

# Periglacial and permafrost



An introduction

# **Periglacial and permafrost**

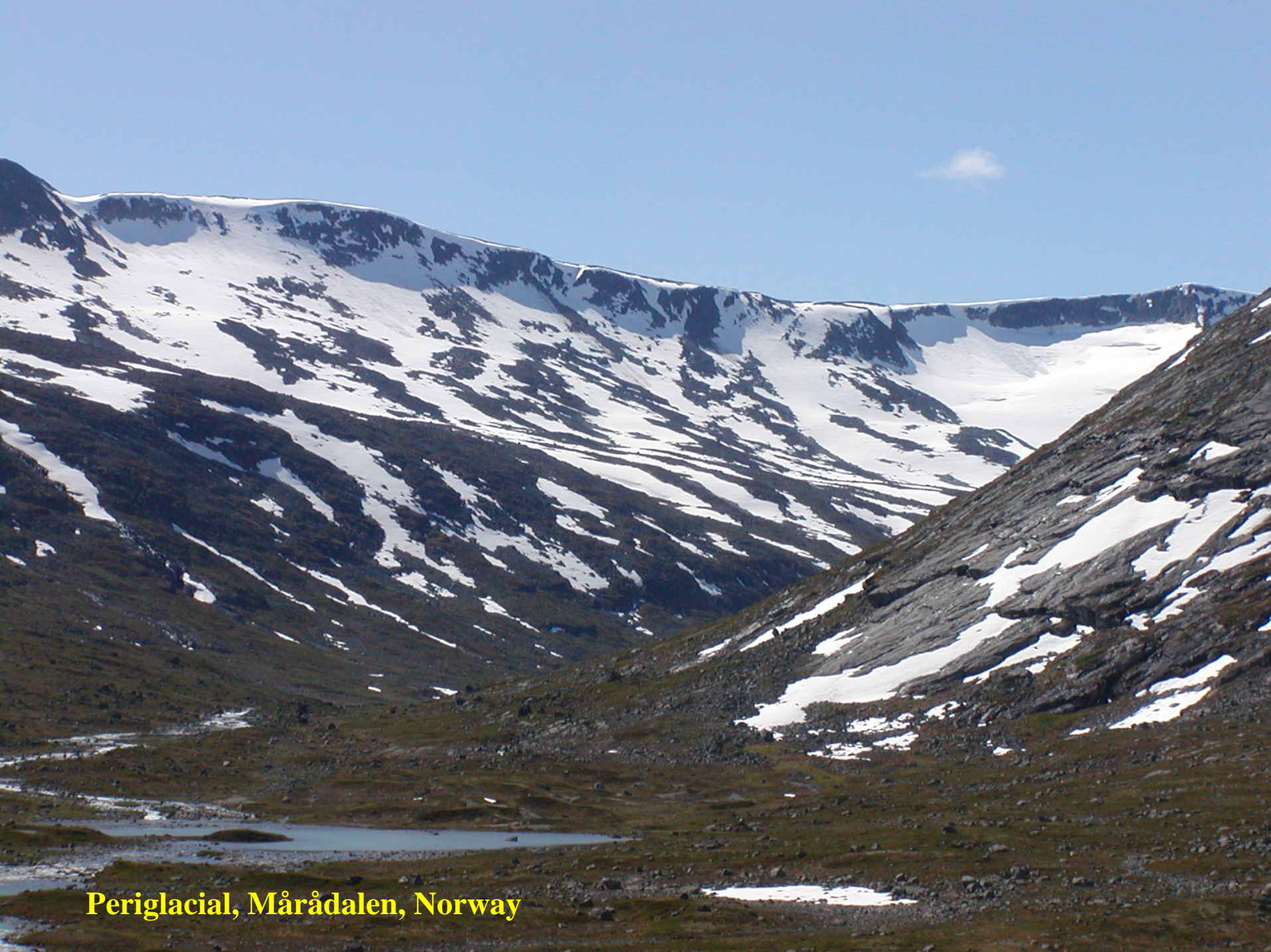
**1: Cold climate non-glaciated environments**

**2: The tree line**

**3: Permafrost**

**4: Periglacial environments**





**Periglacial, Mårådalen, Norway**





**Periglacial, SE Greenland**





**Periglacial and glacial**



# The periglacial environment

- The most important ecological boundary associated with the delimitation of periglacial environments is presumably the tree line.























