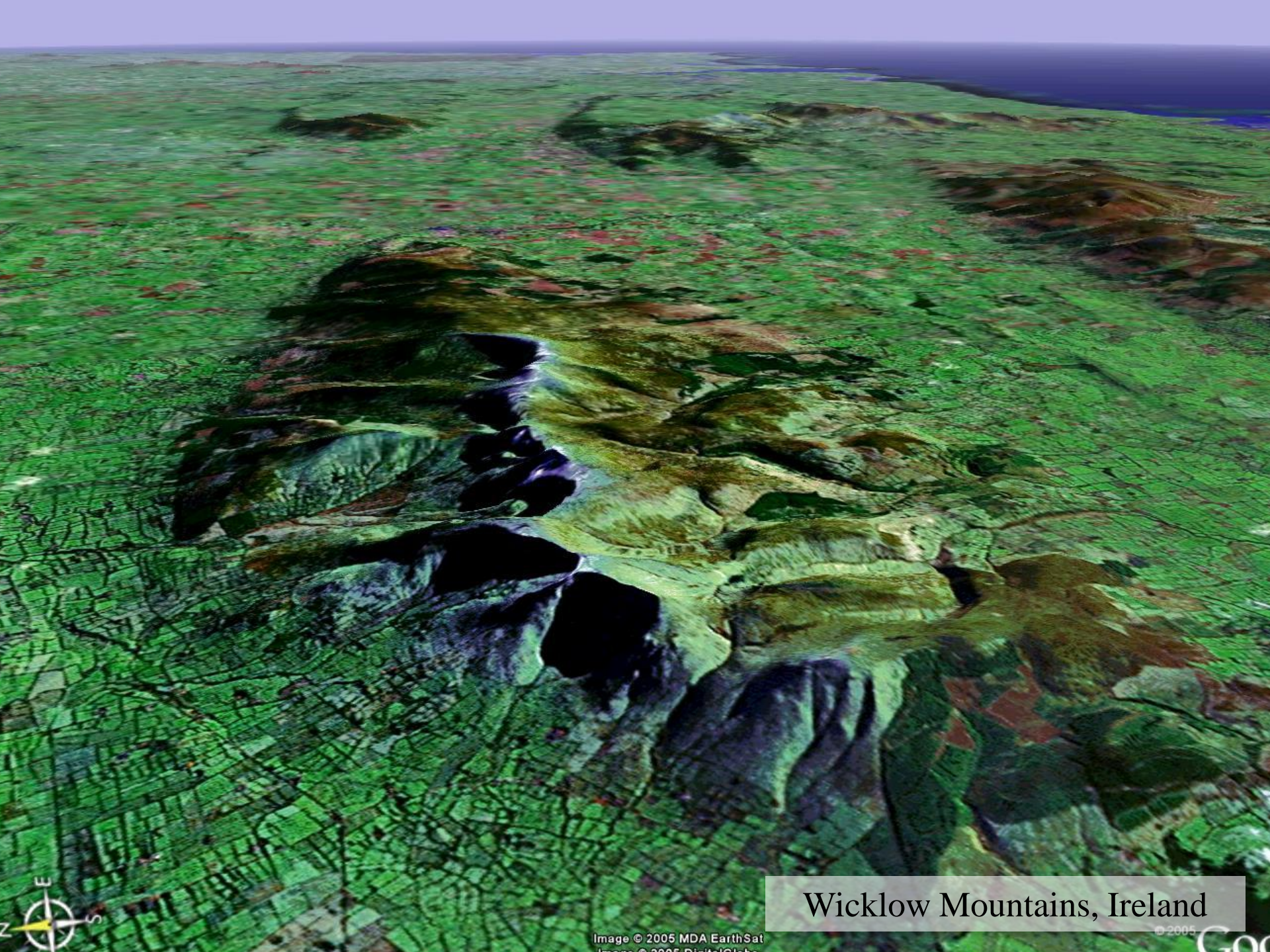
Glacial and non-glacial landforms, Cairngorms, Scotland



