Università degli Studi di Ferrara

Dipartimento di Studi Umanistici

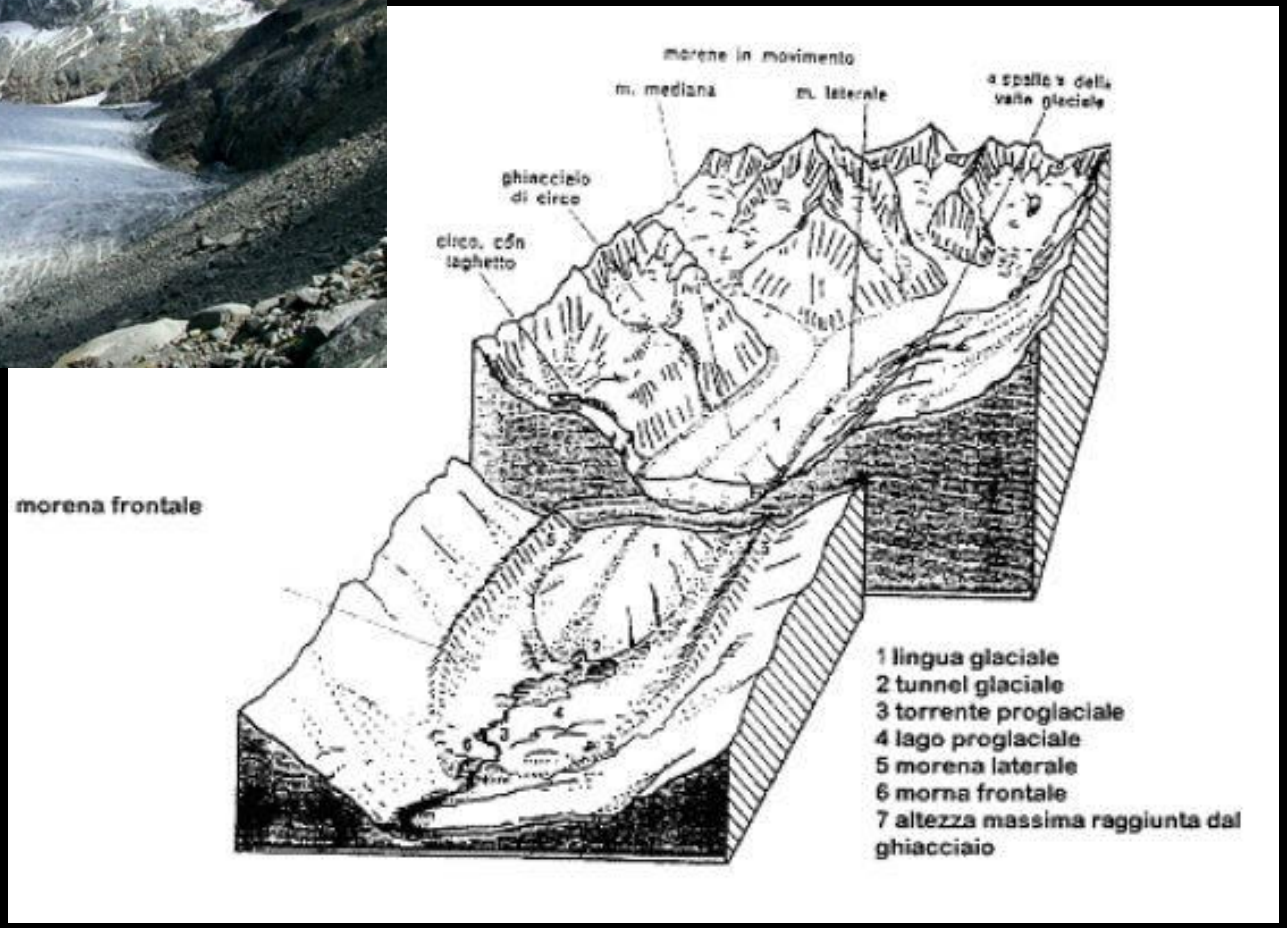
Ecologia Preistorica

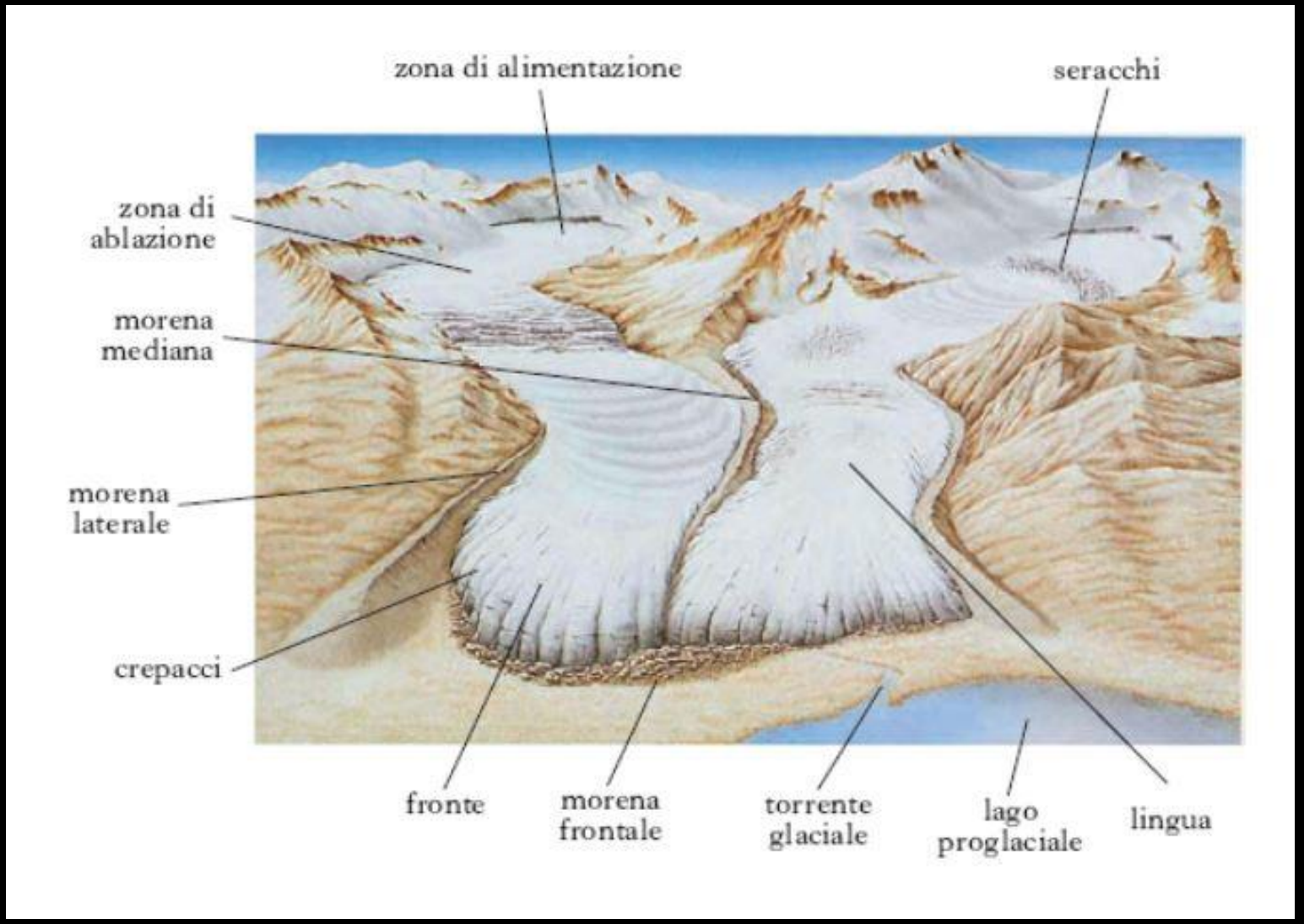
Prof. Marco Peresani

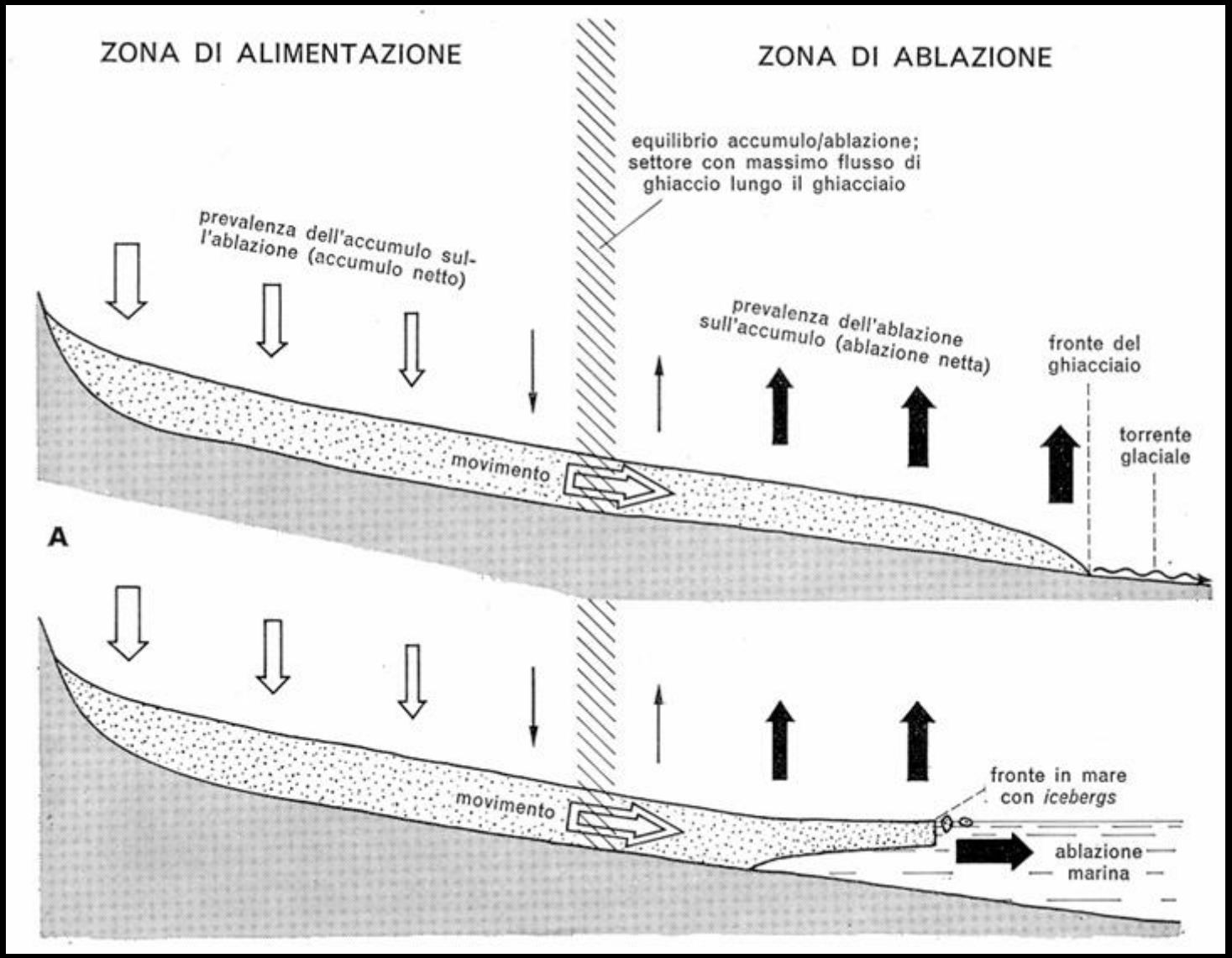
A.A. 2021-2022

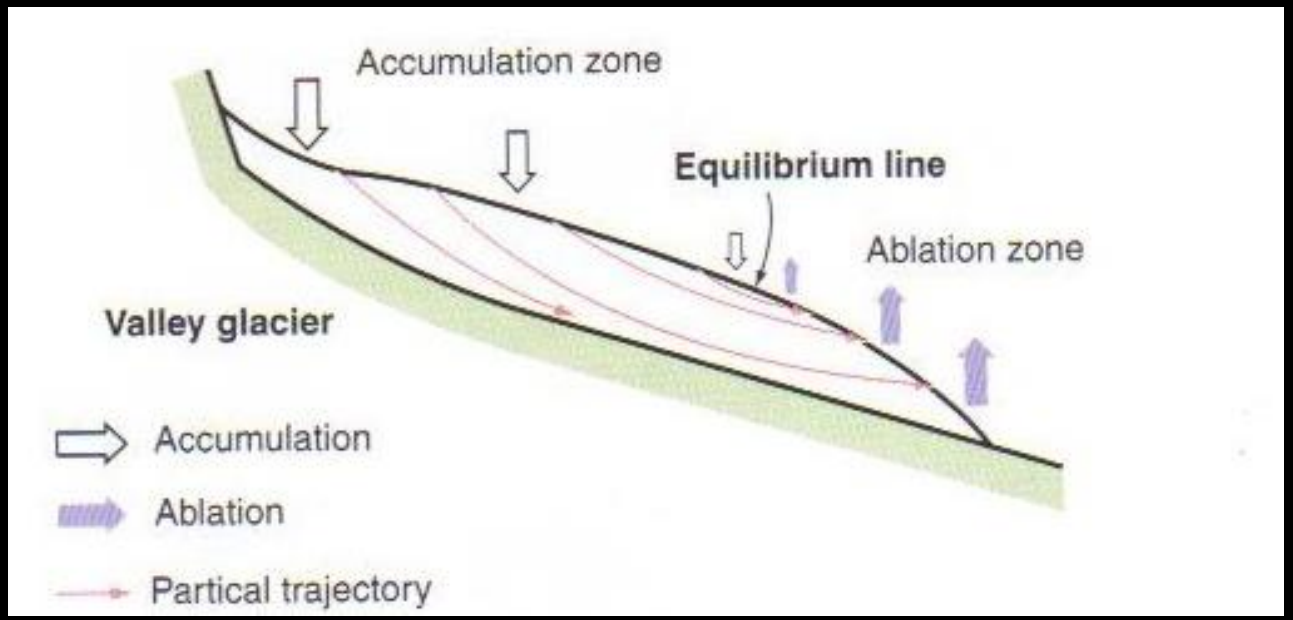
Lezione 5 – Glacialismo e morfologia glaciale

Glacialismo: complesso delle trasformazioni del paesaggio fisico verificatesi in passato causa delle glaciazioni, attraverso l'azione di modellamento, erosione, trasporto e sedimentazione dei ghiacciai.