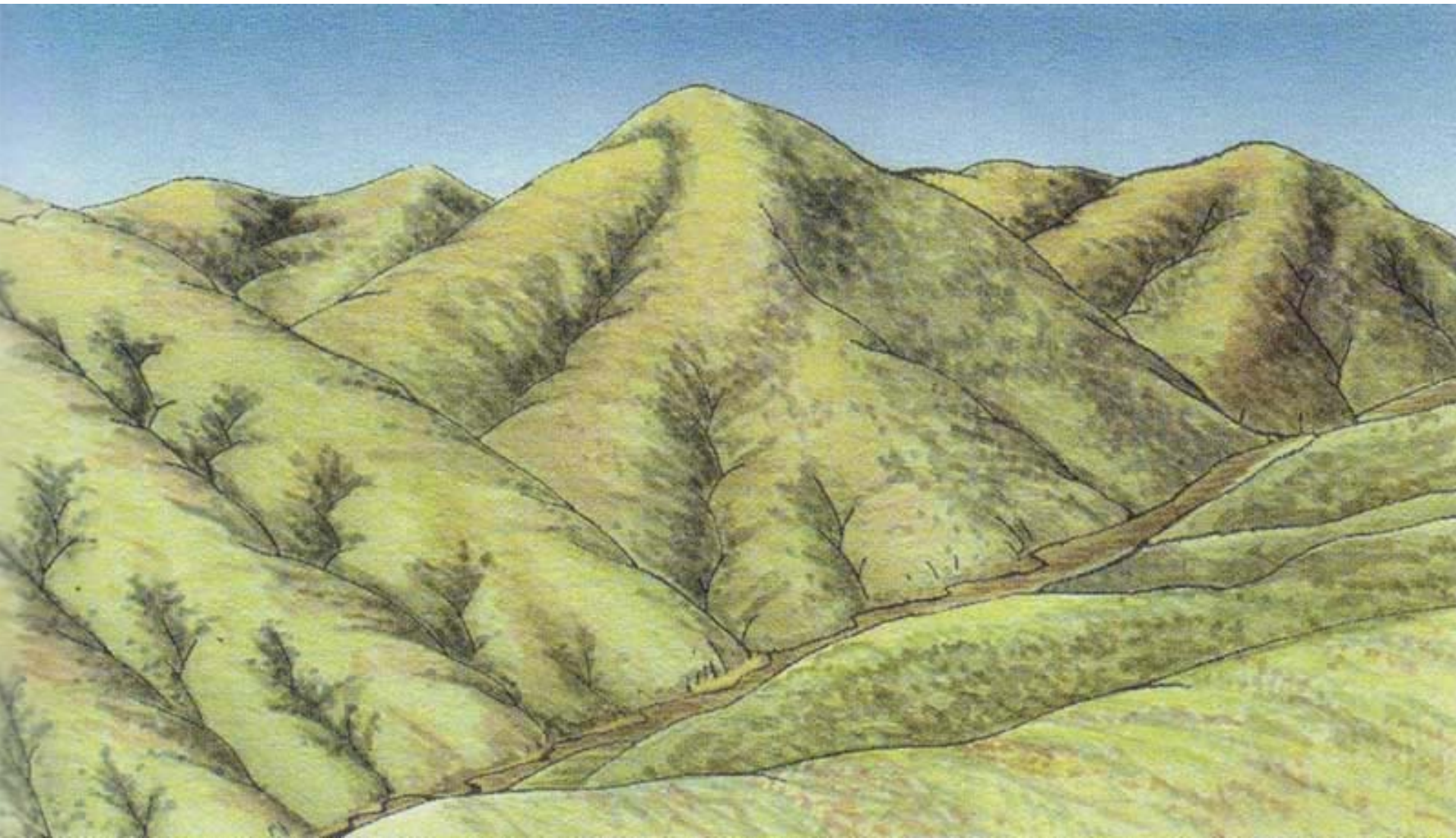






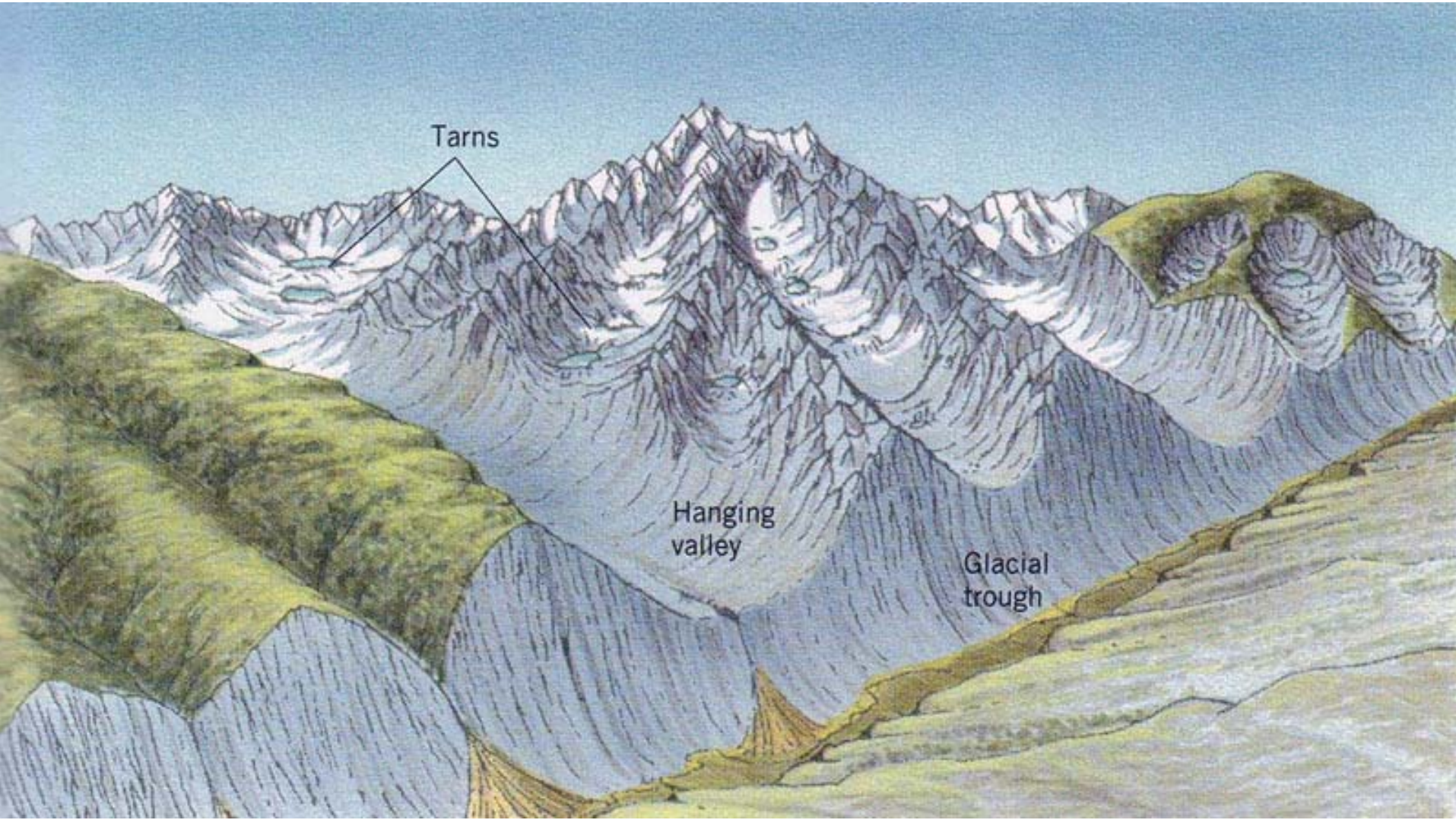
**Glacial environment**





Pre-glacial landscape





Glaciated landscape with periglacial nunataqs









----- **Glaciation level**

----- **Treeline**