The typical textbook illustration: The result of glacial erosion



Diskofjord, Disko Island, Greenland



Wicklow Mountains, Ireland

Evolution of glacial landforms  
requires erosion  
and removal of debris

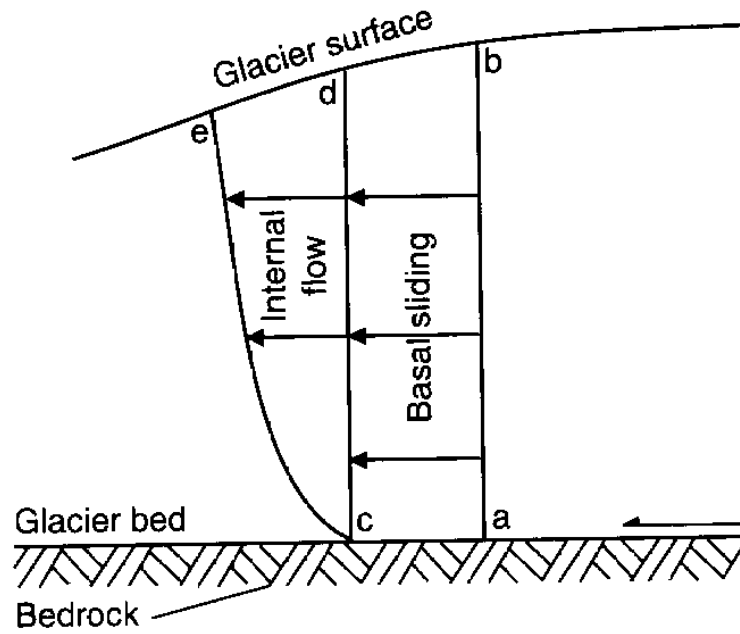


# Glacier erosion: Thermal control

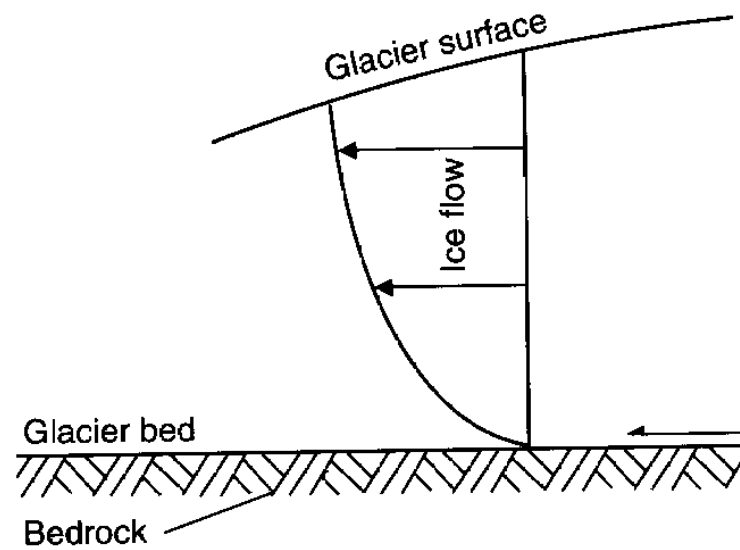


**Thermal glacier type**

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



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