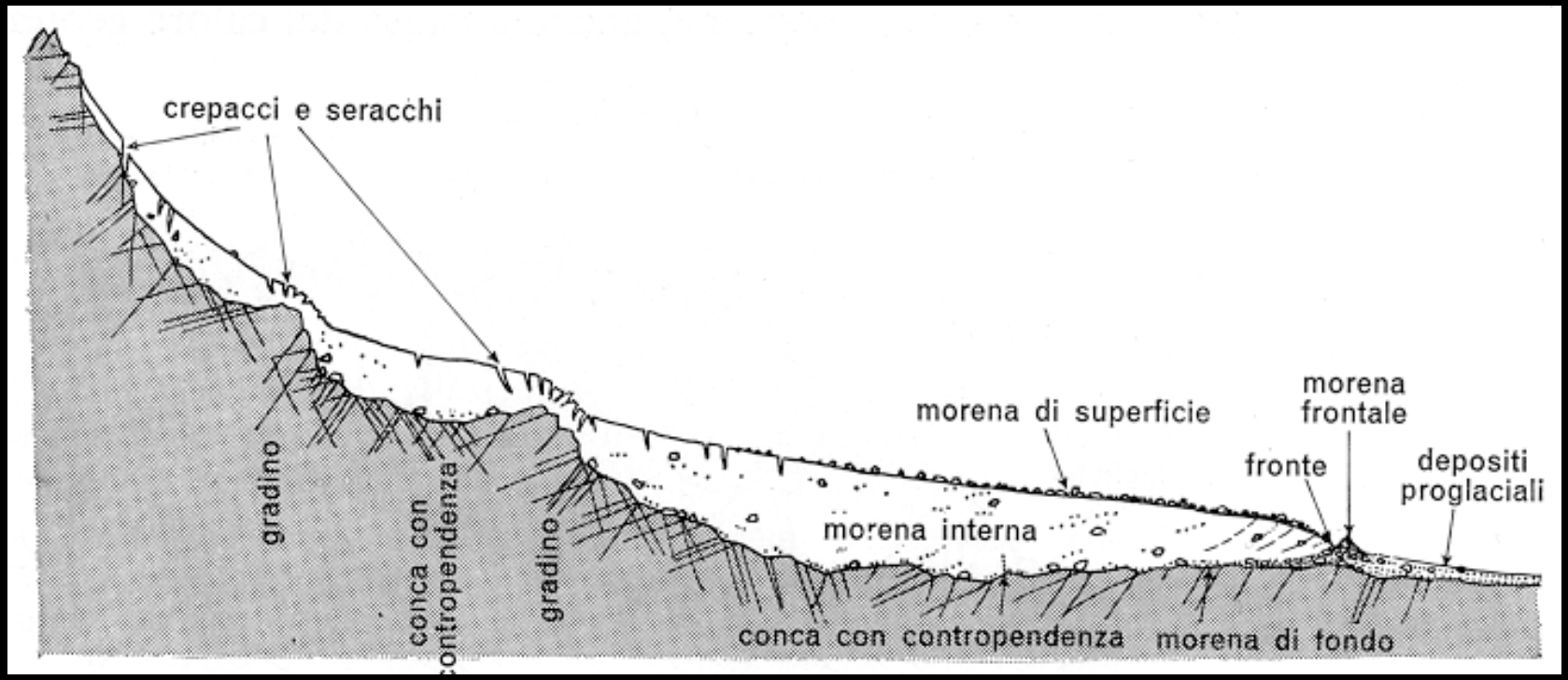

zona di alimentazione
seracchi
zona di ablazione
morena mediana
morena laterale
crepacci
fronte
morena frontale
torrente glaciale
lago proglaciale
lingua


ZONA DI ALIMENTAZIONE
ZONA DI ABLAZIONE
equilibrio accumulo/ablazione; settore con massimo flusso di ghiaccio lungo il ghiacciaio
prevalenza dell'accumulo sull'ablazione (accumulo netto)
prevalenza dell'ablazione sull'accumulo (ablazione netta)
fronte del ghiacciaio
torrente glaciale
movimento
A
movimento
fronte in mare con *icebergs*
ablazione marina


Accumulation zone
Equilibrium line
Ablation zone
Valley glacier
Accumulation
Ablation
Partical trajectory

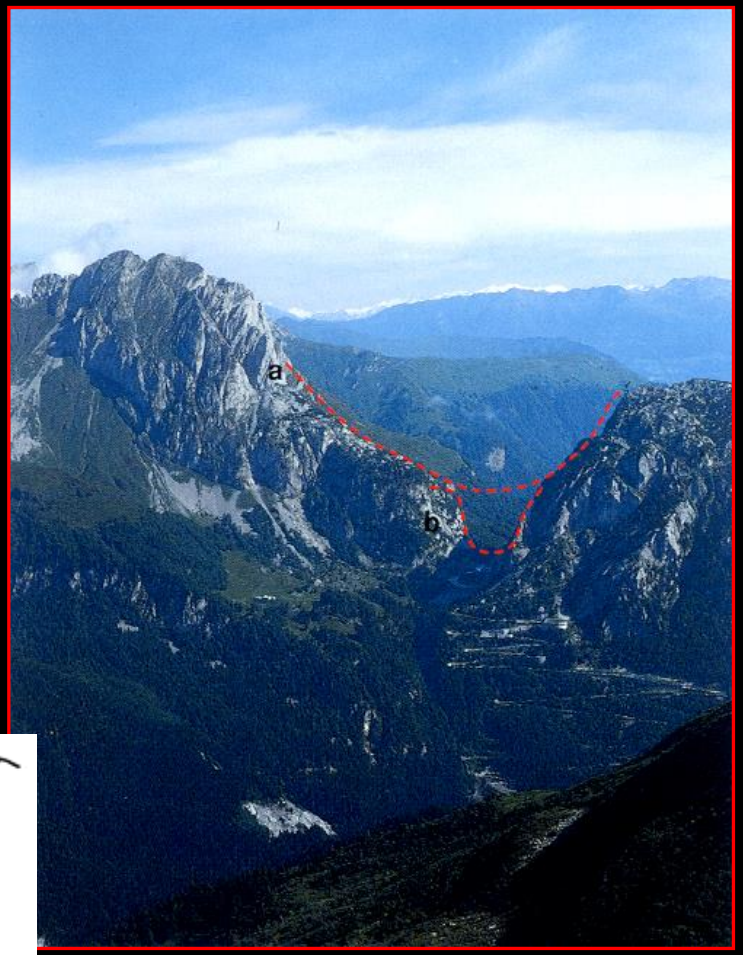
Circo glaciale

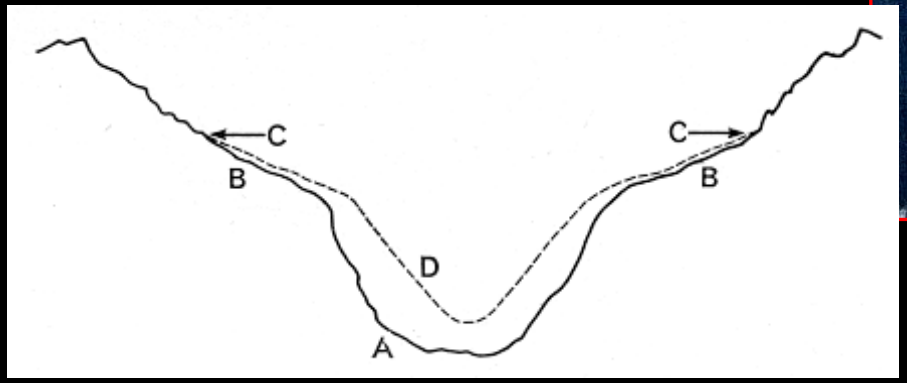
Morfologie legate al glacialismo del Ruitor: circhi glaciali, morene e rocce striate e montonate.


crepacci e seracchi
gradino
conca con contropendenza
gradino
morena di superficie
morena frontale
fronte
depositi proglaciali
morena interna
conca con contropendenza
morena di fondo

Valle a U

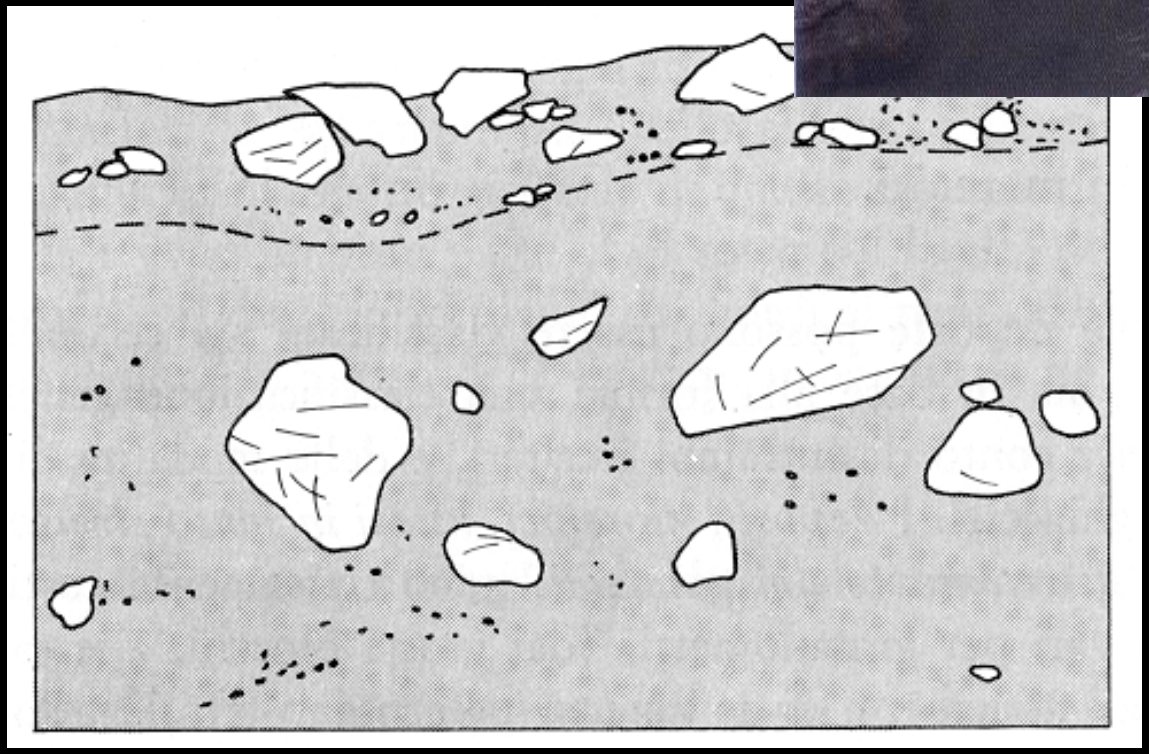
Valle a U sospesa al
Passo Monte di Croce Carnico






(A)


(B)



Morene frontali originate da fasi ripetute di avanzamento e ritiro di un ghiacciaio con fronte sul mare

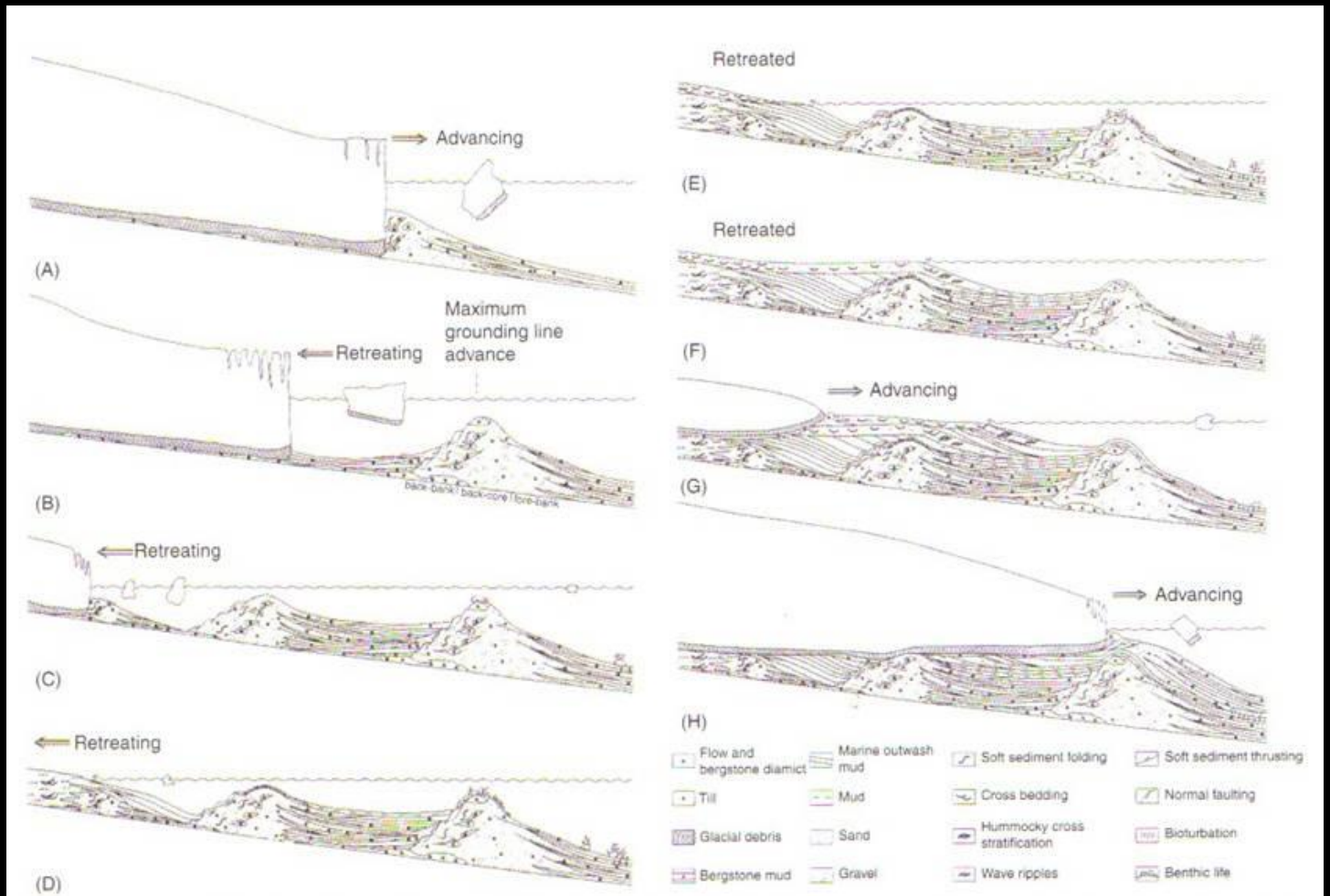
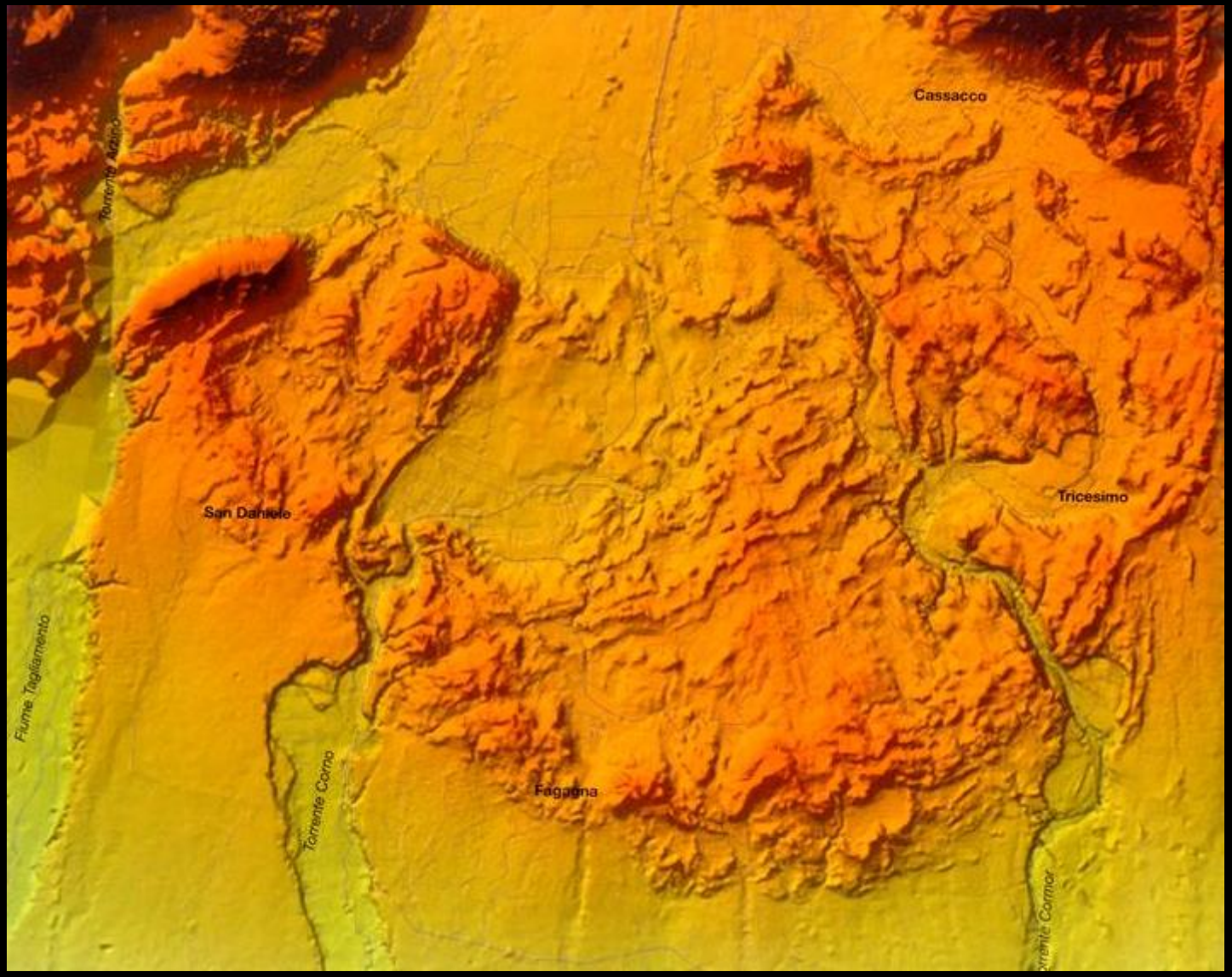
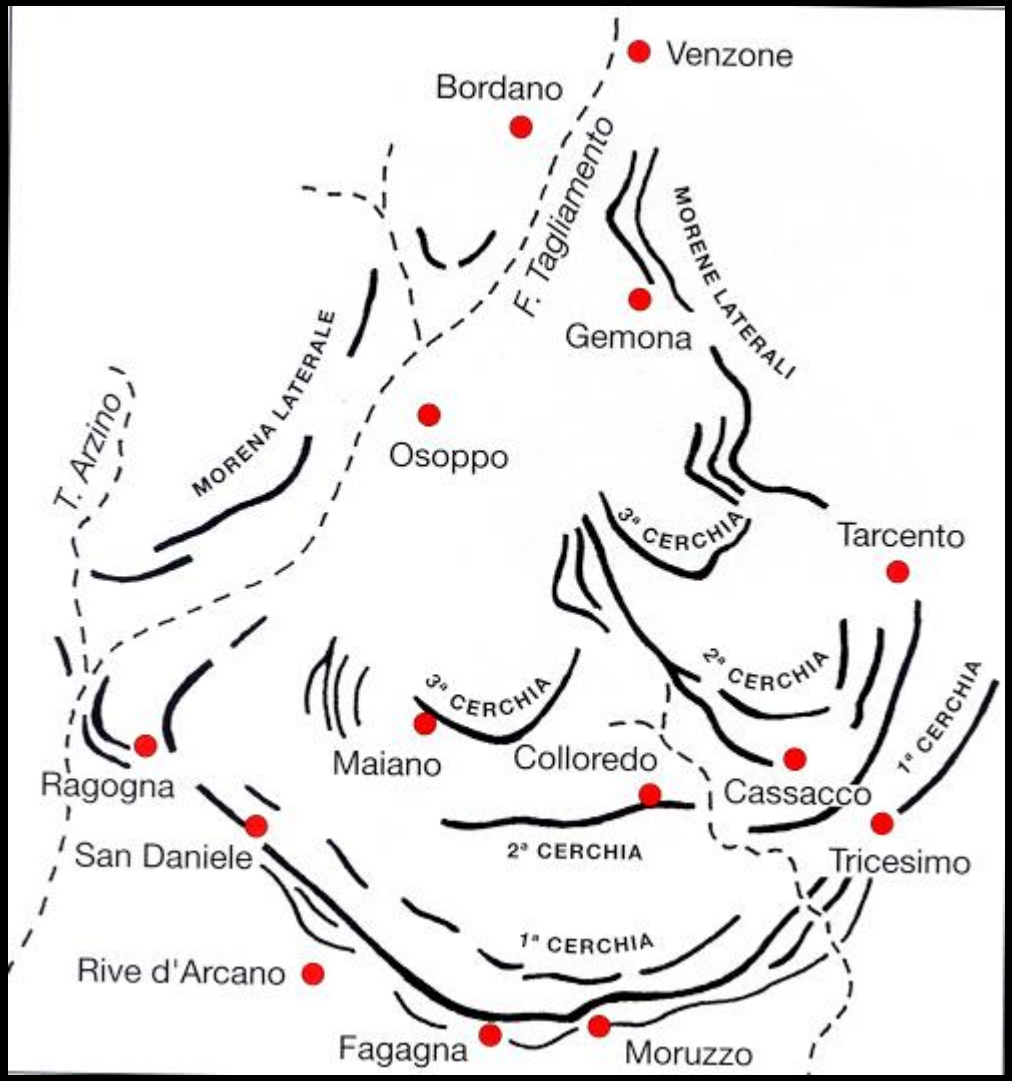