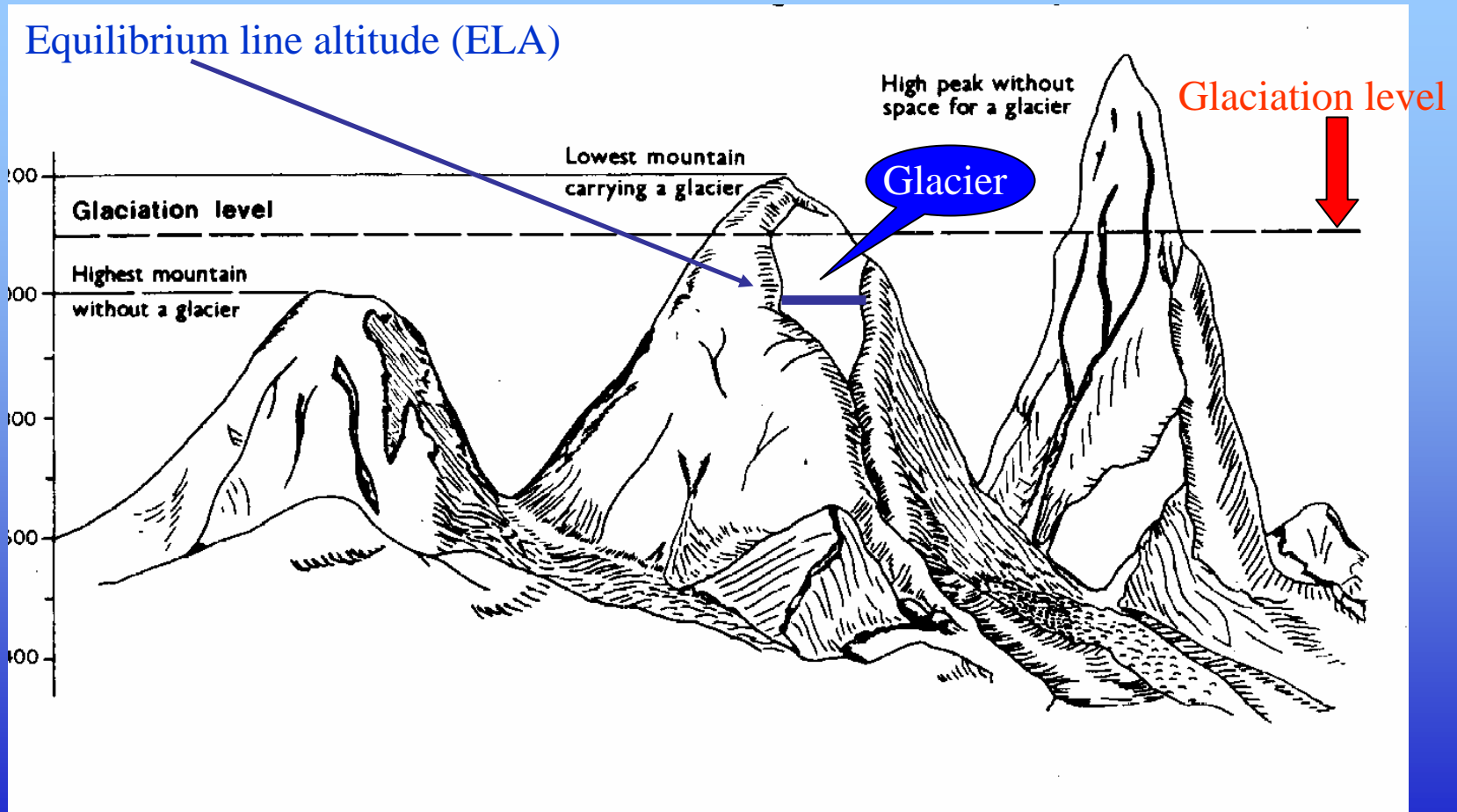




----- Glaciation level

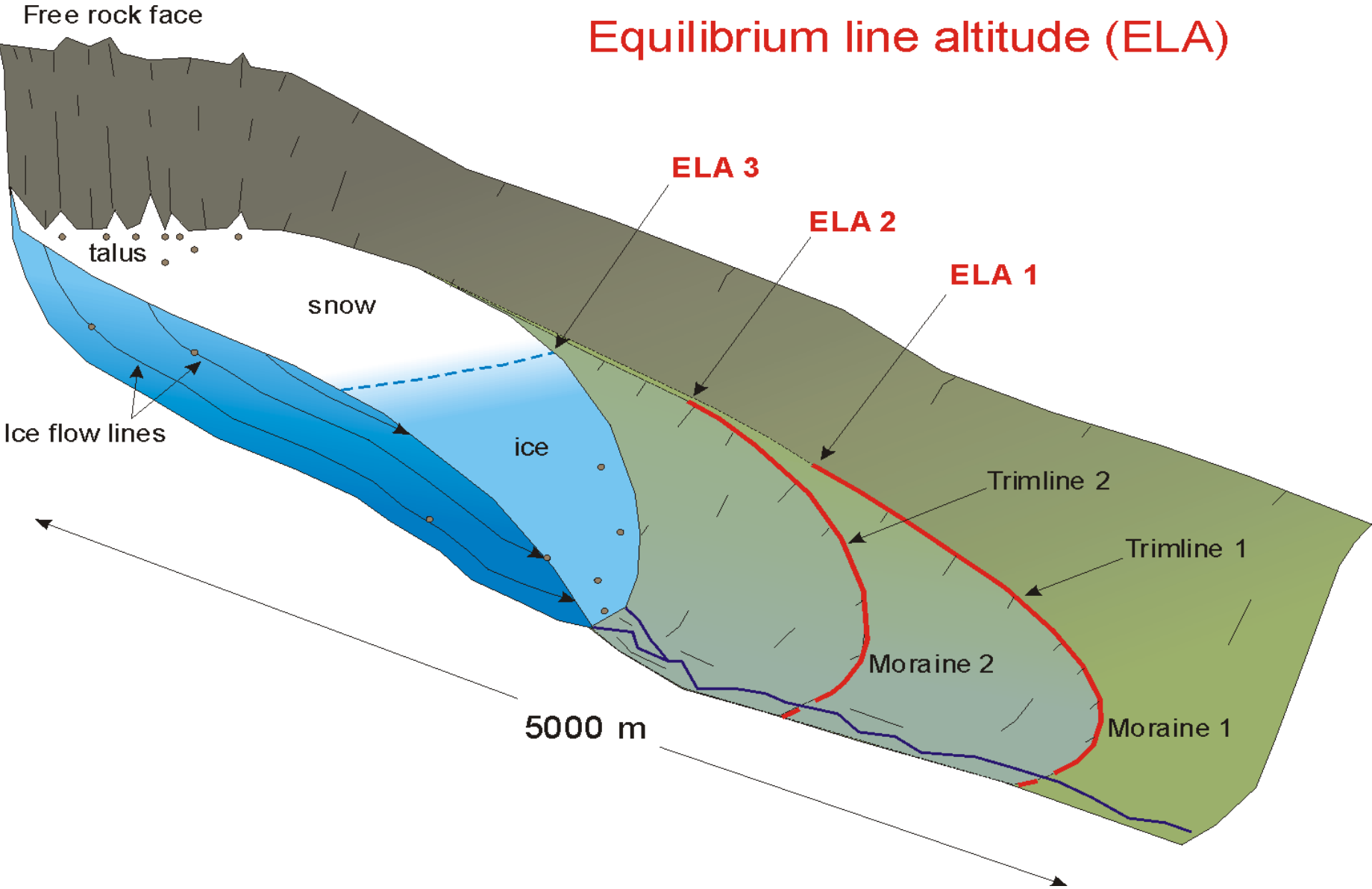


# The glaciation level

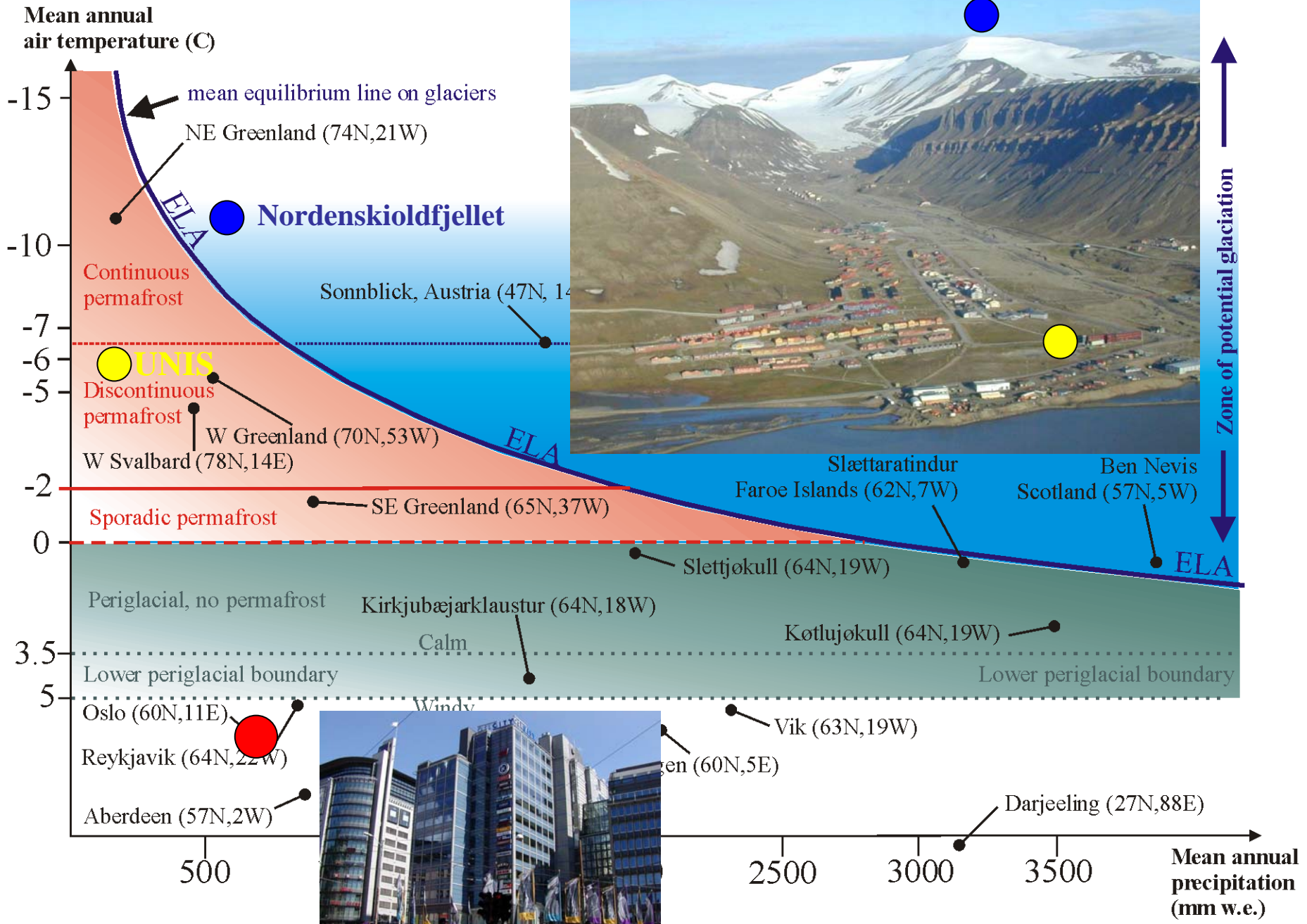




# Equilibrium line altitude (ELA)









# Permafrost

## **Definition:**

Permafrost