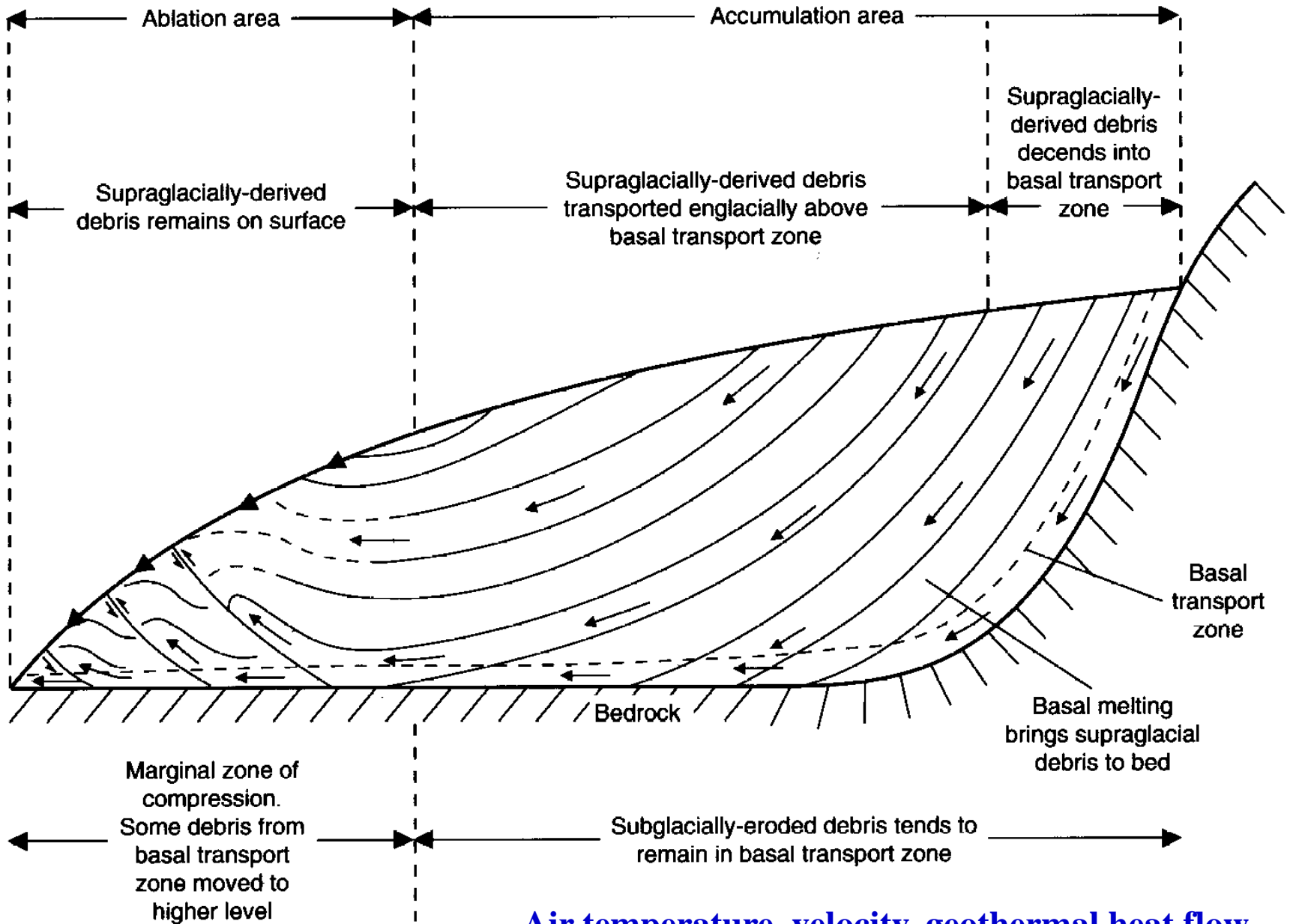






# Controls on glacier temperature

# Controls on glacier temperatures ?



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



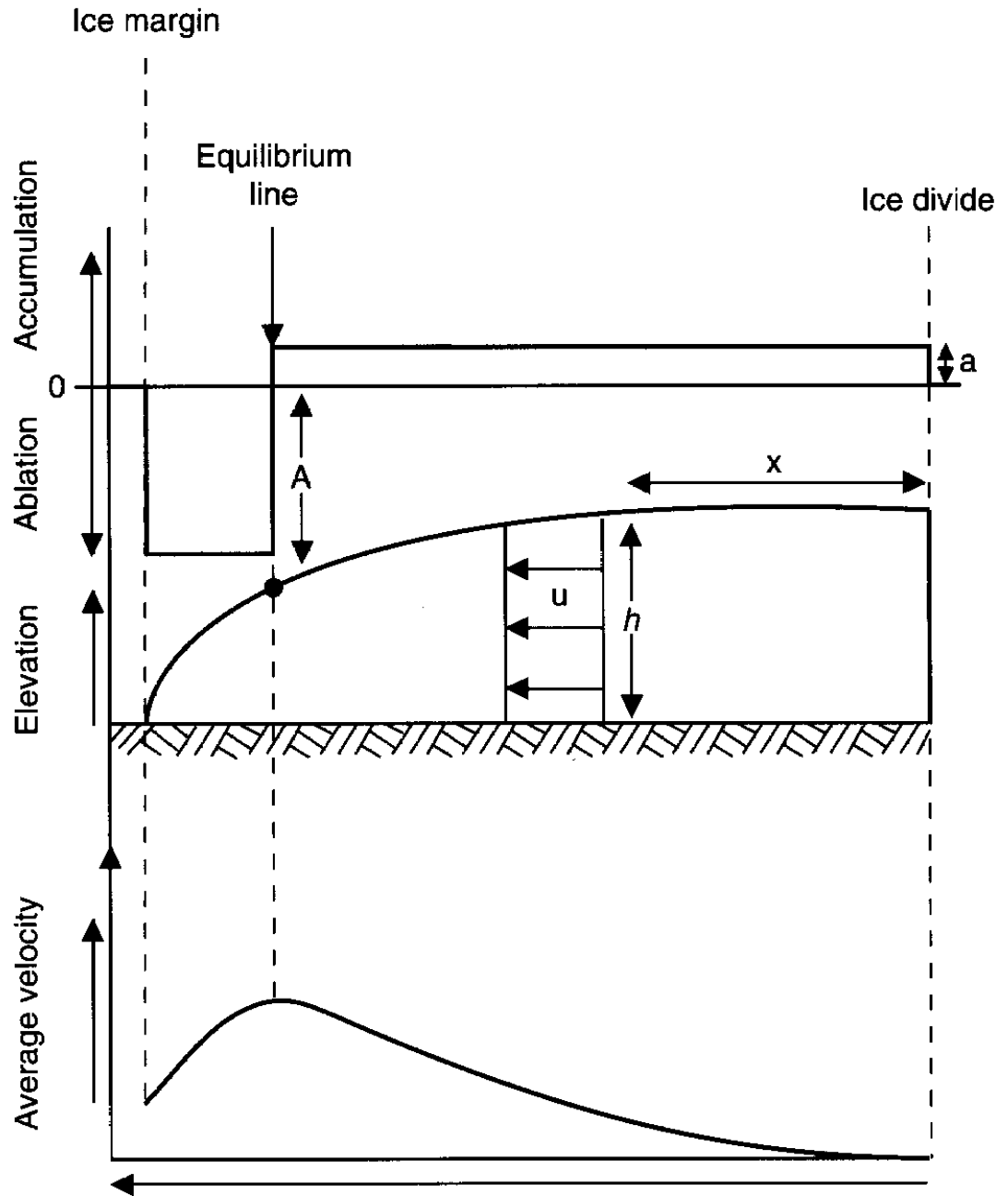
**Flow velocity and crevasses**



Courtesy USGS

**Highest velocity near ELA**

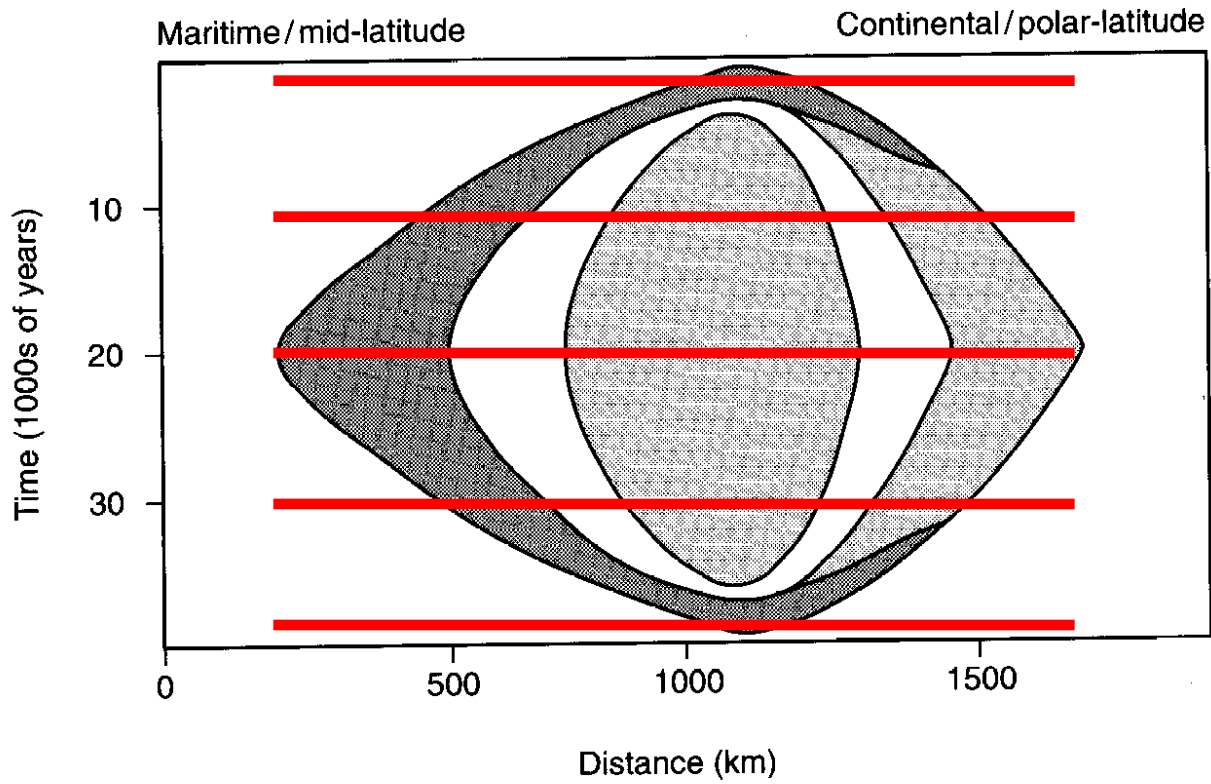
A Mass balance



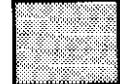


B Ice profile