Figure 7 Model of typical facies associations and architecture in glacimarine environments. The model depicts a glacial advance–retreat–readvance cycle. From Powell RD (2003) Subaquatic landsystems: fjords. In: Evans DJA (ed.) *Glacial Landsystems*, pp. 313–347. London: Arnold. Reproduced with permission.

Figure 5 Laterofrontal moraines at the margin of the Hooker Glacier, New Zealand, formed by the accumulation of debris dumped at the highly debris-charged ice margin when it stood at its Little Ice Age limit. Some glacier pushing will also have contributed to moraine construction.

DTM dell’anfiteatro morenico del Tagliamento (MIS2)




Venzone
Bordano
F. Tagliamento
MORENE LATERALI
Gemona
MORENA LATERALE
T. Arzino
Osoppo
3ª CERCHIA
Tarcento
2ª CERCHIA
3ª CERCHIA
1ª CERCHIA
Maiano
Colloredo
Ragogna
Cassacco
San Daniele
2ª CERCHIA
Tricesimo
1ª CERCHIA
Rive d'Arcano
Fagagna
Moruzzo


R
M
P

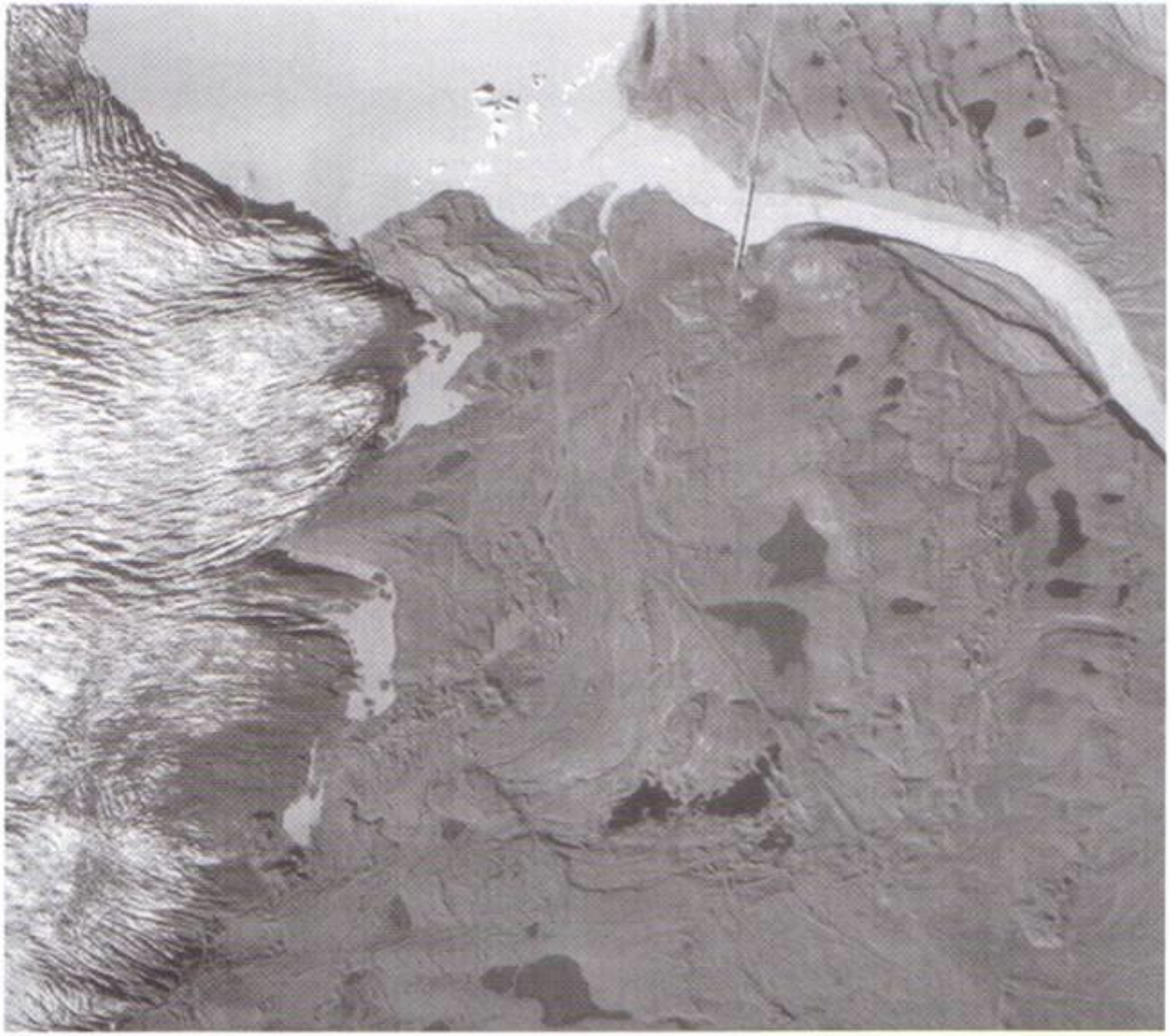
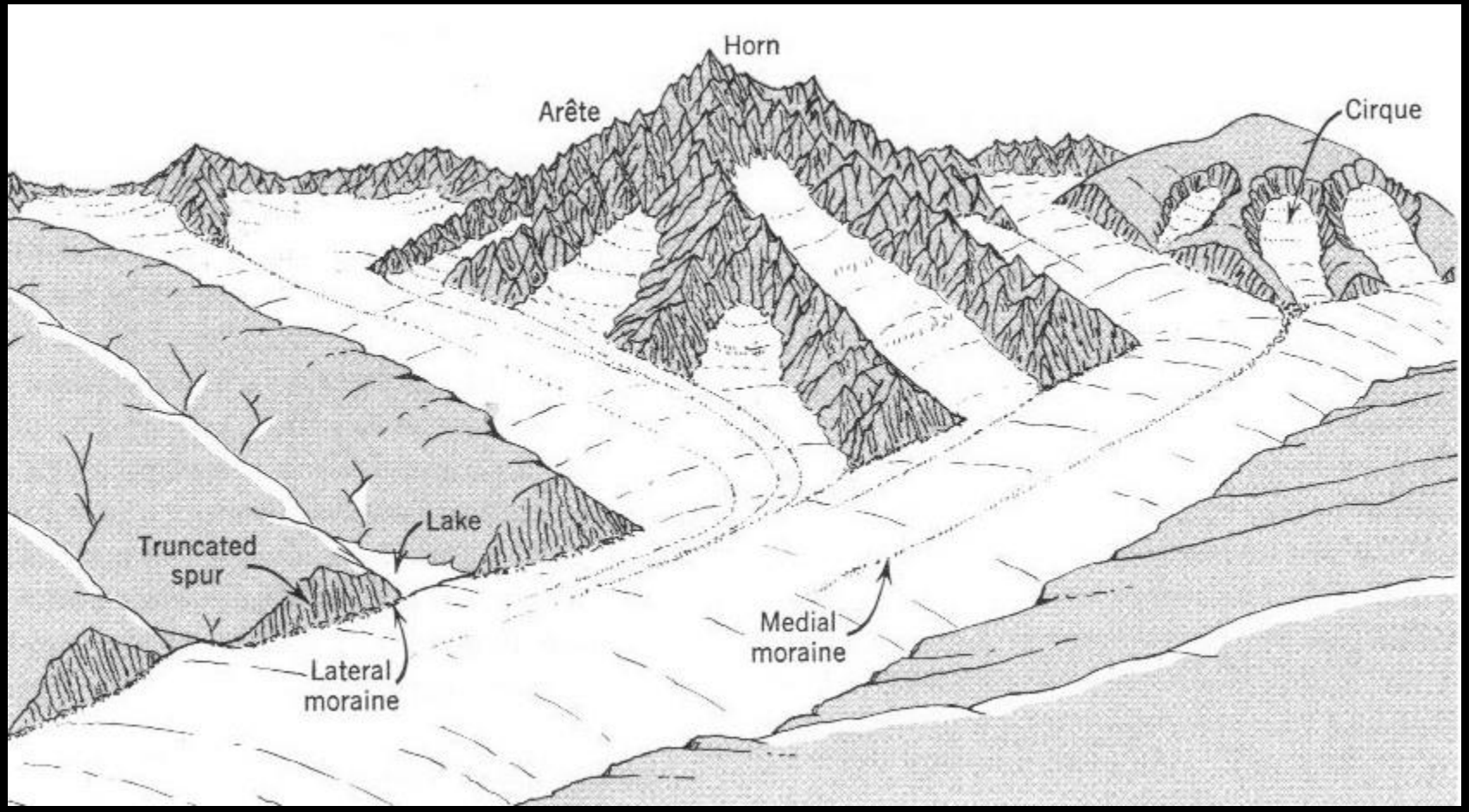
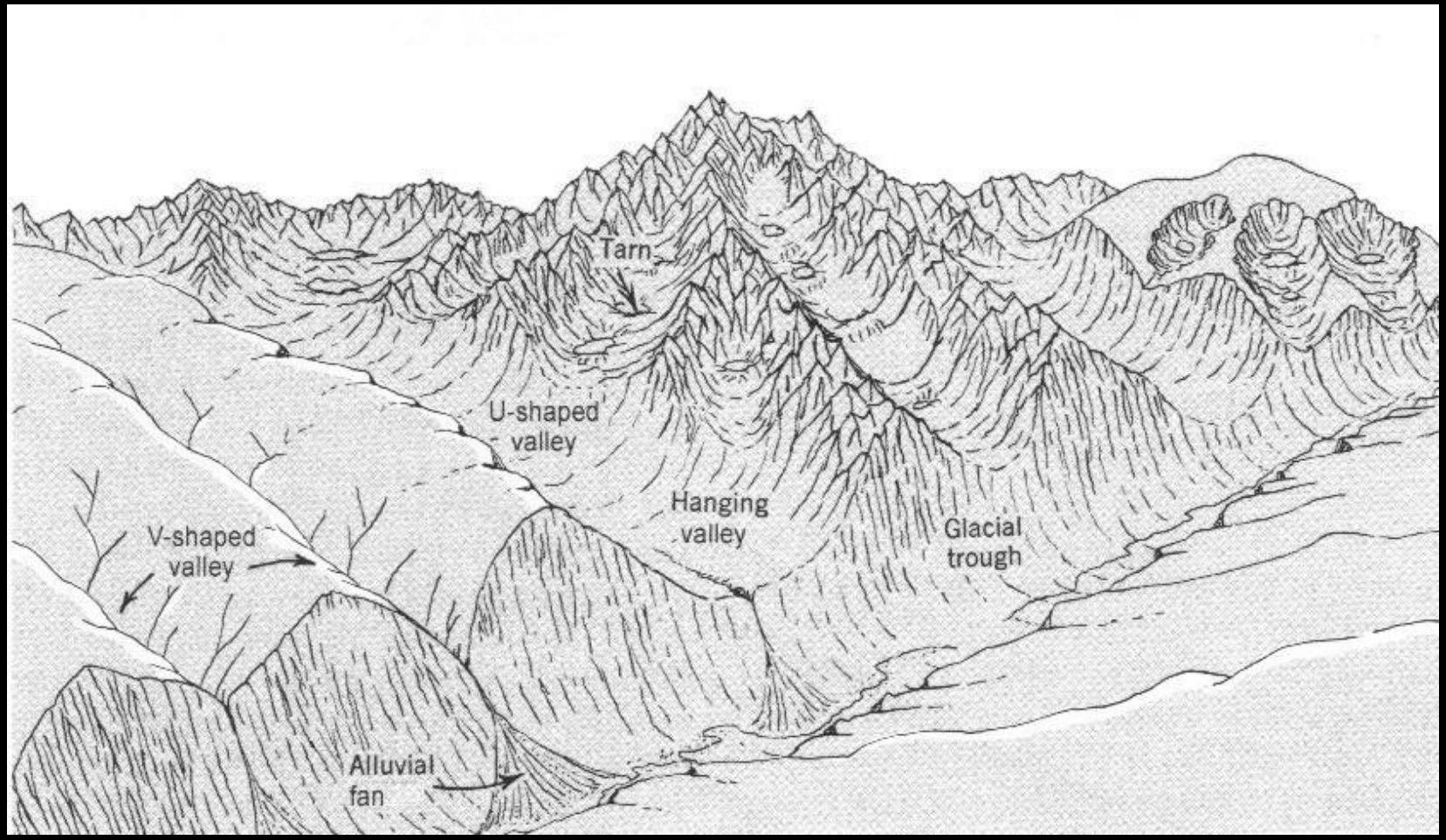
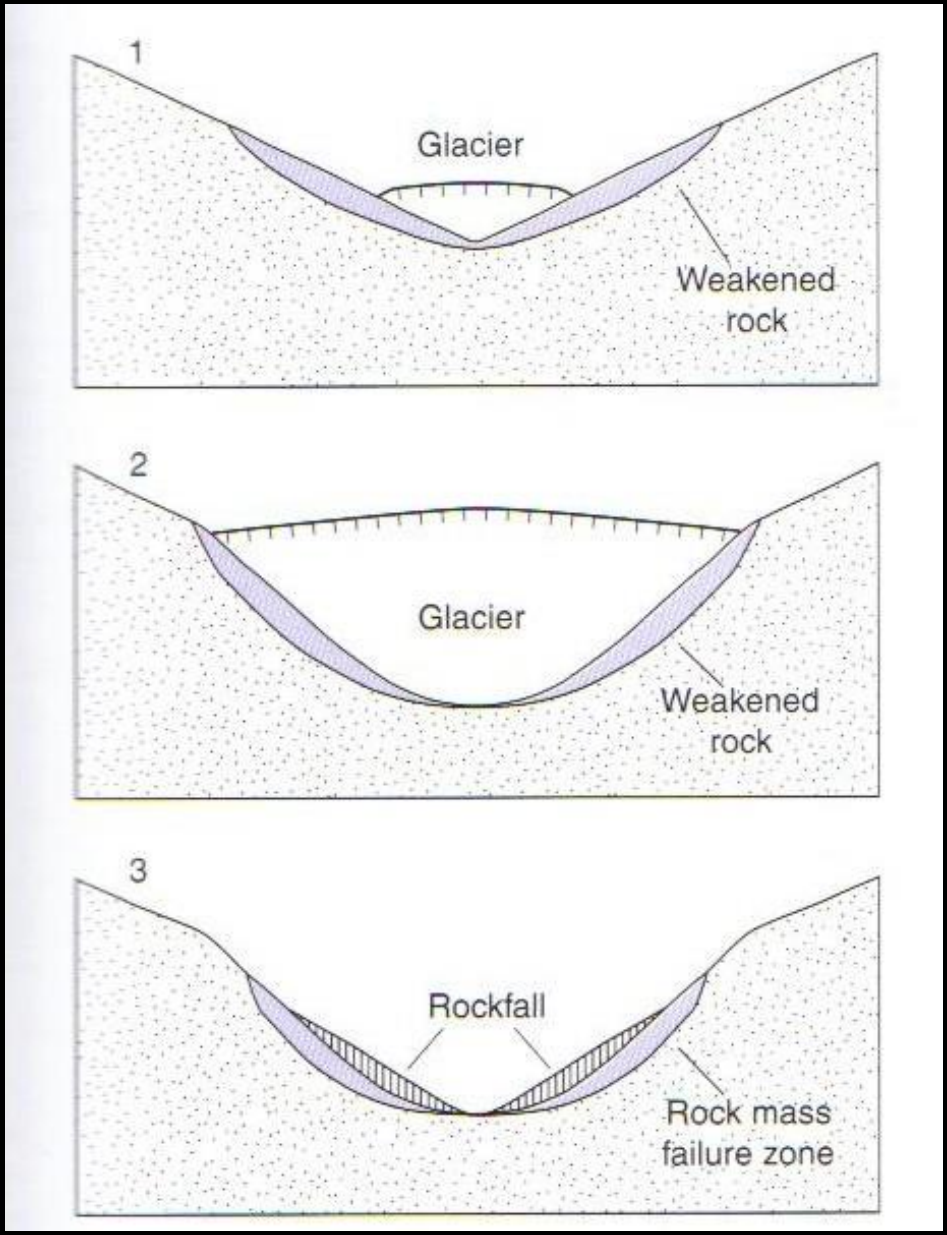