is defined on the basis of **temperature**: that is ground (i.e. soil, sediments, bedrock, etc.) that remains at or below 0°C (i.e. the pressure melting point for pure ice) for at least two consecutive years. Moisture, in the form of water or ice, may or may not be present in permafrost

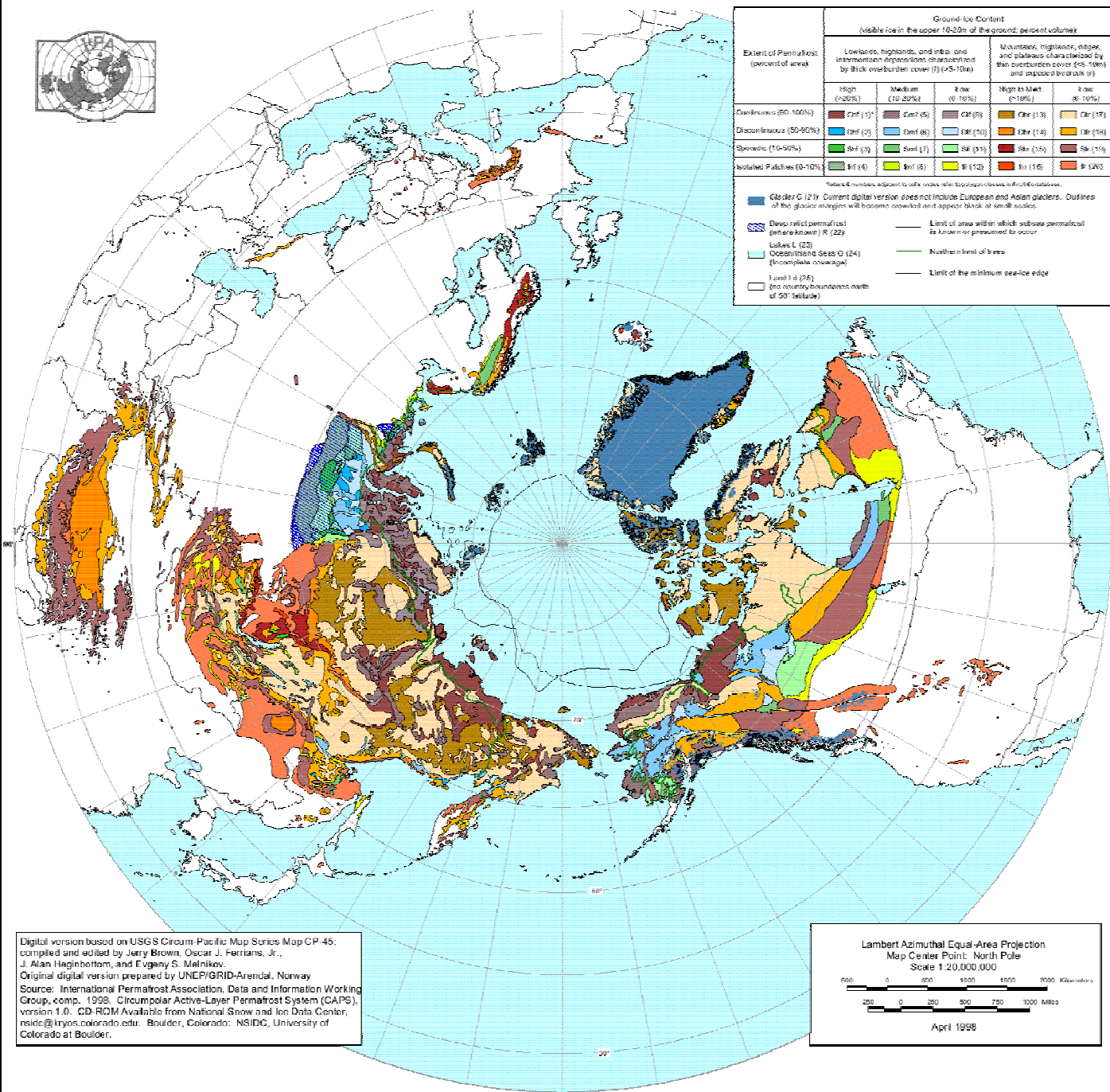
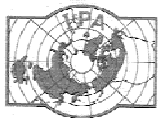
## **However:**

Permafrost may not necessarily be frozen since the freezing point of included water may be depressed several degrees below 0°C.