C Ice velocity

Distance from the ice divide

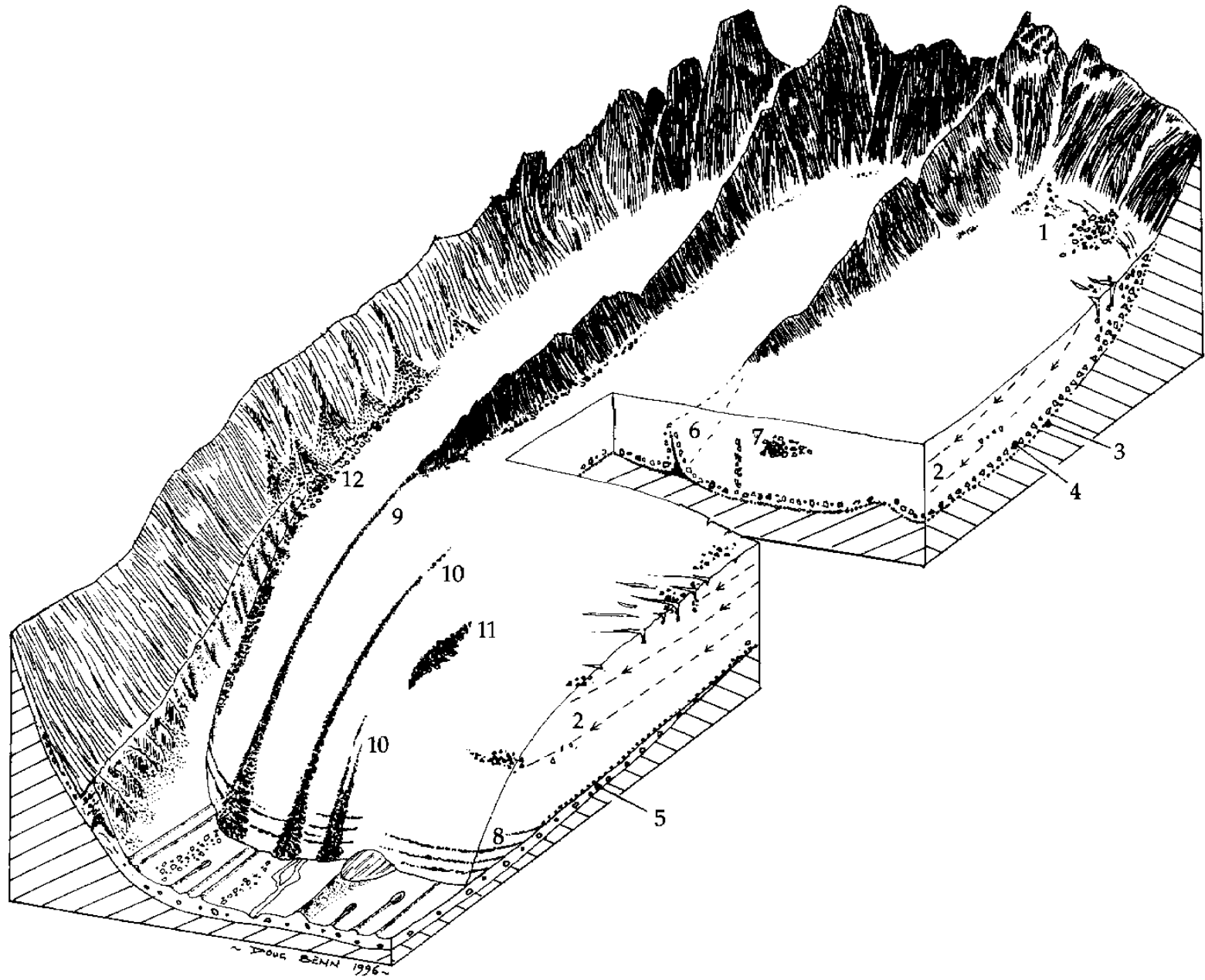


-  Condition A, warm ice
-  Condition B, thermal equilibrium
-  Condition C, cold ice

**Changes over time for an ice sheet**

# Some basic erosional processes





~ DOUG BENN 1996 ~

**Basic erosional processes**

**Basal sliding**





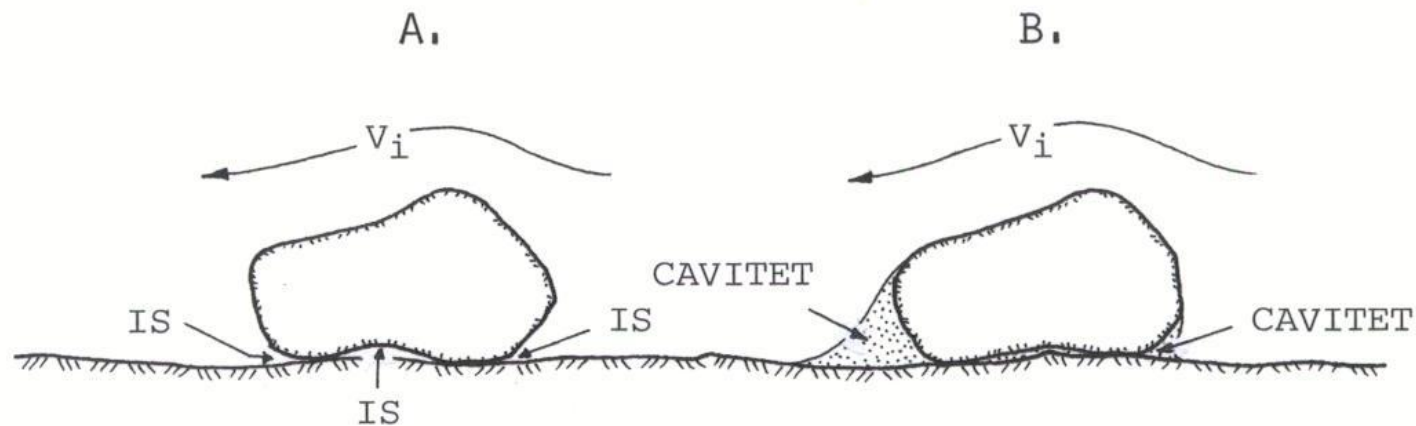
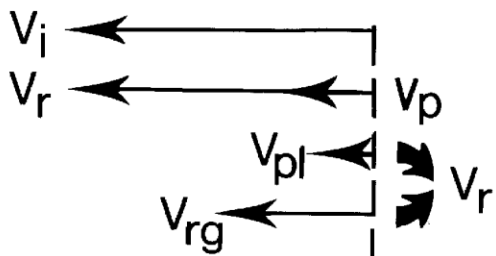
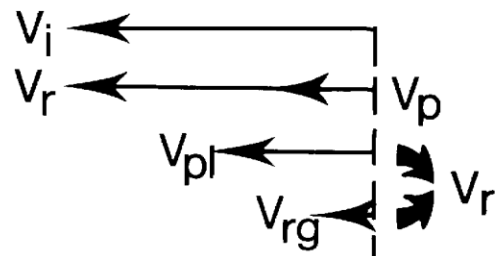