Figure 2 Aerial photograph of the margin of Fjallsjokull, Iceland in 1965, showing sequence of annual push moraines with 'saw-tooth' plan forms (© University of Glasgow and Landmaelingar Islands).

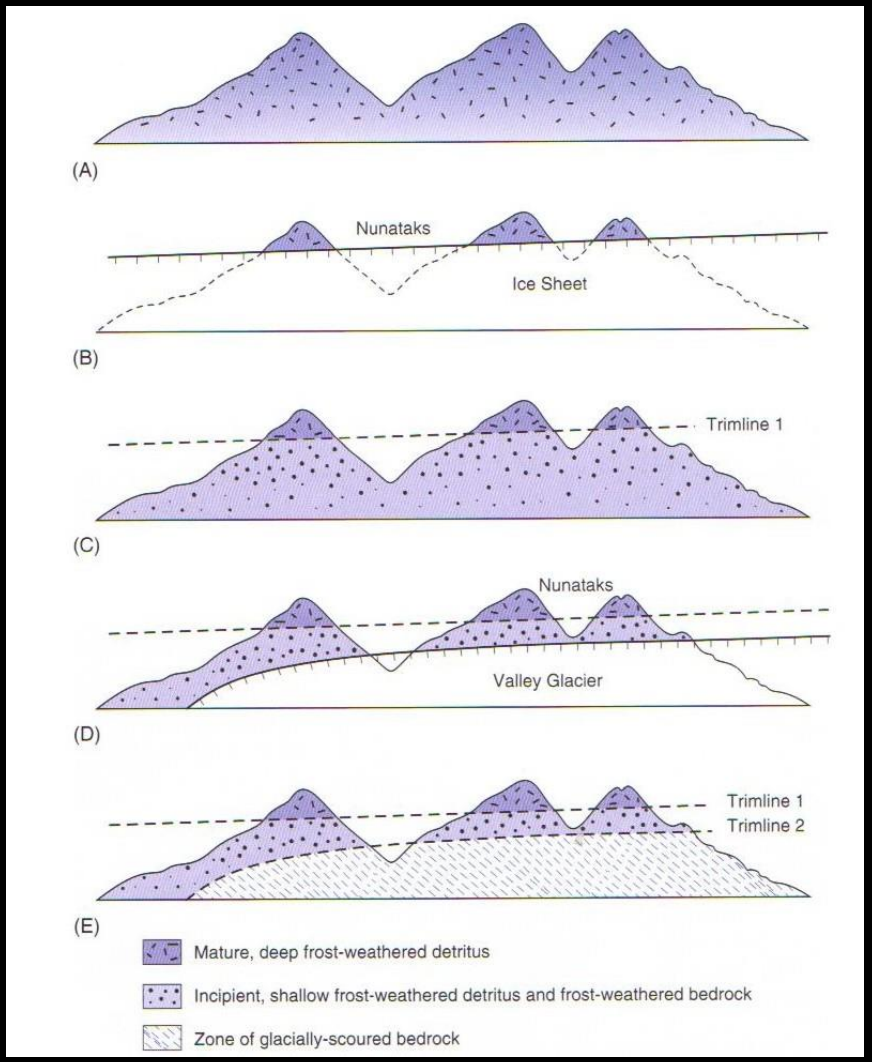
Figure 11 Hummocky moraine produced by the melting of a debris-charged surge snout, Tungnaarjokull, Iceland.


Horn
Arête
Cirque
Lake
Truncated spur
Lateral moraine
Medial moraine

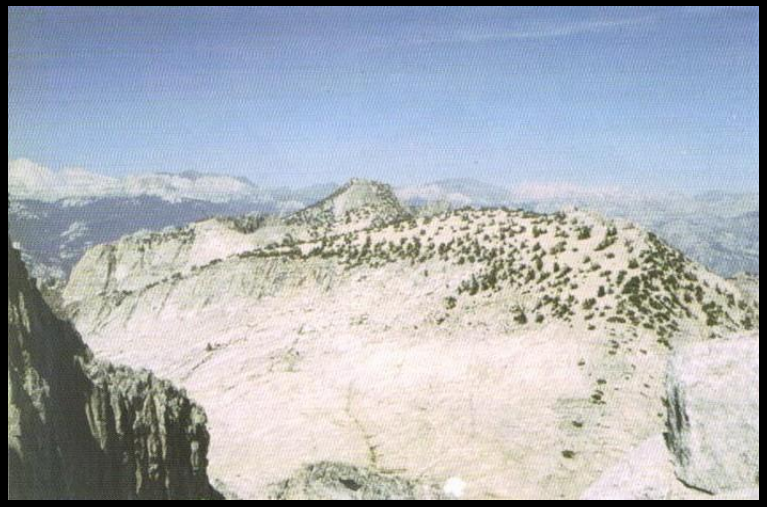

Tarn
U-shaped valley
Hanging valley
Glacial trough
V-shaped valley
Alluvial fan



Formazione di falde detritiche di versante successive al ritiro di una massa glaciale



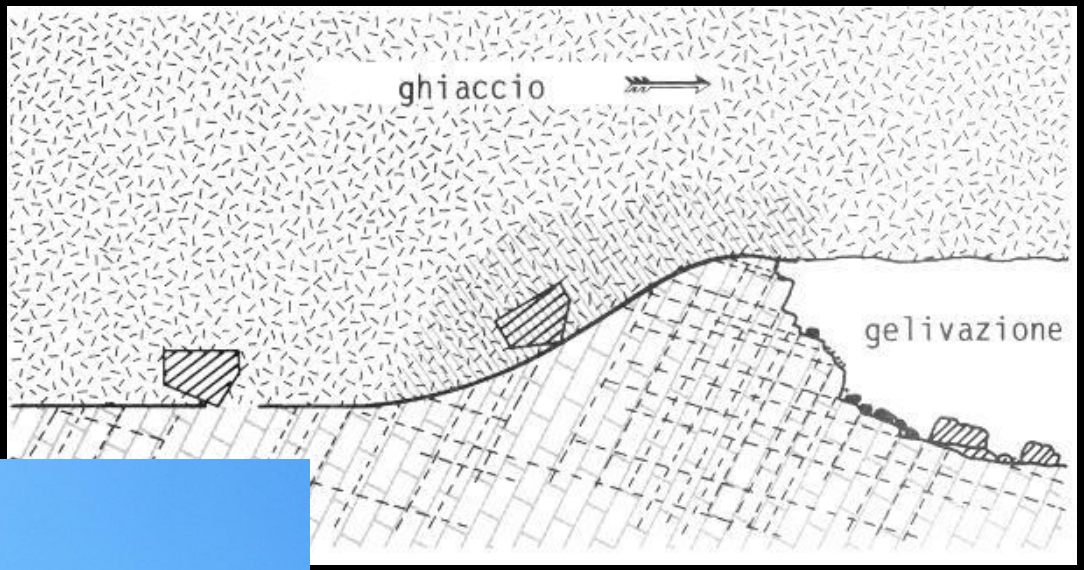
Significato del limite superiore di espansione della massa glaciale (trimline)



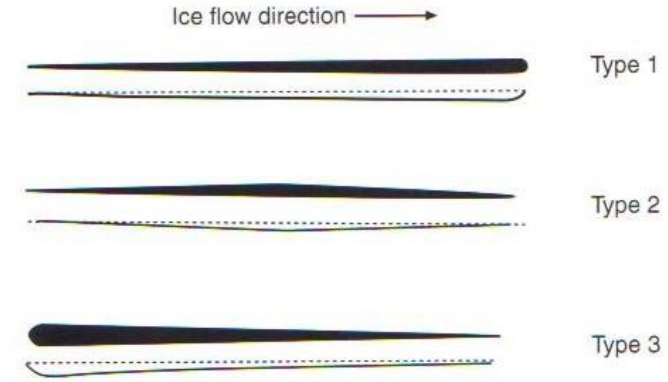
Nunataks

Rocce montonate

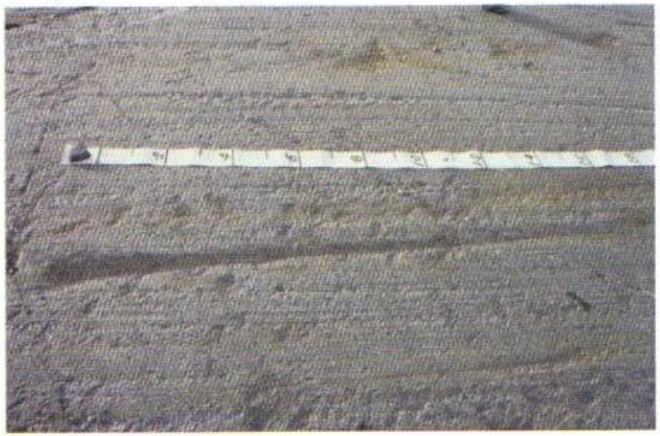
Rocce montonate, lisciate, striate



Massi erratici



(A)