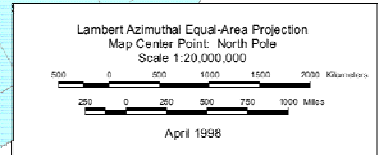


# CIRCUM-ARCTIC MAP OF PERMAFROST AND GROUND-ICE CONDITIONS

## Modern permafrost distribution in the northern hemisphere



Digital version based on USGS Circum-Pacific Map Series Map CP-45; compiled and edited by Jerry Brown, Oscar J. Ferrans, Jr., J. Alan Haginbottom, and Evgany S. Melnikov. Original digital version prepared by UNCP/GRID-Arendal, Norway. Source: International Permafrost Association, Data and Information Working Group, comp. 1998. Circumpolar Active-Layer Permafrost System (CAPS), version 1.0. CD-ROM Available from National Snow and Ice Data Center, nsidc@kryos.colorado.edu. Boulder, Colorado: NSIDC, University of Colorado at Boulder.





## **Permafrost importance:**

In modern times, permafrost covers about 25% of the non-glaciated land surface

During the Quaternary glacial periods, permafrost covered about 50% of the non-glaciated land surface

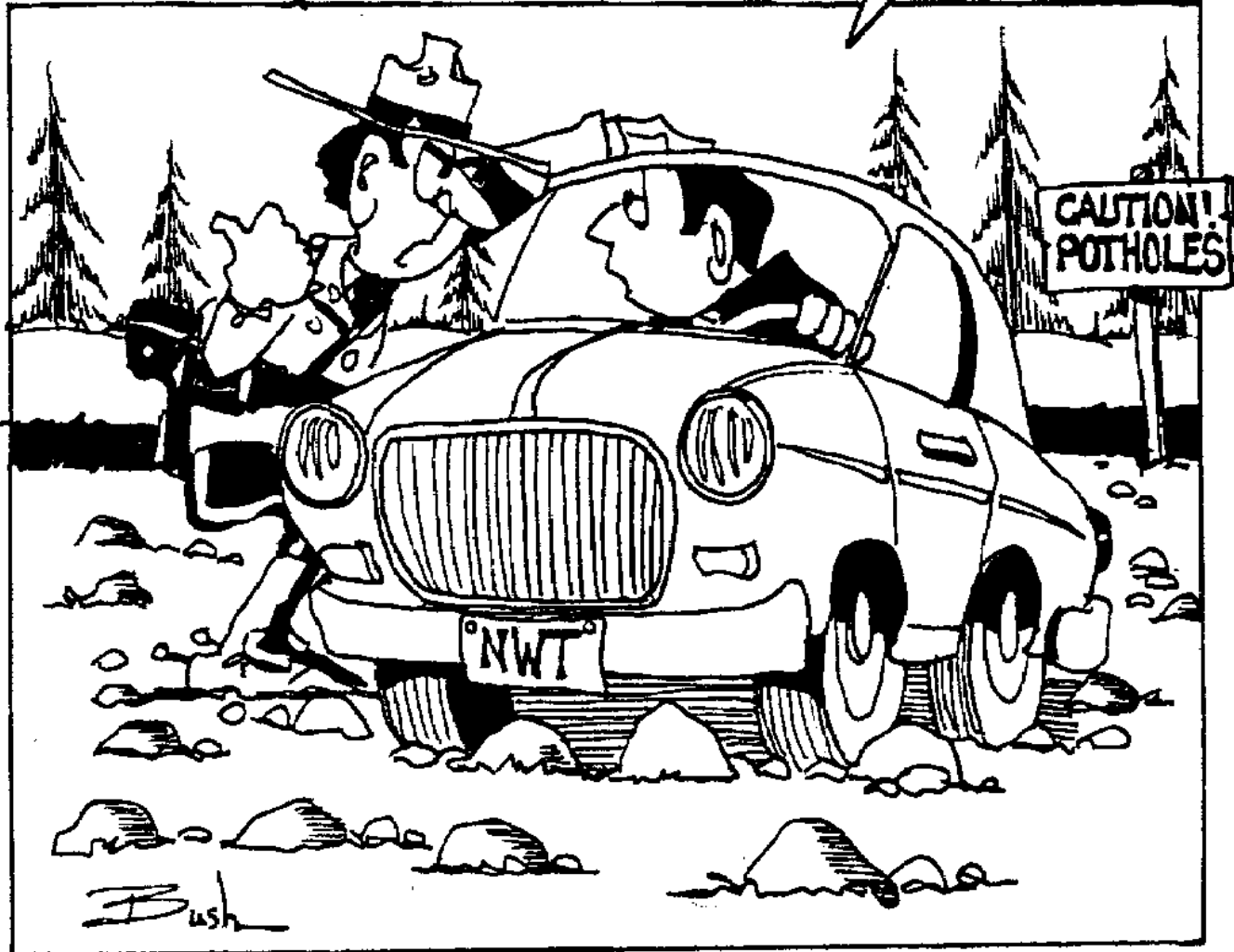
Permafrost thickness and distribution varies with climate

A series of specific problems arise during construction work in permafrost regions



ANY PARTICULAR REASON  
YOU'RE DRIVING IN THE DITCH  
INSTEAD OF ON THE ROAD?