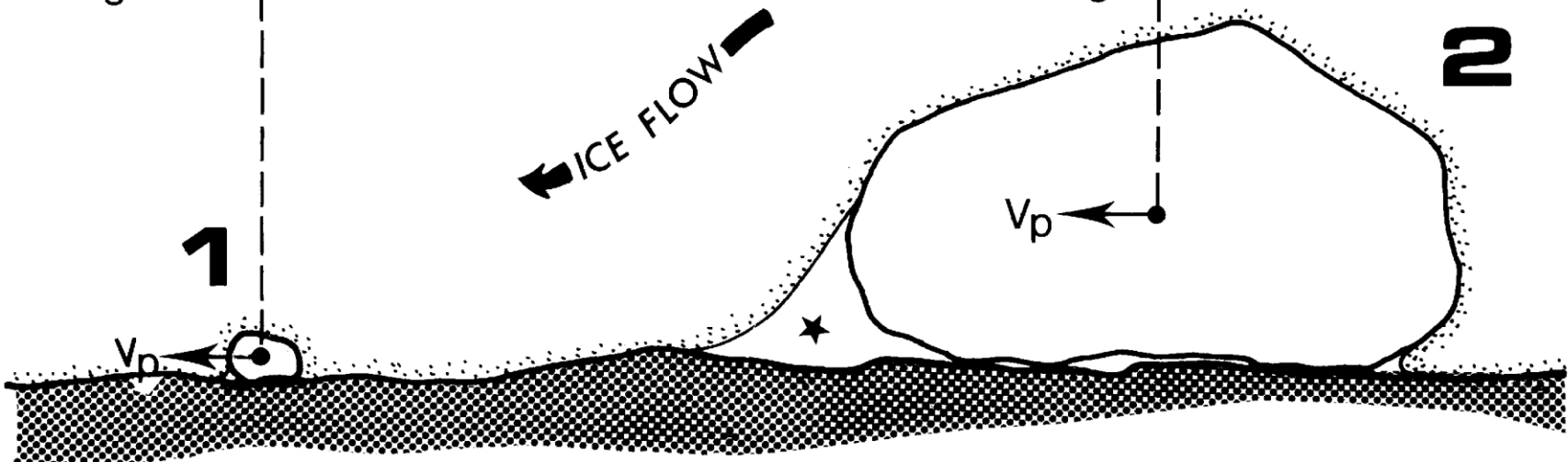
Fig.3.15. Principskitse for to muligheder ( A og B ) for partikler i basal transport. De to situationer er nærmere diskuteret i den ovenstående tekst. I den følgende modelopstilling er situation B anvendt.