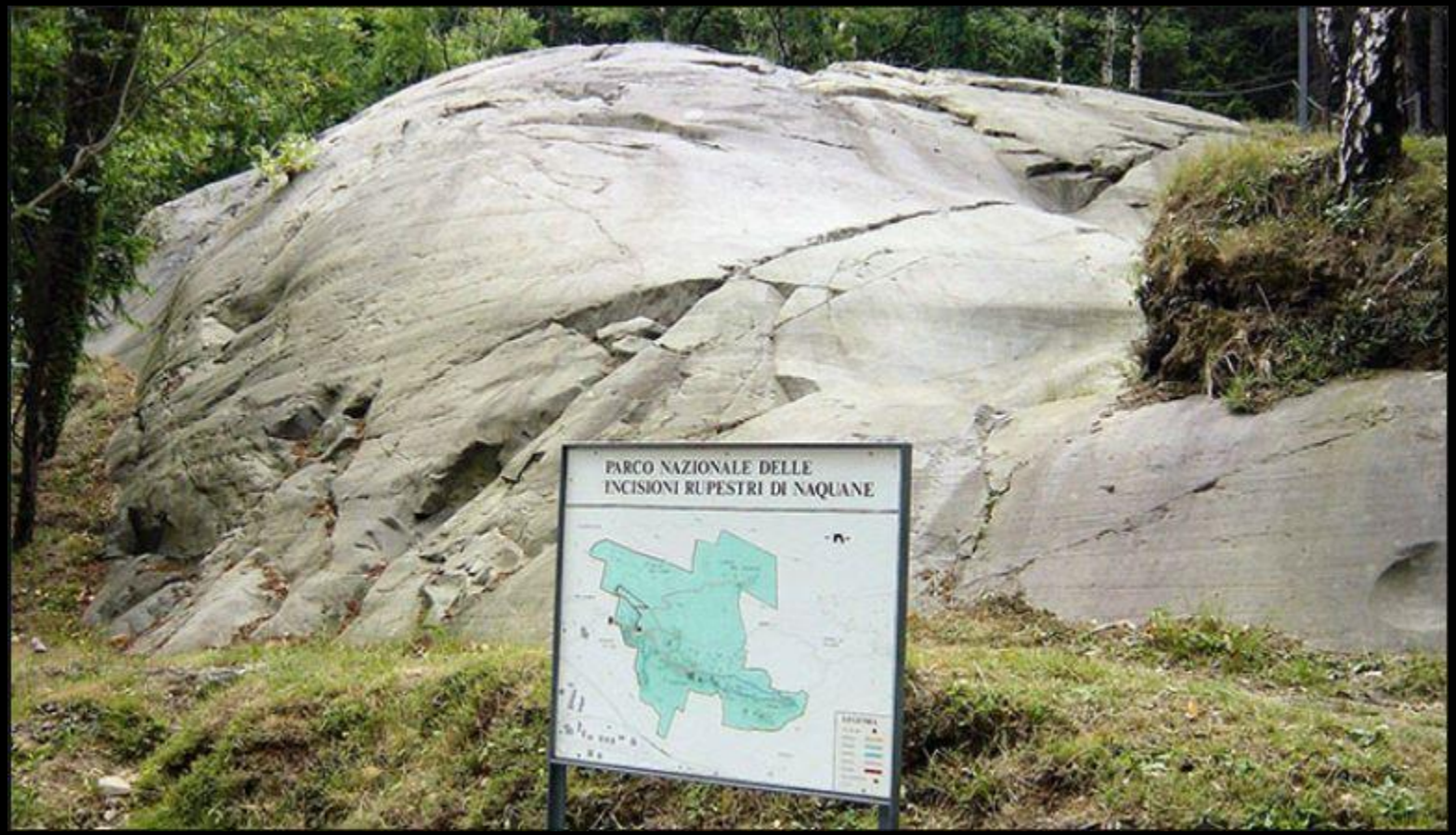


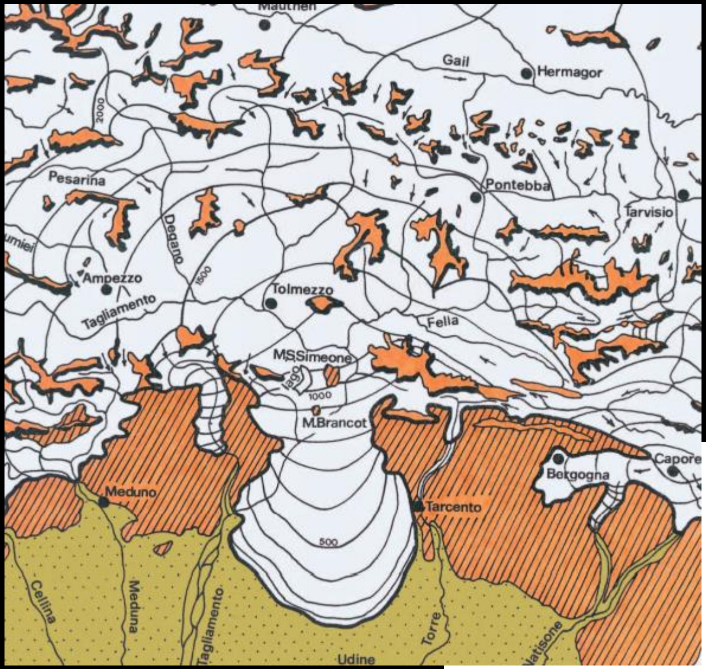
(B)

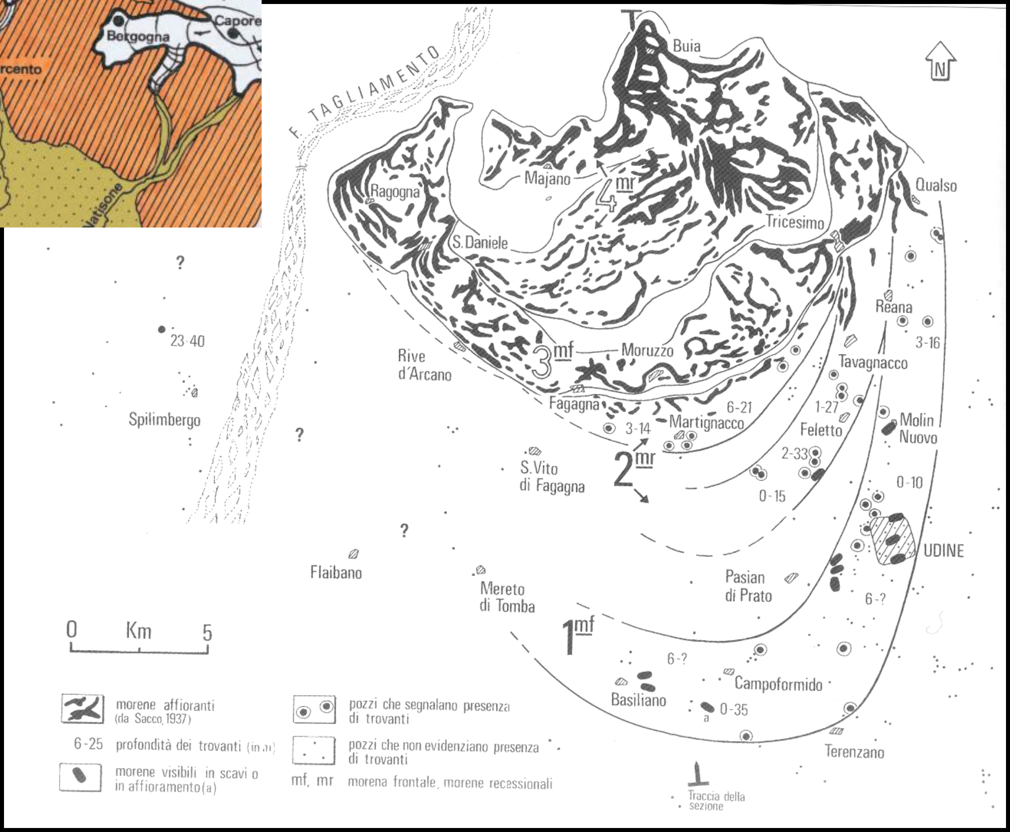
(C)

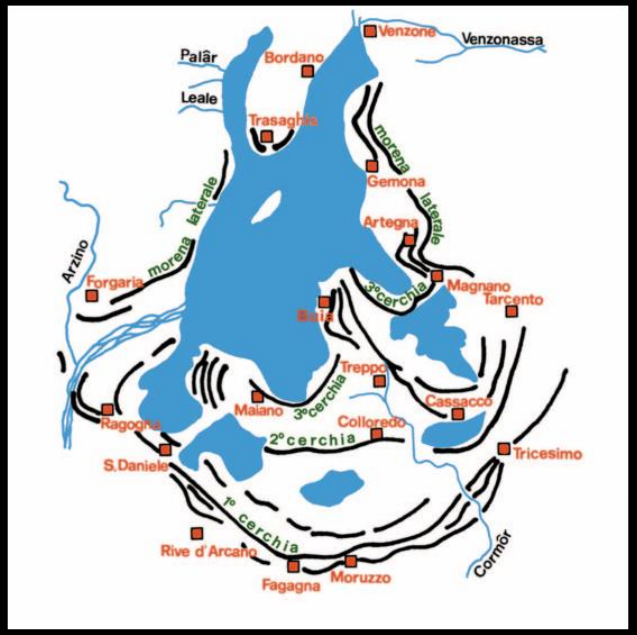
Figure 12 Examples of typical glacial striae. (A) The striae type classification based on the descriptions of Chamberlin (1883). (B) Type 1 striation, widening and deepening until the abrupt termination is reached. From Rea BR and Whalley WB (1994) Subglacial observations from Øksfjordjøkelen, North Norway. *Earth Surface Processes and Landforms* 19: 659–673. Copyright John Wiley and Sons Ltd. Reproduced with permission. (C) Two type 3 striae starting at an abrupt initiation point and shallowing and narrowing to the end point. Note the concave downflow partial ring fractures in the base of the striae.

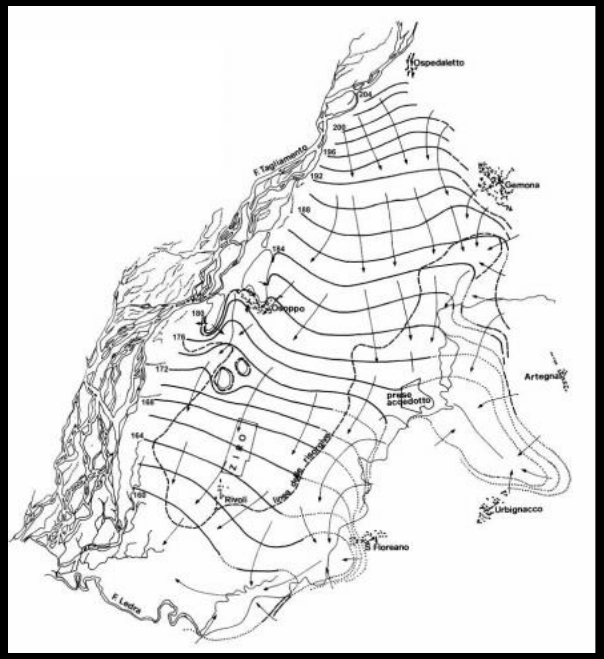
Incisioni rupestri Valcamonica


PARCO NAZIONALE DELLE
INCISIONI RUPESTRI DI NAQUANE


Mauthen
Gail
Hermagor
Pesarina
Pontebba
Tarvisio
Degano
Ampezzo
Tagliamento
Tolmezzo
Fella
MSSimeone
1000
M.Brancot
Bergogna
Capore
Meduno
Tarcento
500
Cellina
Meduna
Tagliamento
Torre
Natisone
Udine

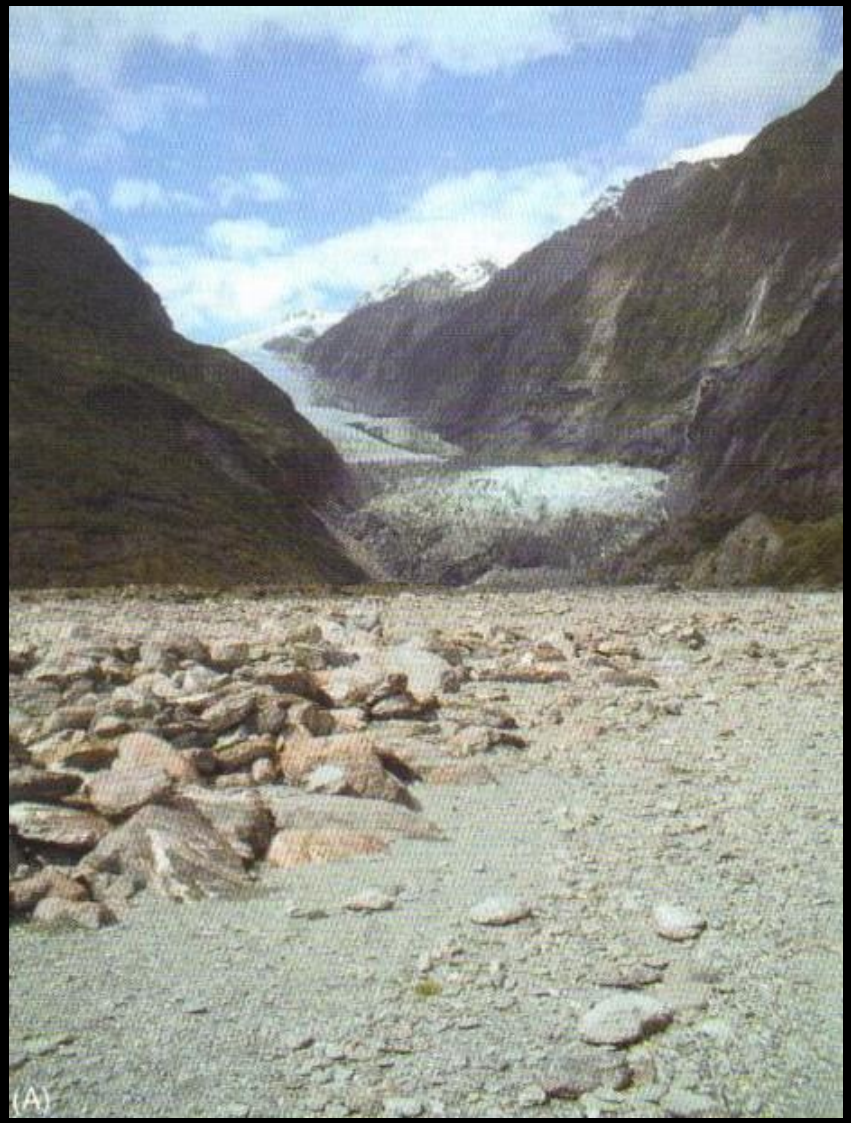

F. TAGLIAMENTO
Buia
N
Majano
4mr
Ragogna
Qualso
Tricesimo
S.Daniele
Reana
3-16
Rive d'Arcano
3mf
Moruzzo
Tavagnacco
Fagagna
6-21
1-27
Molin Nuovo
23-40
Spilimbergo
3-14
Martignacco
Feletto
2mr
2-33
S.Vito di Fagagna
0-15
0-10
UDINE
Flaibano
Mereto di Tomba
Pasian di Prato
6-?
1mf
6-?
Campoformido
Basiliano
0-35
Terenzano
0 Km 5
morene affioranti (da Sacco, 1937)
6-25 profondità dei trovanti (in m)
morene visibili in scavi o in affioramento (a)
pozzi che segnalano presenza di trovanti
pozzi che non evidenziano presenza di trovanti
mf, mr morena frontale, morene recessionali
Traccia della sezione