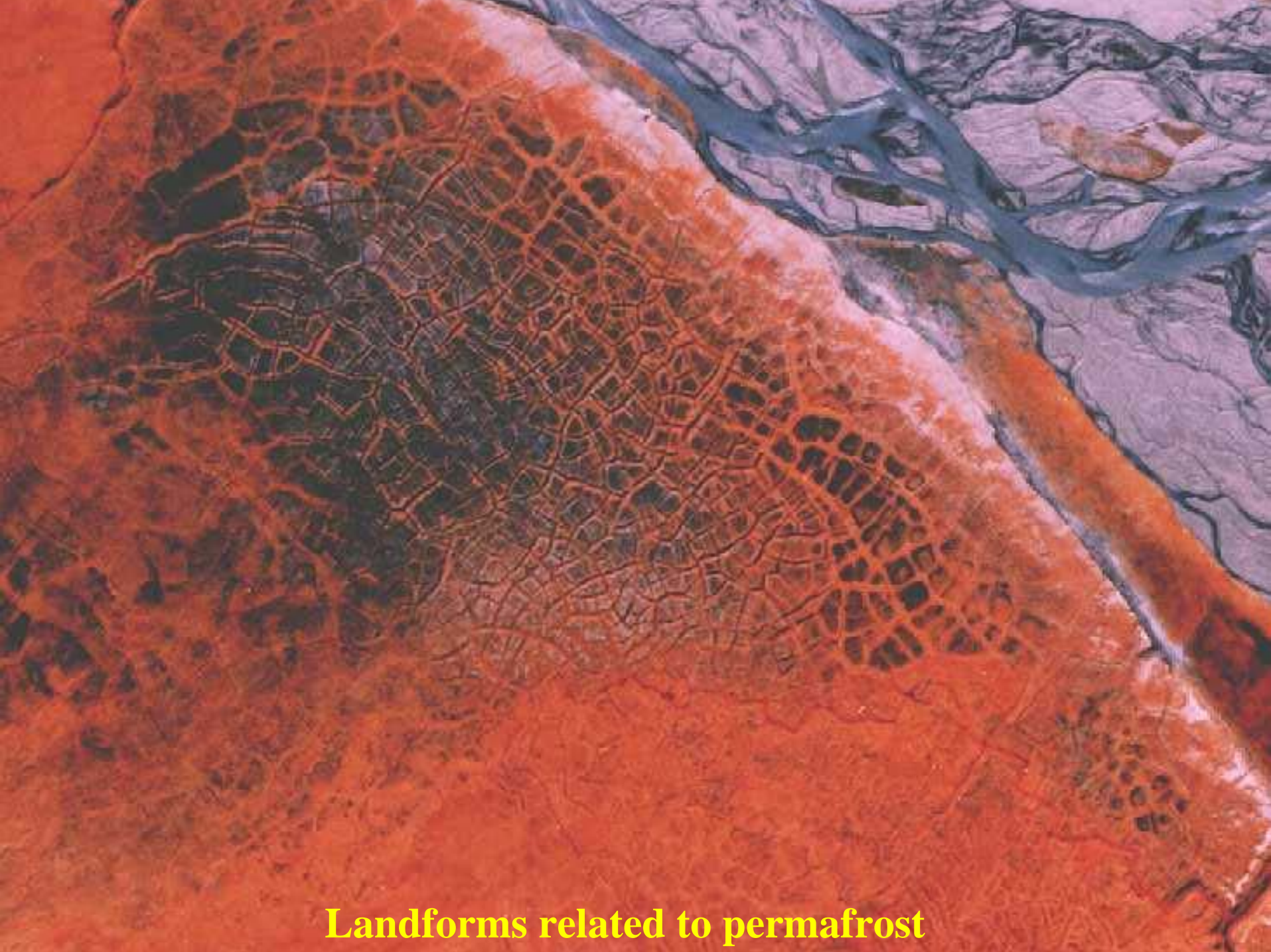
FEWER BUMPS.











**Landforms related to permafrost**



































# Periglacial

## **Definition:**

Periglacial environments are characterised by frost action and the recurrent presence of a snow cover. If the ground surface consists of sediments, sorted ground phenomena are widespread.

## **Please note:**

Periglacial environments may have permafrost but many periglacial regions have not.



# More about periglacial environments



- Freezing and thawing of the ground
- Permafrost may or may not be present
- Solifluction and patterned ground of a frost-action nature frequent
- The most important ecological boundary associated with the delimitation of periglacial environments is presumably the treeline
- Regions with a mean annual air temperature (MAAT) below 3°C (5°C in windy regions) should be considered periglacial