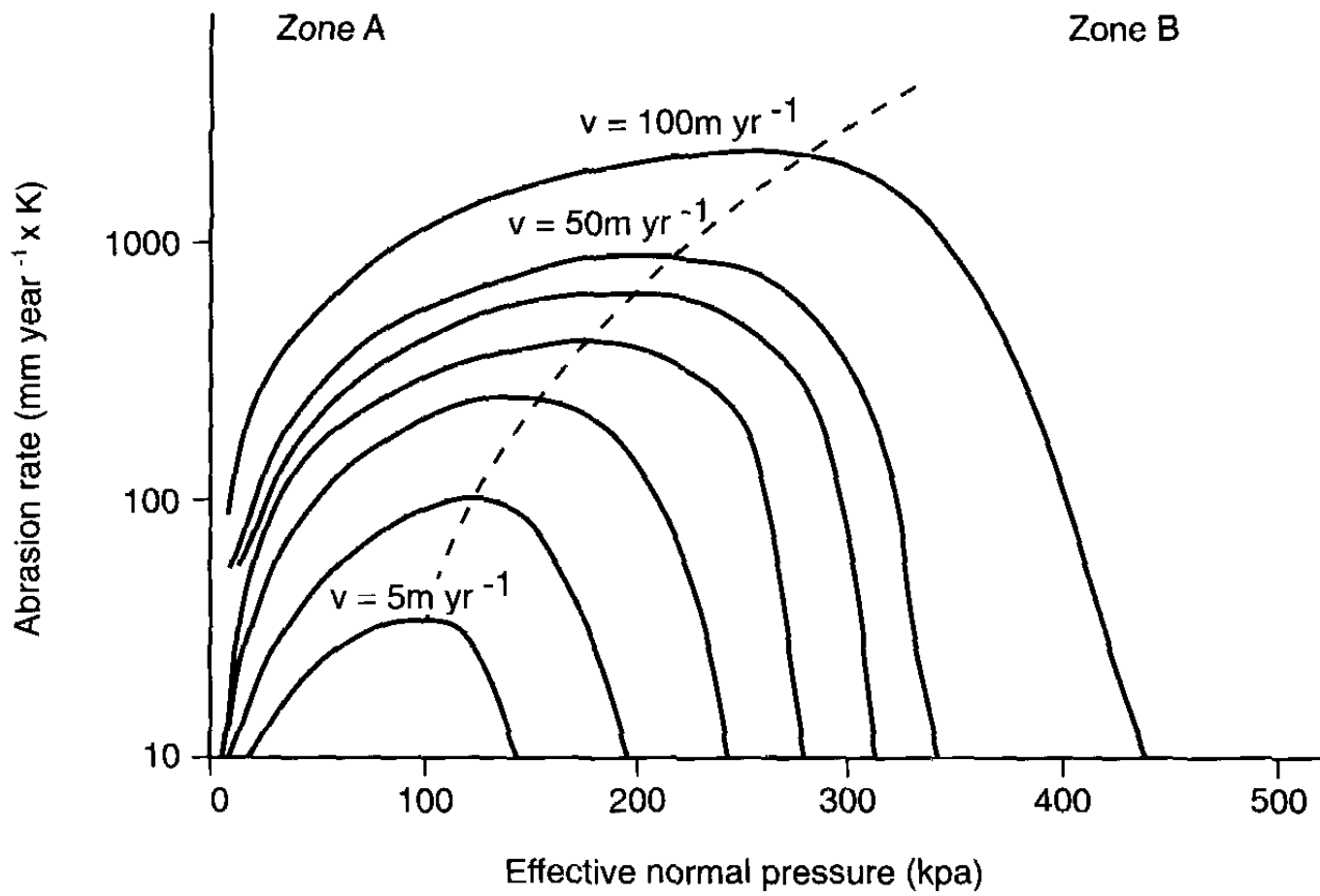


ICE FLOW



2





## Basal debris concentration





Ice abraded bedrock at Chelsea, Ottawa, Canada



# Small erosional features

# Bedrock hardness