Una delle maggiori falde freatiche in Italia

Lago di Cavazzo

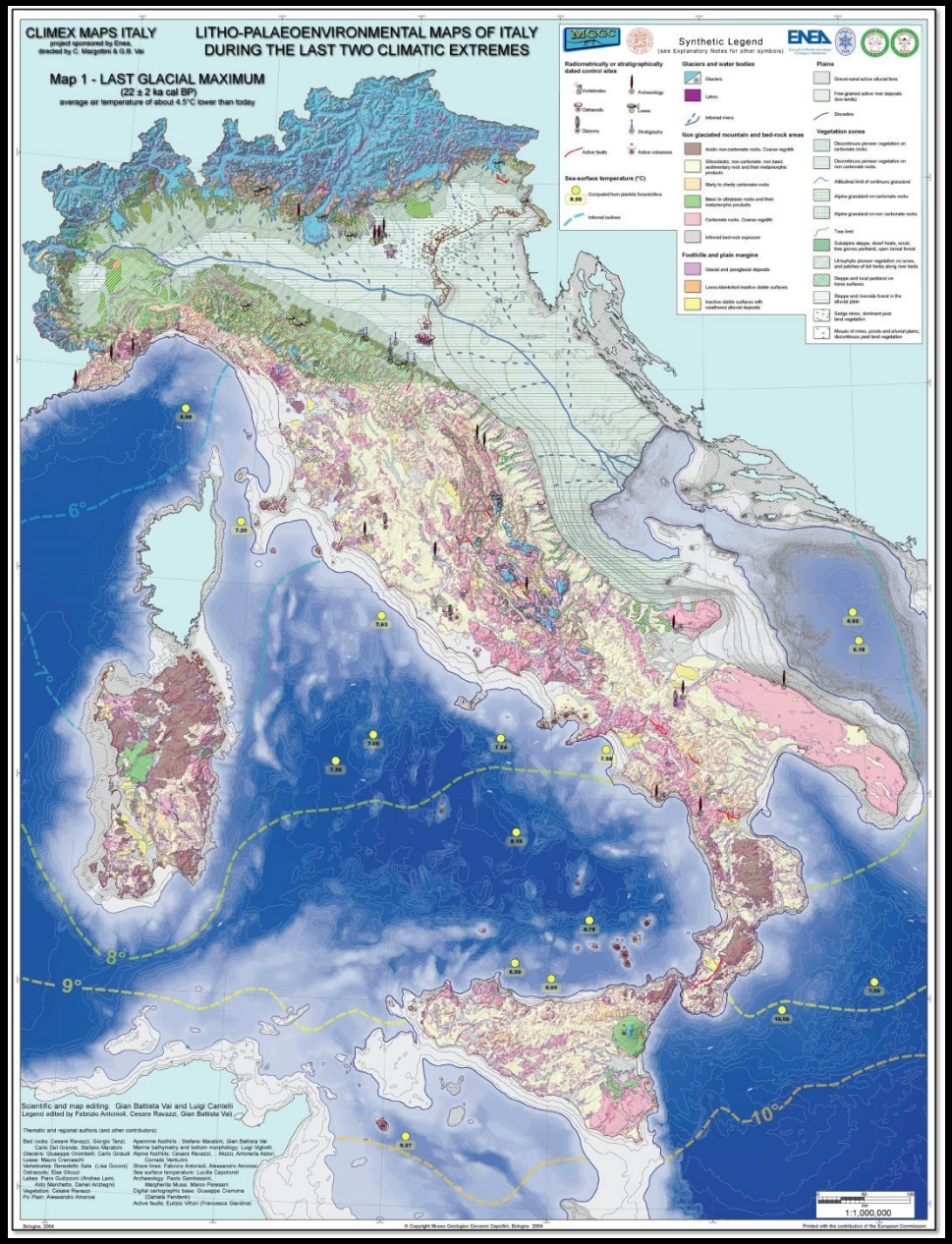


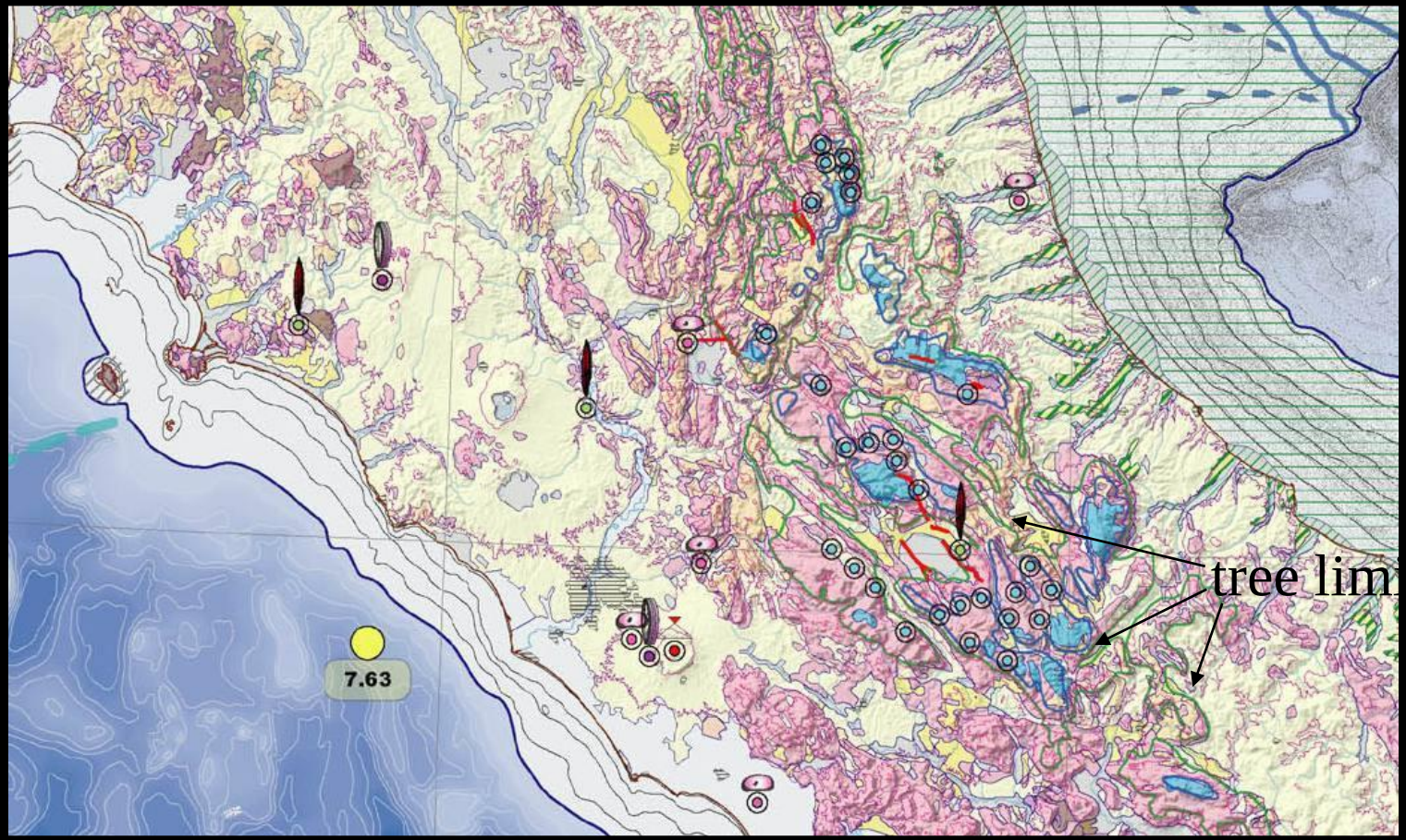
Torrente fluvioglaciale
e piana alluvionale

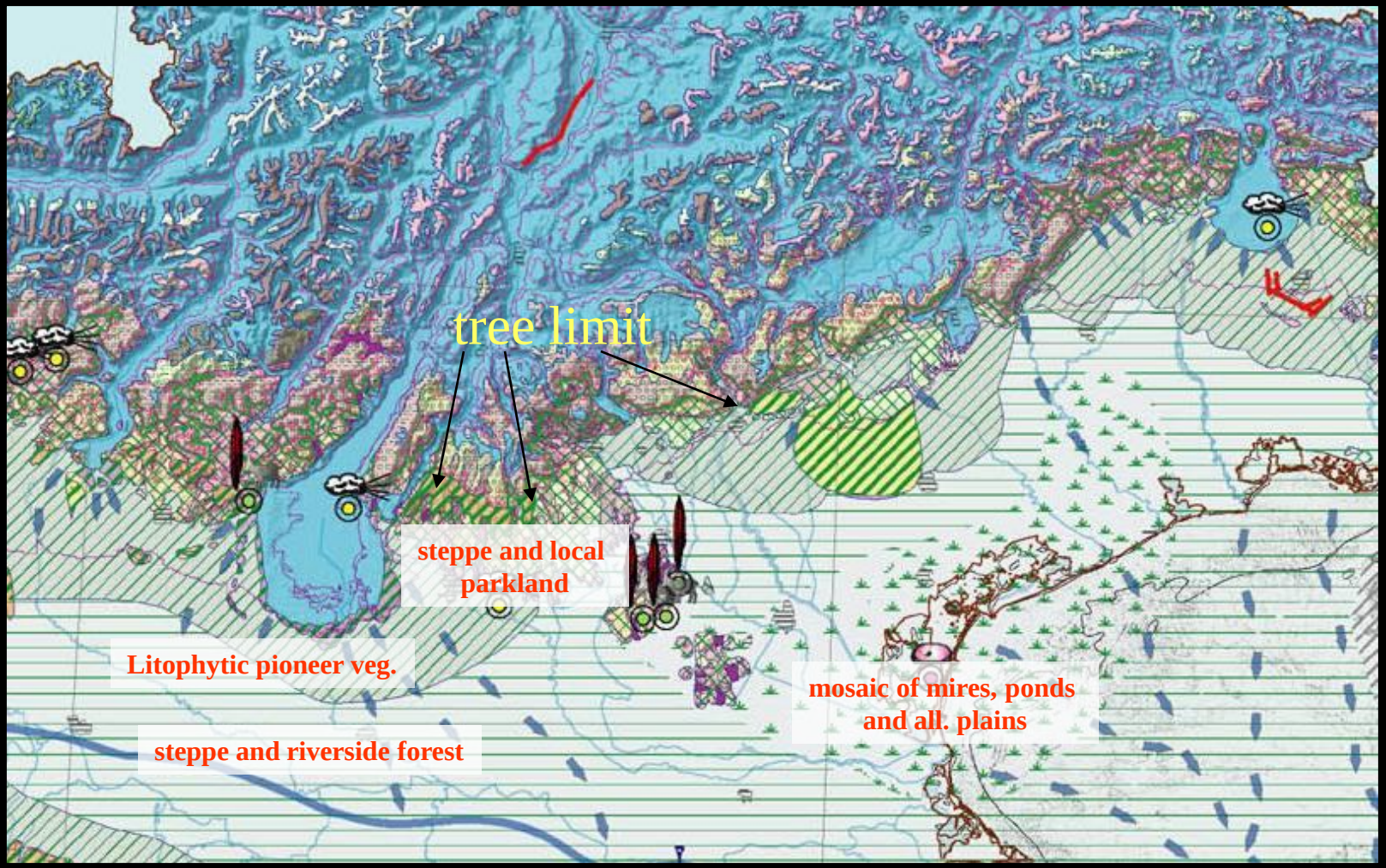
The LGM Map of Italy

By Antonioli F. & Vai G.B. Eds.

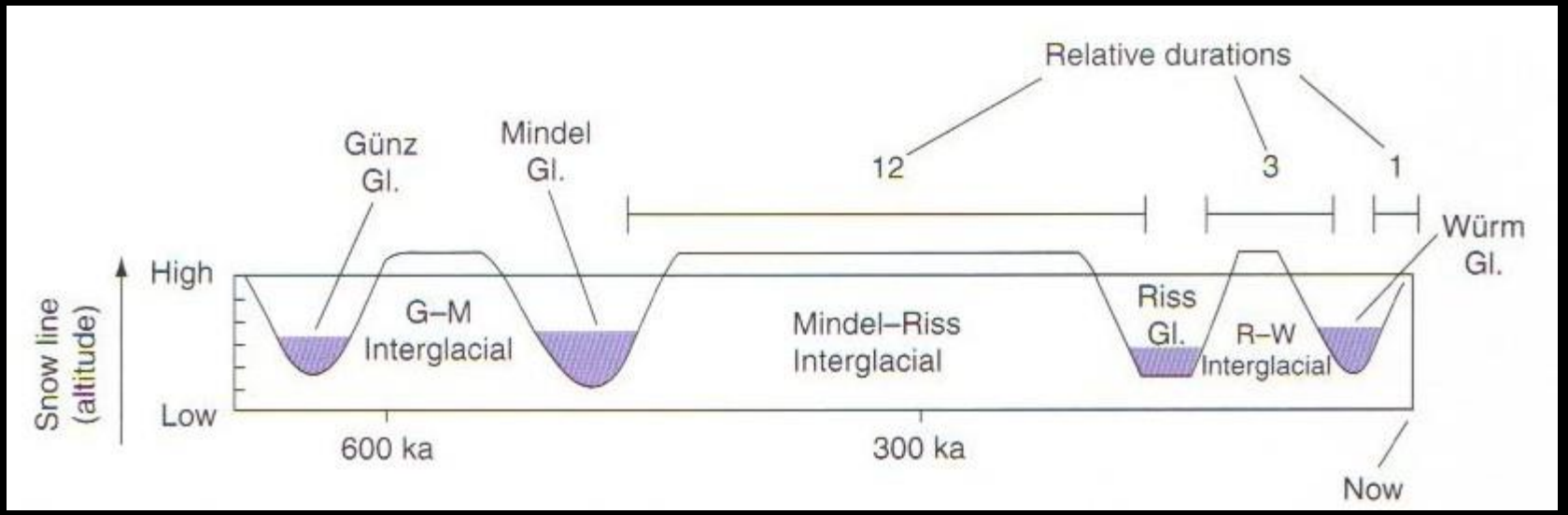
- **lithological, geological and geomorphological units**
- **vegetation zones**
- **palaeontological, palaeobotanical, archaeological, limnological evidence and other proxies of palaeoclimatic relevance.**




7.63
tree lim

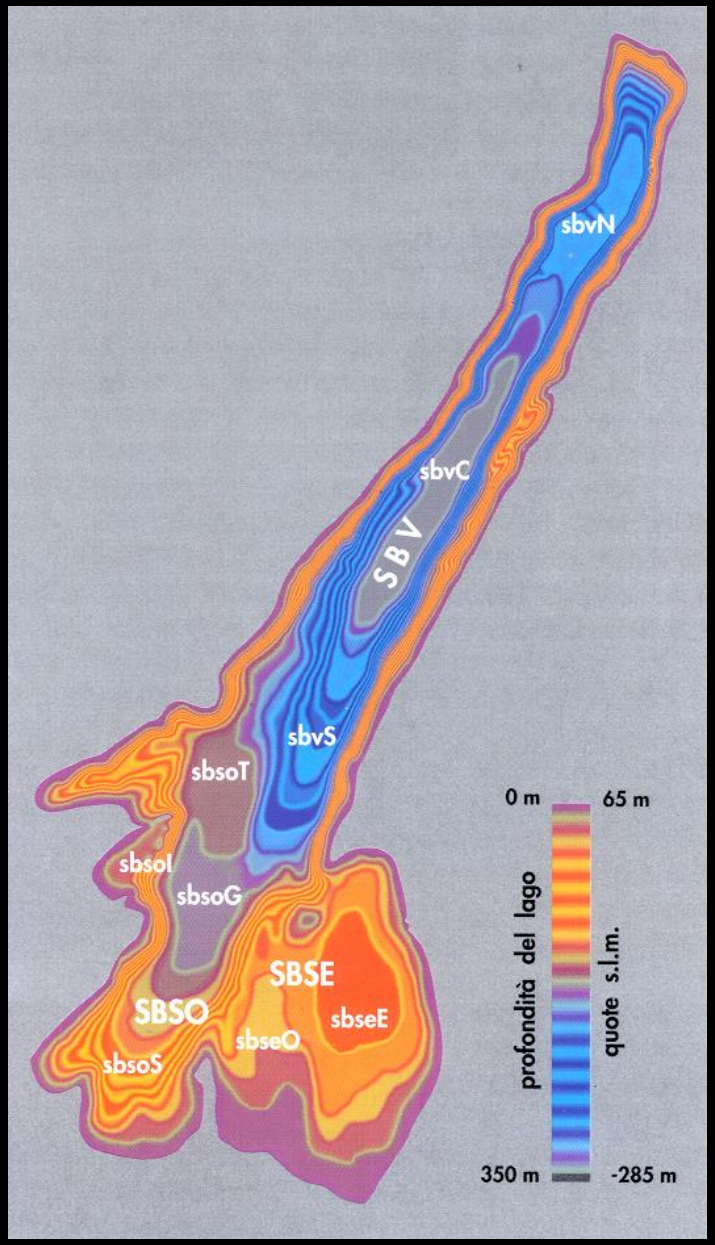

tree limit
steppe and local parkland
Litophytic pioneer veg.
steppe and riverside forest
mosaic of mires, ponds and all. plains

Sistema glaciazioni Quaternario
Penck & Bruchner



	Alps	Northern Europe	North America	European USSR
Authors	Penck & Brückner (1909–11)	Woldstedt (1926)	Flint (1957)	Flint (1957)
Glacial	Würm	Weichsel	Wisconsin	Valdai
Interglacial	Riss/Würm	Eem	Sangamon	Mikulino
Glacial	Riss	Saale	Illinoian	Moscow/Dneipr
Interglacial	Mindel/Riss	Holstein	Yarmouth	Lichvin
Glacial	Mindel	Elster	Kansan	Oka
Interglacial	Günz/Mindel	Cromer	Aftonian	Muchkap
Glacial	Günz		Nebraskan	?