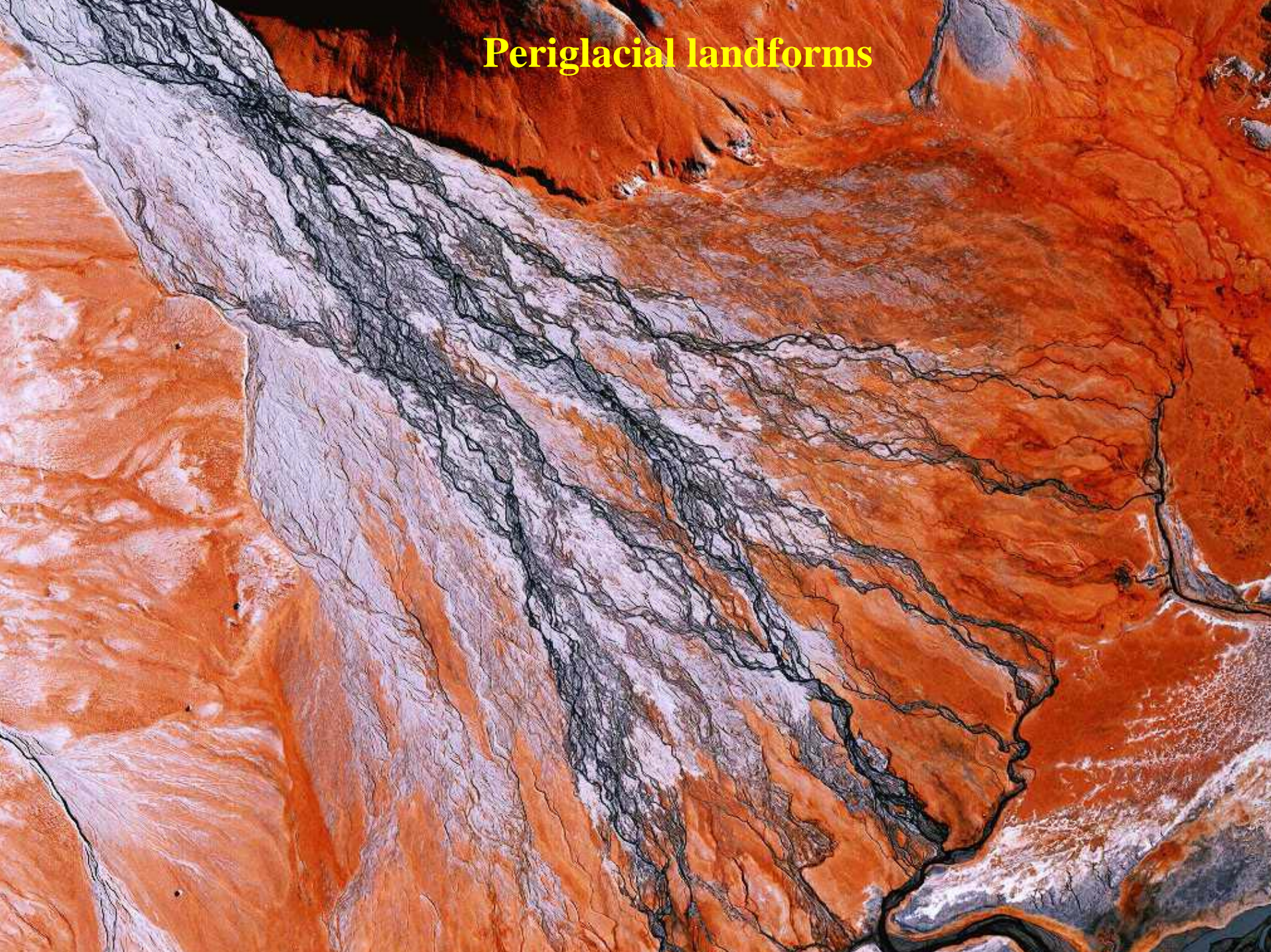




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# Periglacial landforms

































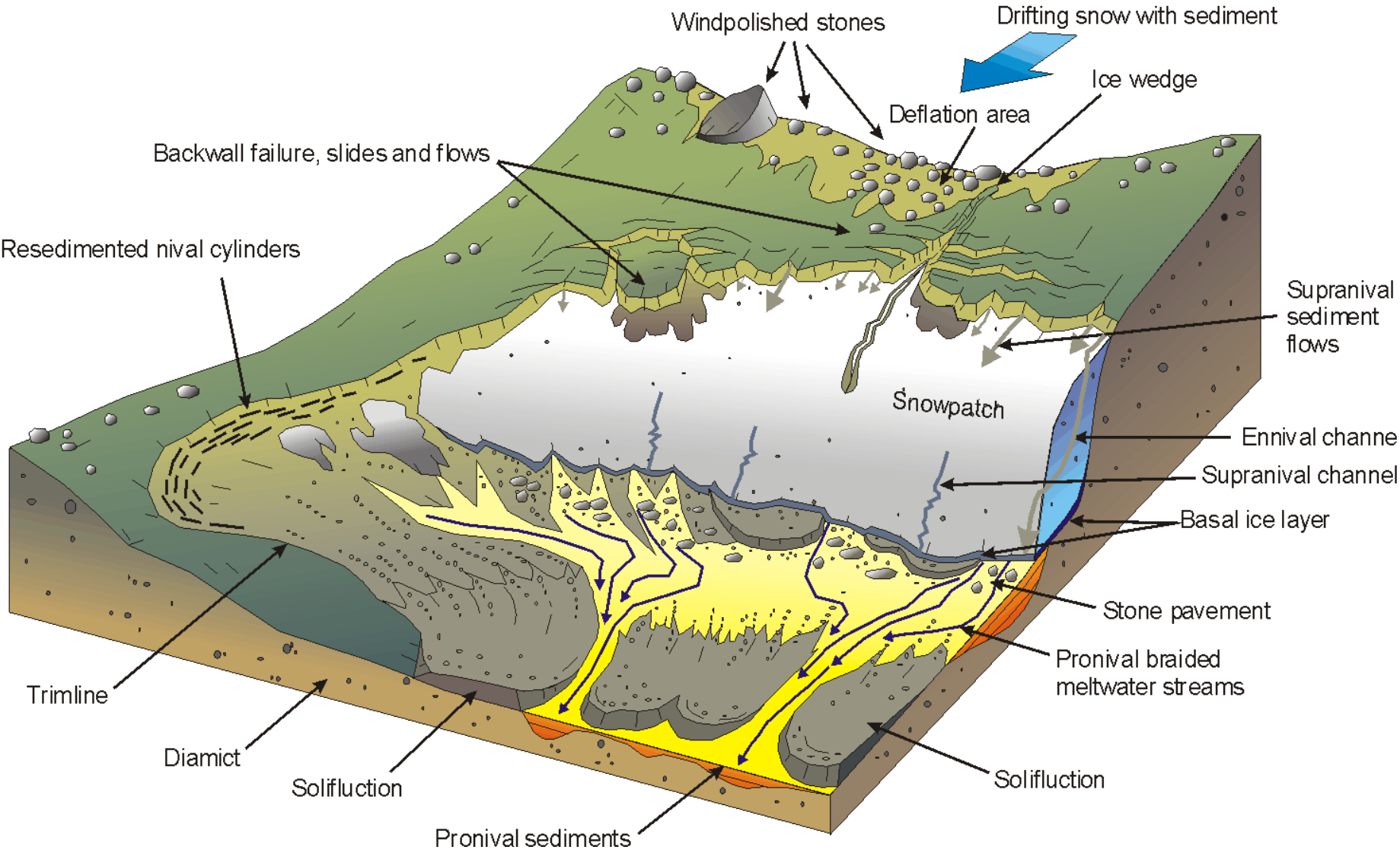








# High Arctic Nivation Process-Form-Sediment Model







**Glacial**  
**Periglacial**  
**Permafrost**