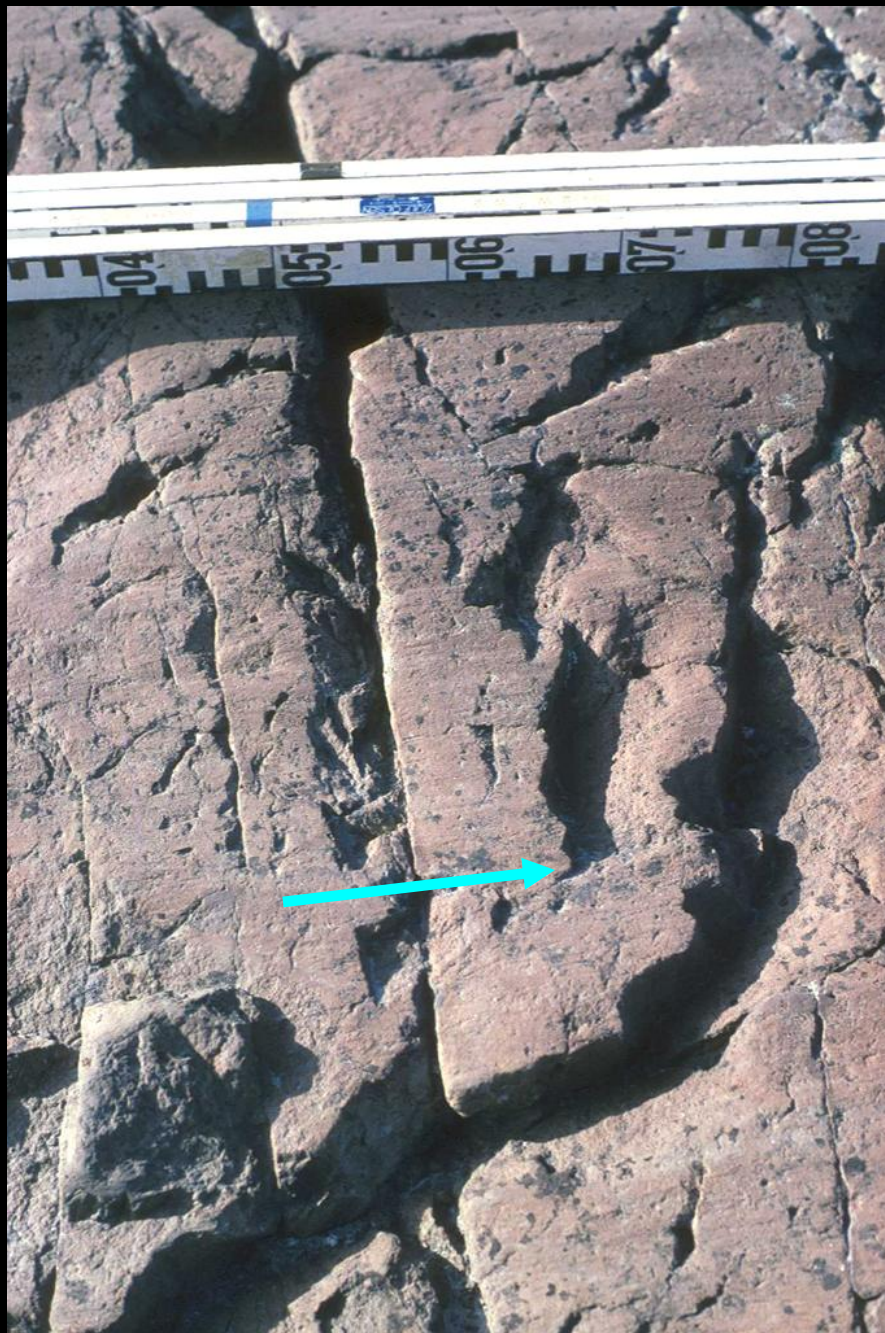




# Bedrock structures







# Chatter marks



Crescentic gouge

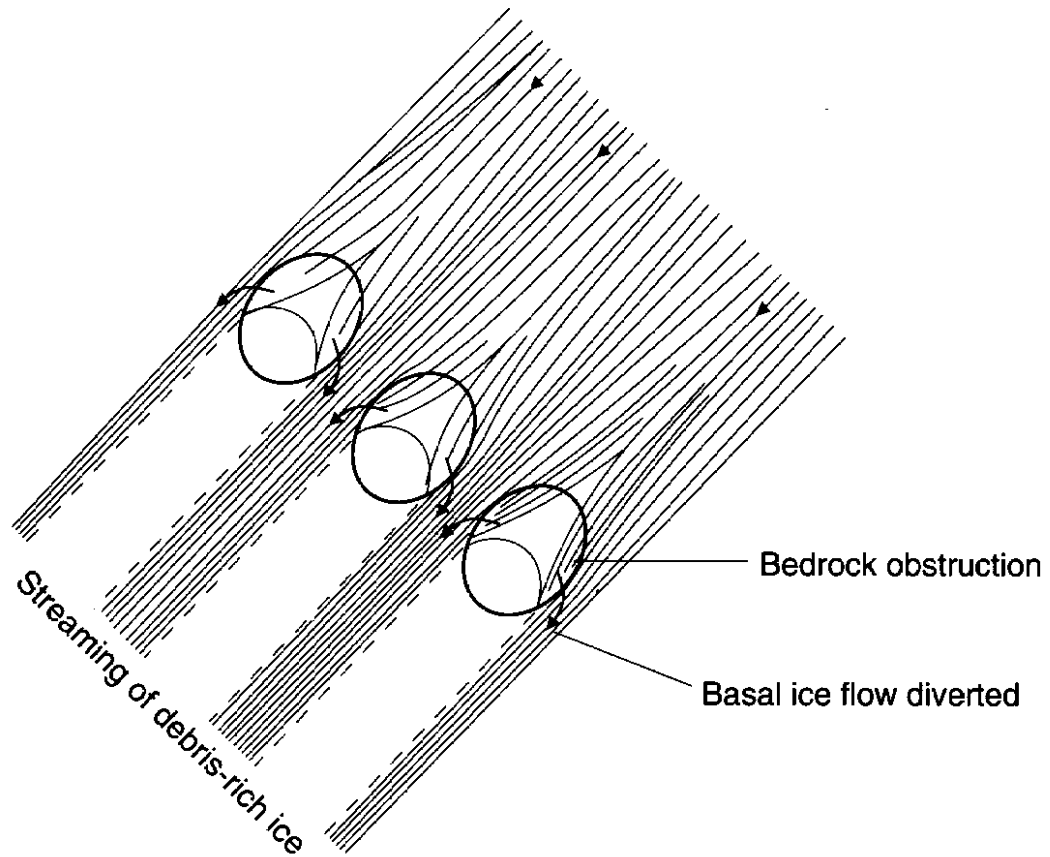
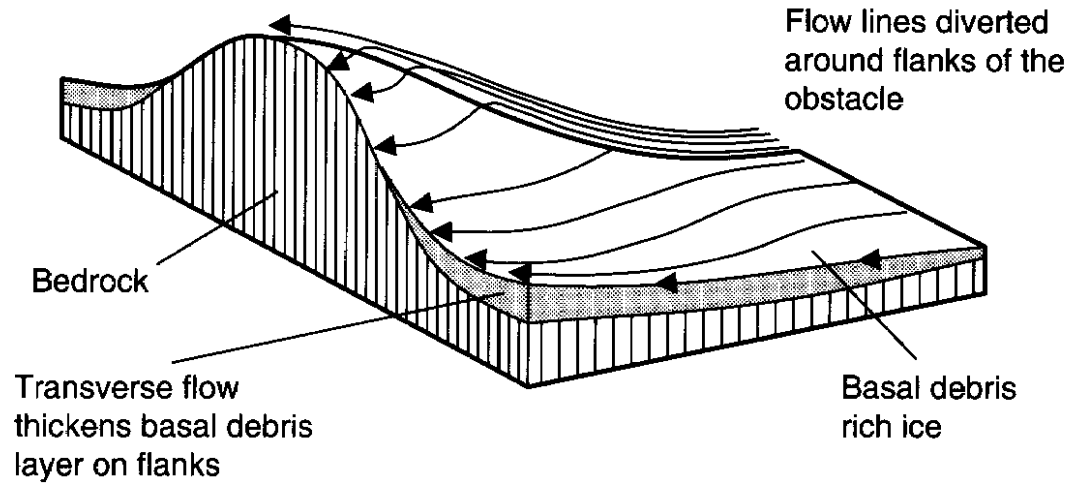