Profondità Lago di Garda



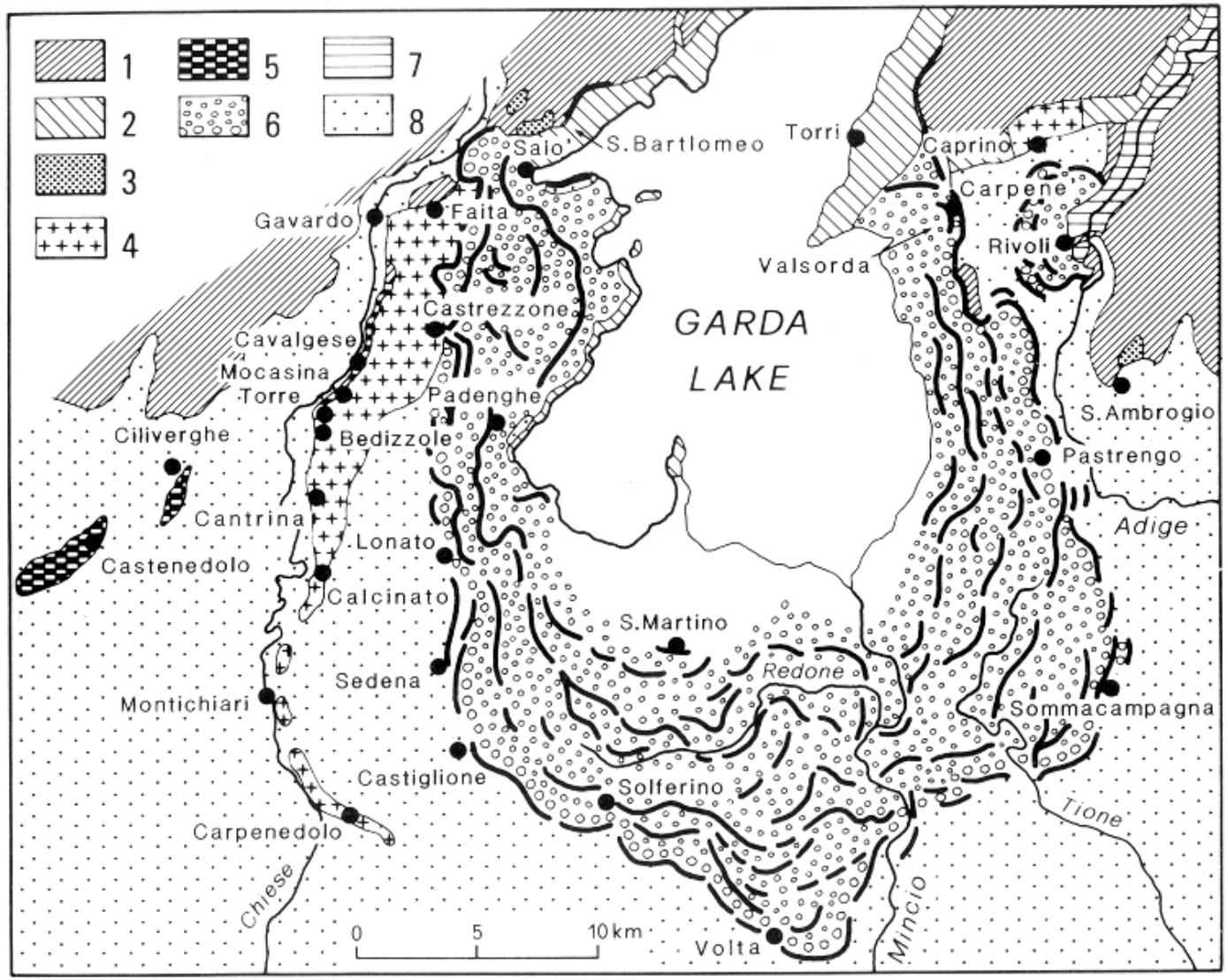


Fig. 9 - Le morene ed i depositi quaternari connessi nella regione gardesana. 1) rocce prequaternarie mai raggiunte dai ghiacciai quaternari; 2) rocce prequaternarie raggiunte dai ghiacciai quaternari; 3) ghiaie plioceniche di S. Ambrogio e S. Bartolomeo; 4) morene antiche e connessi terrazzi fluvioglaciali; 5) morene recenti e principali cordoni morenici; 6) terrazzi fluvioglaciali antichi; 7) terrazzi fluvioglaciali recenti; 8) antico lago nella valle dell'Adige.

GLACIAL STAGES IN THIS STUDY	SACCO 1896	PENCK 1909	CACCIAMALI 1914	COZZAGLIO 1932	VENZO 1957	FRAENZLE 1965	VENZO 1965/69	CHARDON 1965
SOLFERINO	only one glacial period	WURM	WURM + RISS II	WURM + RISS	WURM I, II / RISS I, II	WURM	WURM I, II / RISS I, II	WURM
SEDENA (not distinguished in previous studies)		RISS	RISS I	MINDEL	MINDEL II	RISS	MINDEL II	RISS
CARPENEDOLO		MINDEL	MINDEL		MINDEL I	MINDEL	GUNZ I, II	MINDEL
FAITA		GUNZ	GUNZ (fluvioglacial)	GUNZ (fluviatile)	GUNZ		MINDEL	GUNZ (fluvioglacial)
CILIVERGHE	VILLA FRANCHIAN							

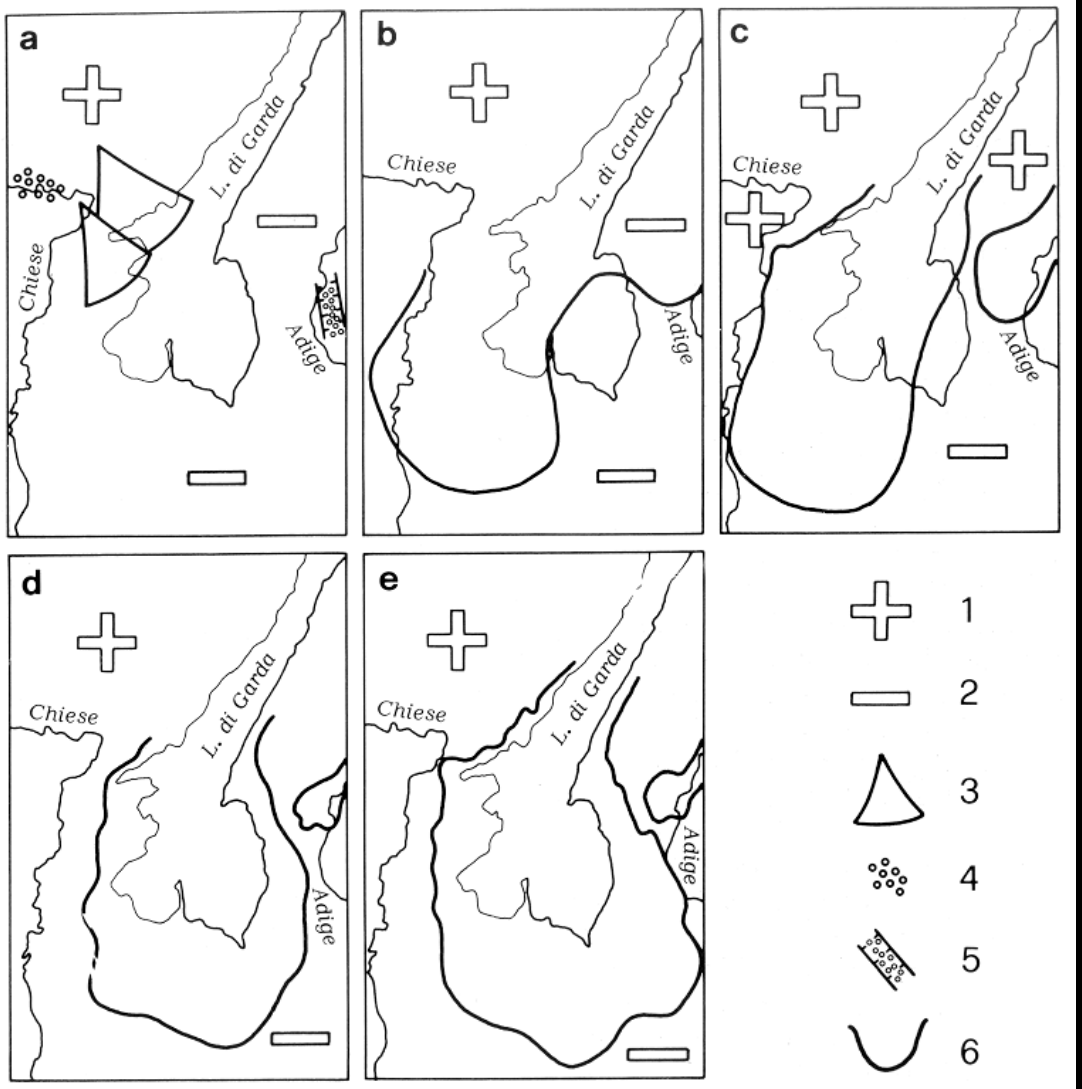


Fig. 10 - Evoluzione dell'area gardesana tra il tardo Terziario-Pleistocene inferiore ed il Pleistocene superiore; a) periodo preglaciale (Pleistocene inferiore o tardo Terziario); b) fasi glaciali di Civerghe e Monte Faita; c) fase glaciale di Carpenedolo; d) fase glaciale di Sedena; e) fase glaciale di Solferino; 1) area in sollevamento; 2) area subsidente; 3) conoidi; 4) depositi ghiaiosi prealpini del Pleistocene (?); 5) ghiaie di S. Ambrogio, del Pleistocene inferiore; 6) limite esterno delle morene frontali.


Anfiteatro morenico ghiacciaio di Rivoli

Rivoli Veronese – anfiteatro morenico

Depositi glaciali

Depositi fluvioglaciali

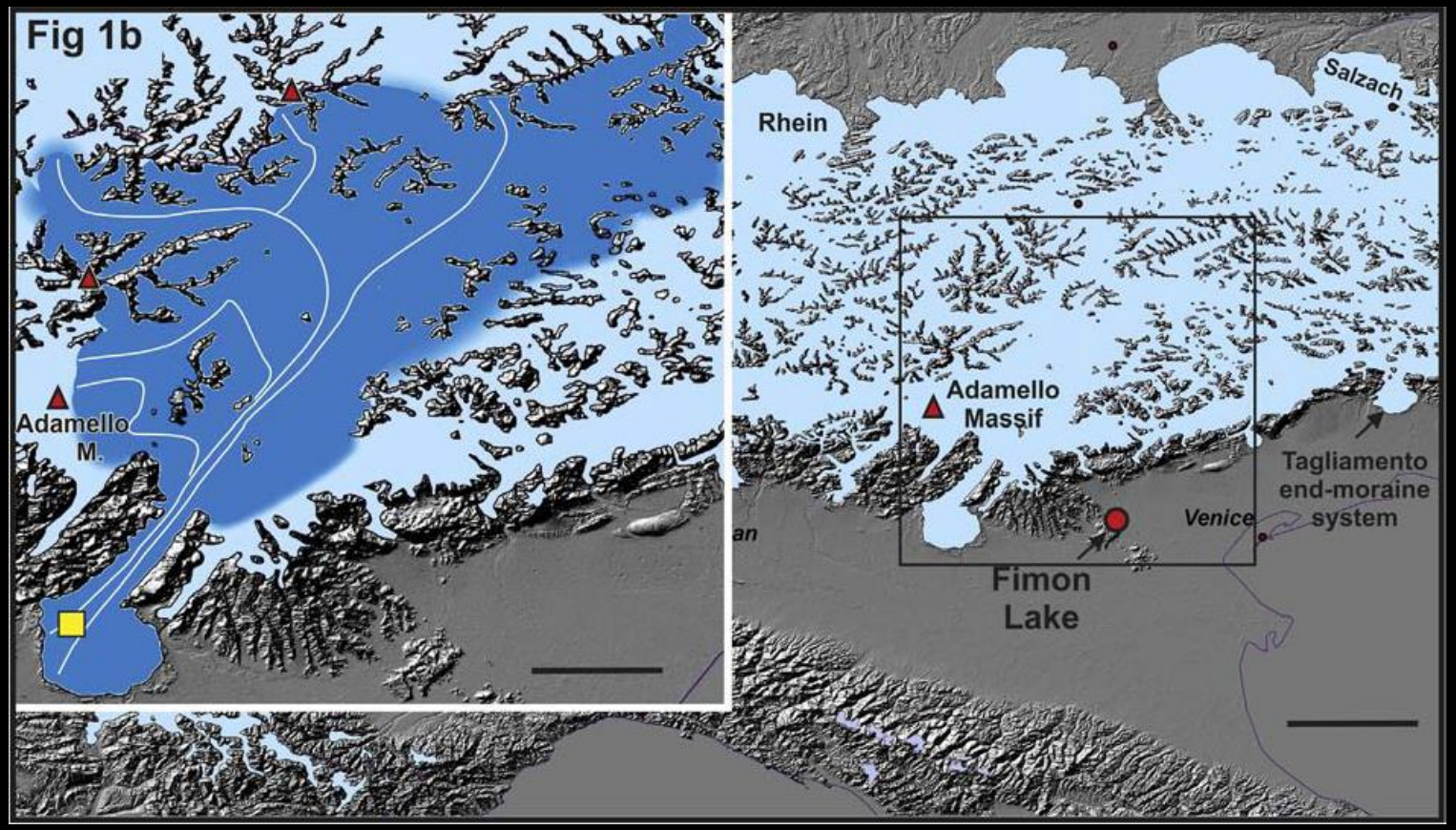
Contents lists available at ScienceDirect