# Basal debris streaming







# Sichelwannen





# Medium erosional features



Chelsea, Ottawa, Canada





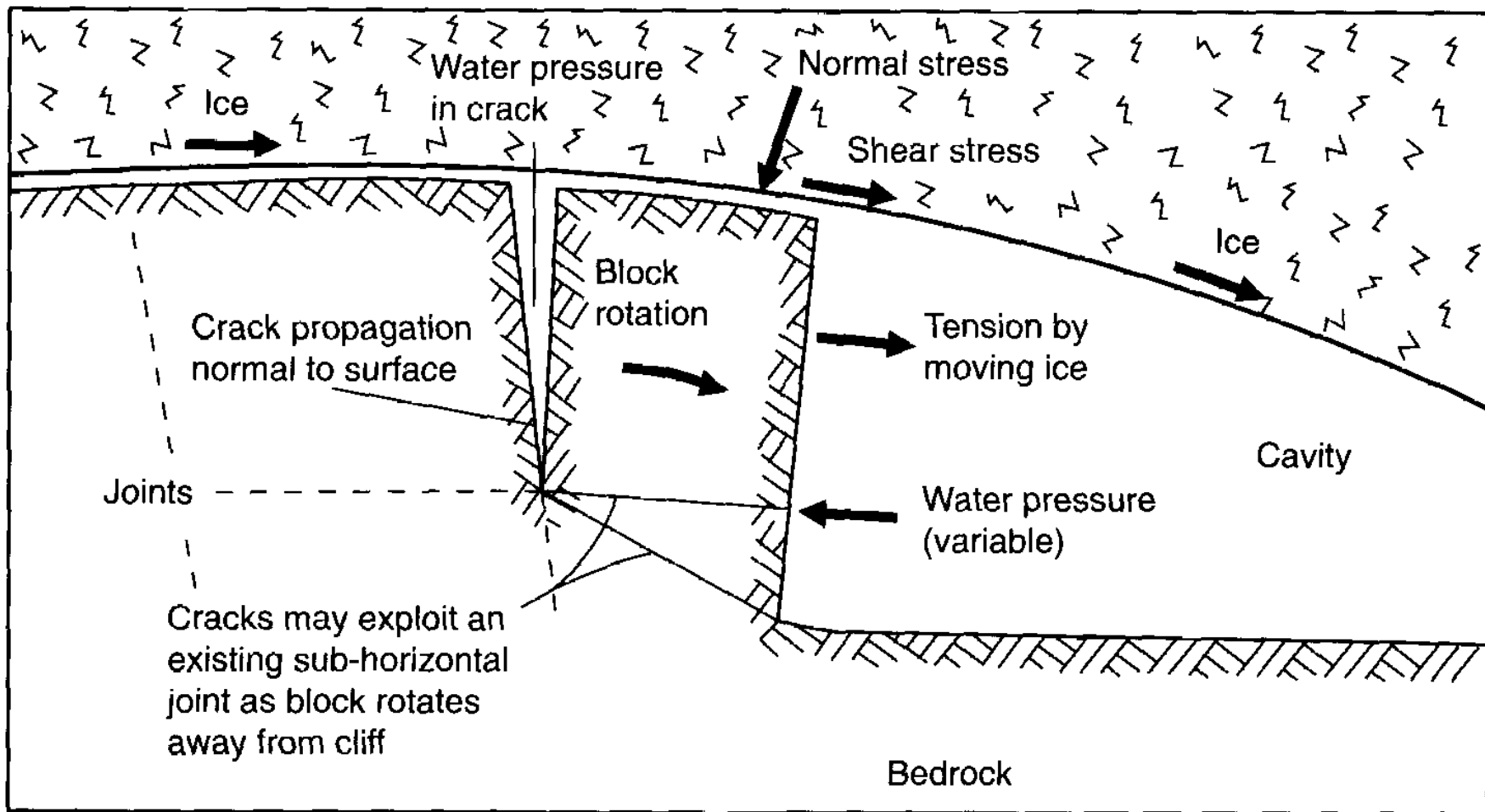


**Roches moutonne's**

# Lodgement boulder







# Large erosional features



Nærøyfjorden, Norway



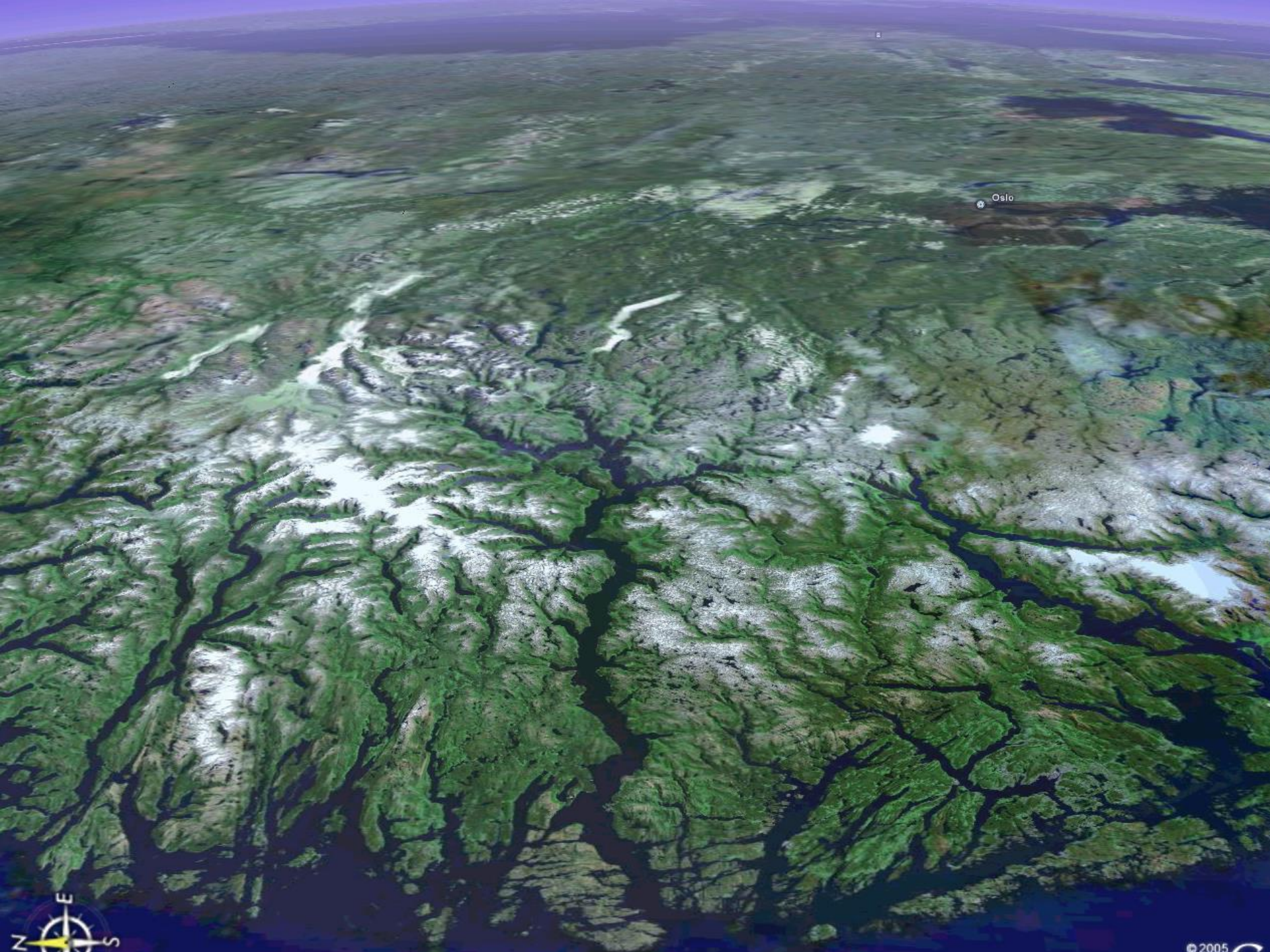












Oslo