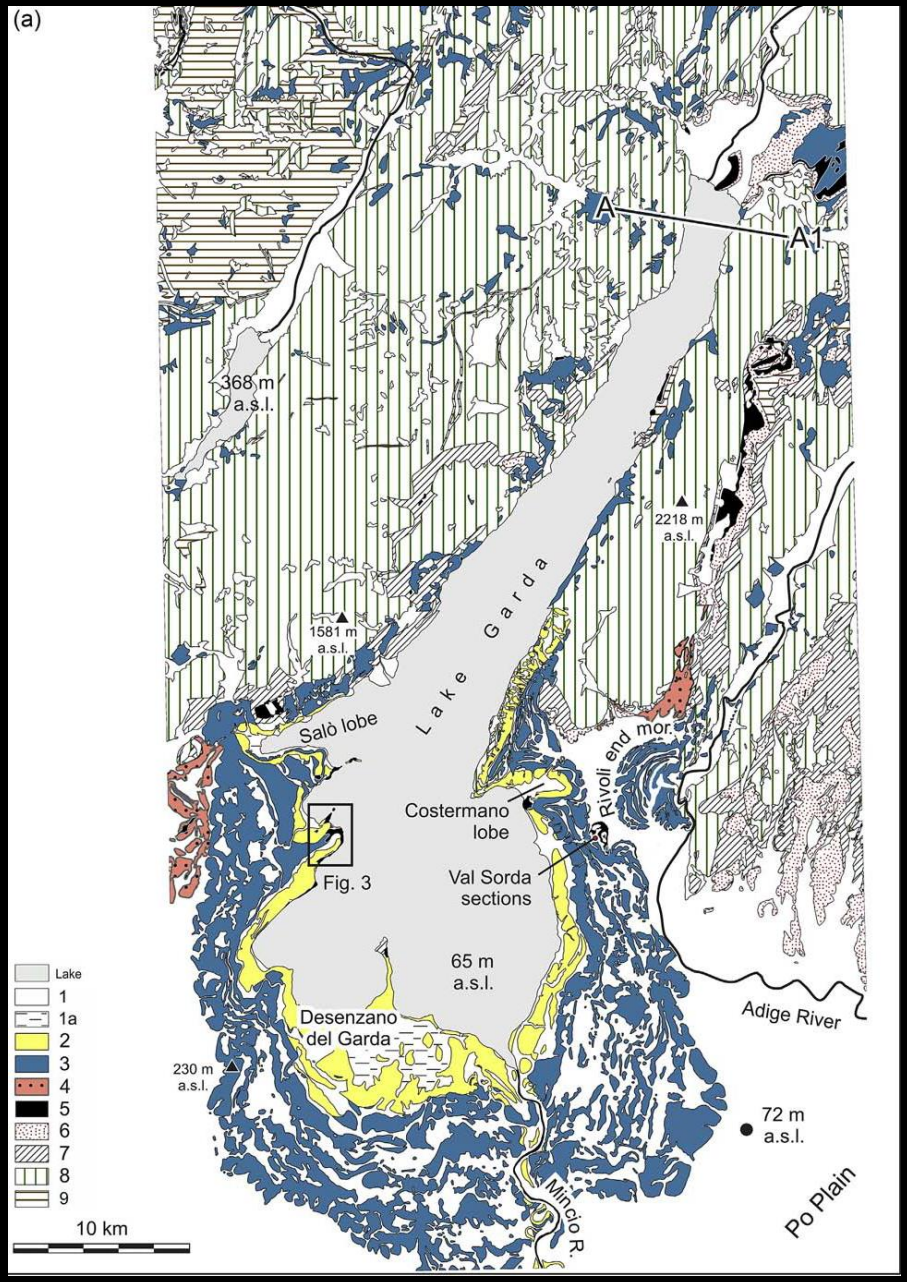
Quaternary Science Reviews

journal homepage: www.elsevier.com/locate/quascirev

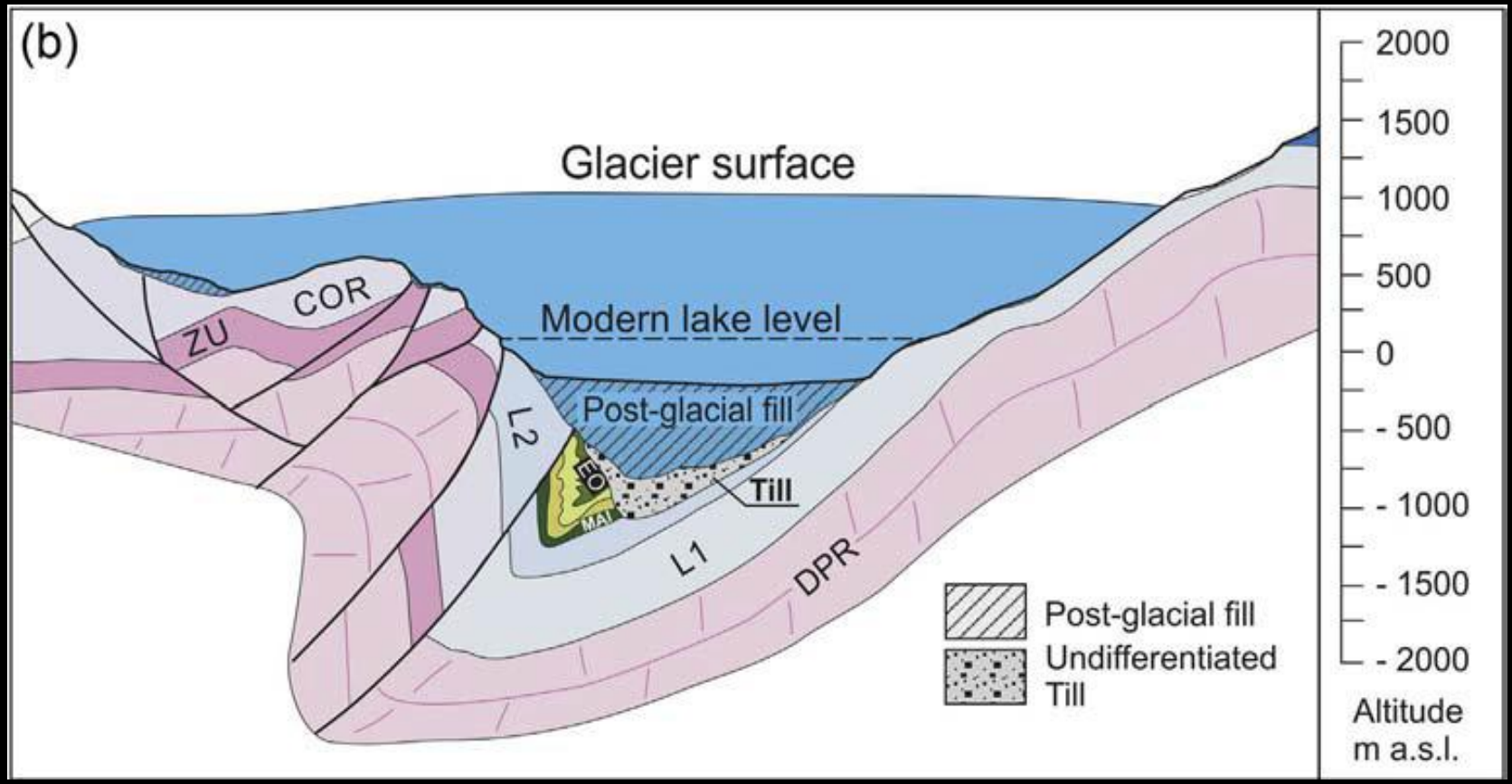
The latest LGM culmination of the Garda Glacier (Italian Alps) and the onset of glacial termination. Age of glacial collapse and vegetation chronosequence

Cesare Ravazzi [a, *], Roberta Pini [a], Federica Badino [a], Mattia De Amicis [b], Laurent Londeix [c], Paula J. Reimer [d]

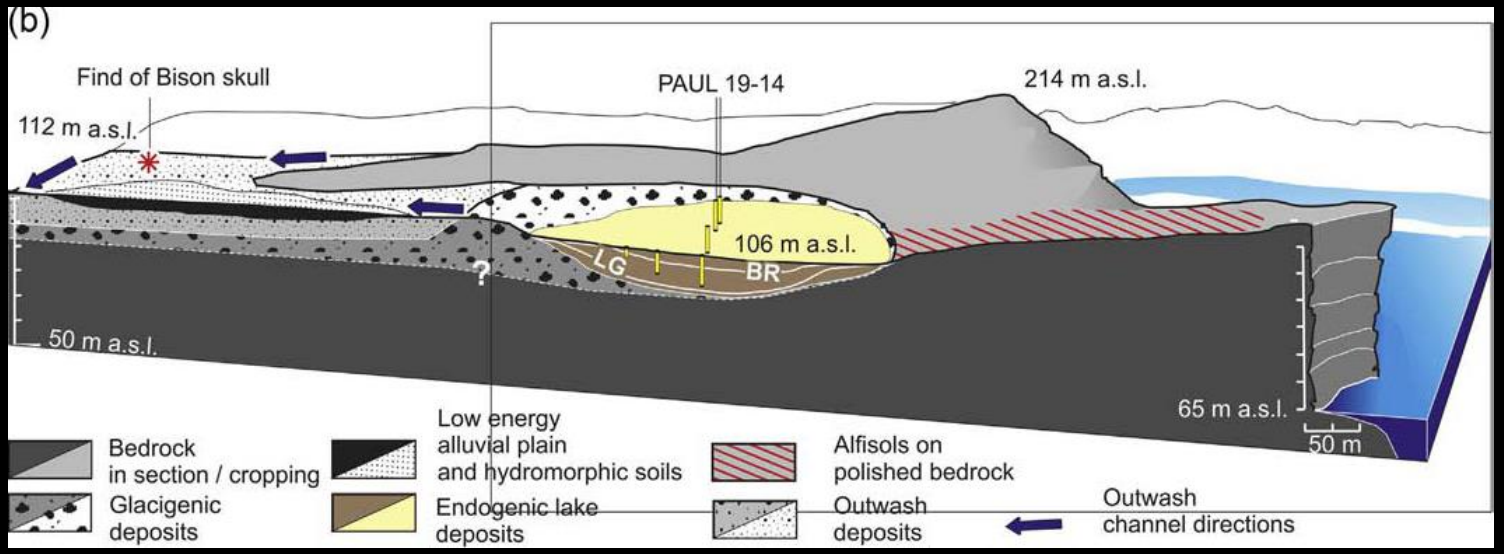


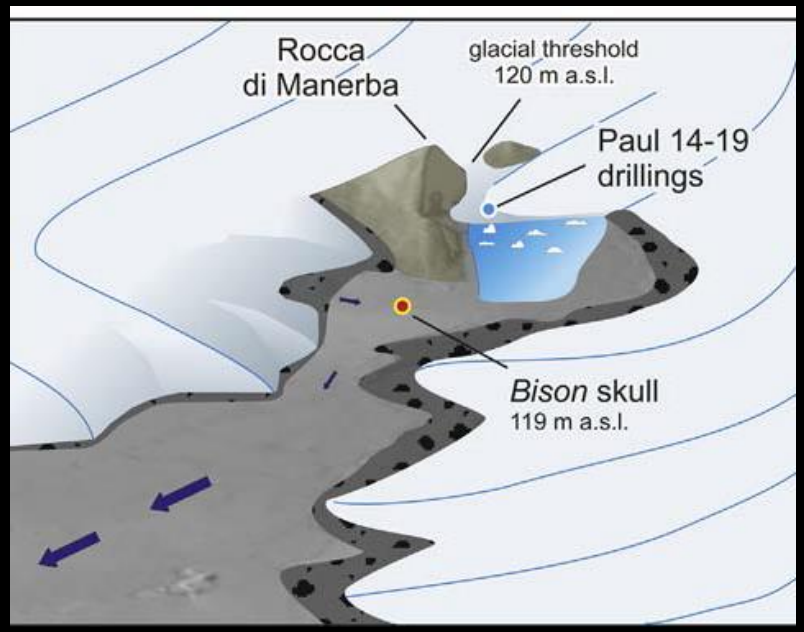


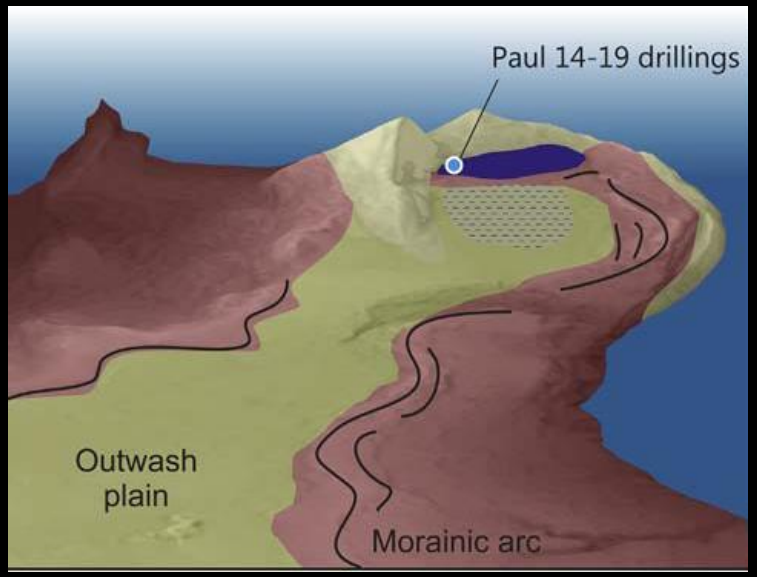
Lithostratigraphic map of the Garda area.
1 Outwash, glacifluvial, alluvial plains and intermorainic lacustrine basins;
1a Partly varved lacustrine deposits (last Lateglacial);
2 Inner LGM glacial ridge (Manerba advance, end of LGM);
3 Glacial ridges (LGM);
4 Glacial and ice-contact deposits (Middle Pleistocene);
5-9 Pre-quaternary bedrock

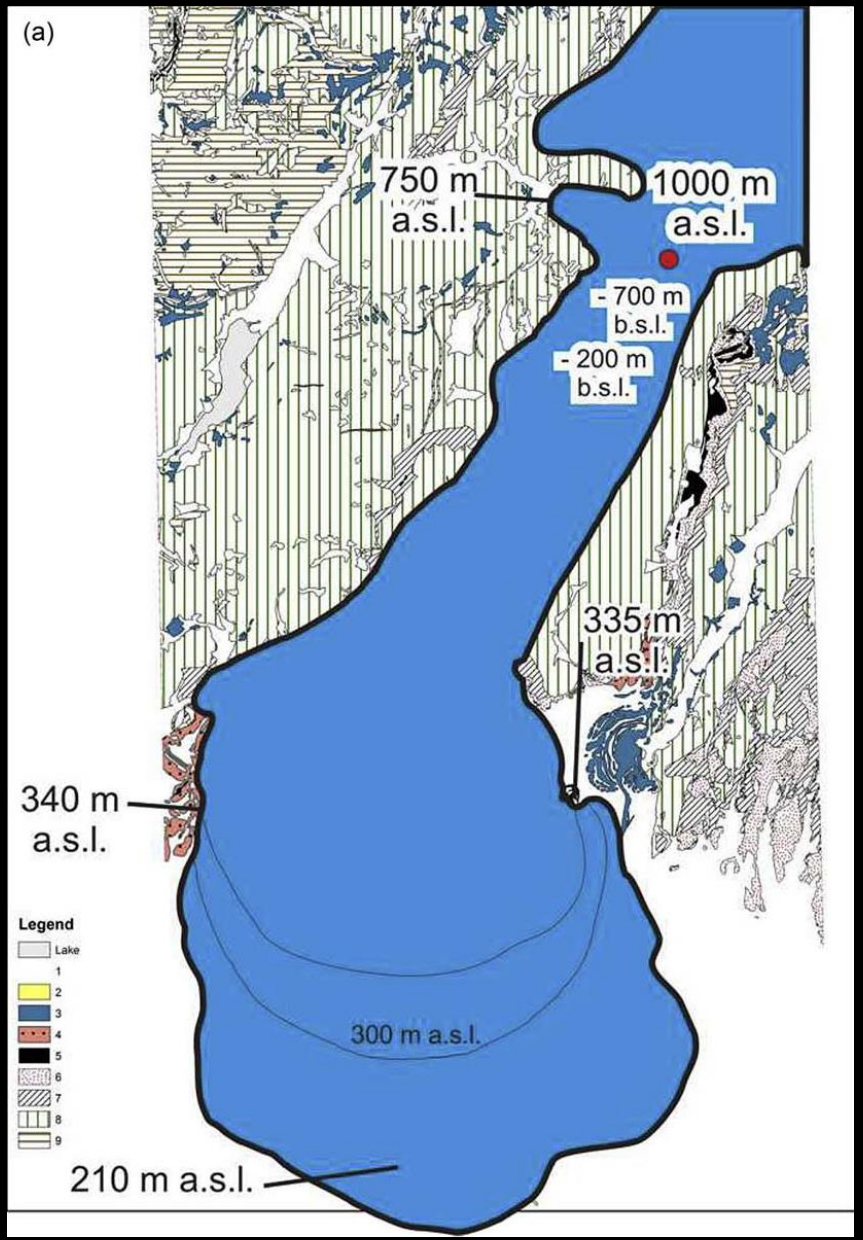

(b)
Glacier surface
Modern lake level
COR
ZU
L2
Post-glacial fill
Till
MAI
L1
DPR
Post-glacial fill
Undifferentiated Till
2000
1500
1000
500
0
- 500
- 1000
- 1500
- 2000
Altitude m a.s.l.

The Manerba promontory hanging over the Garda Lake viewed from the East



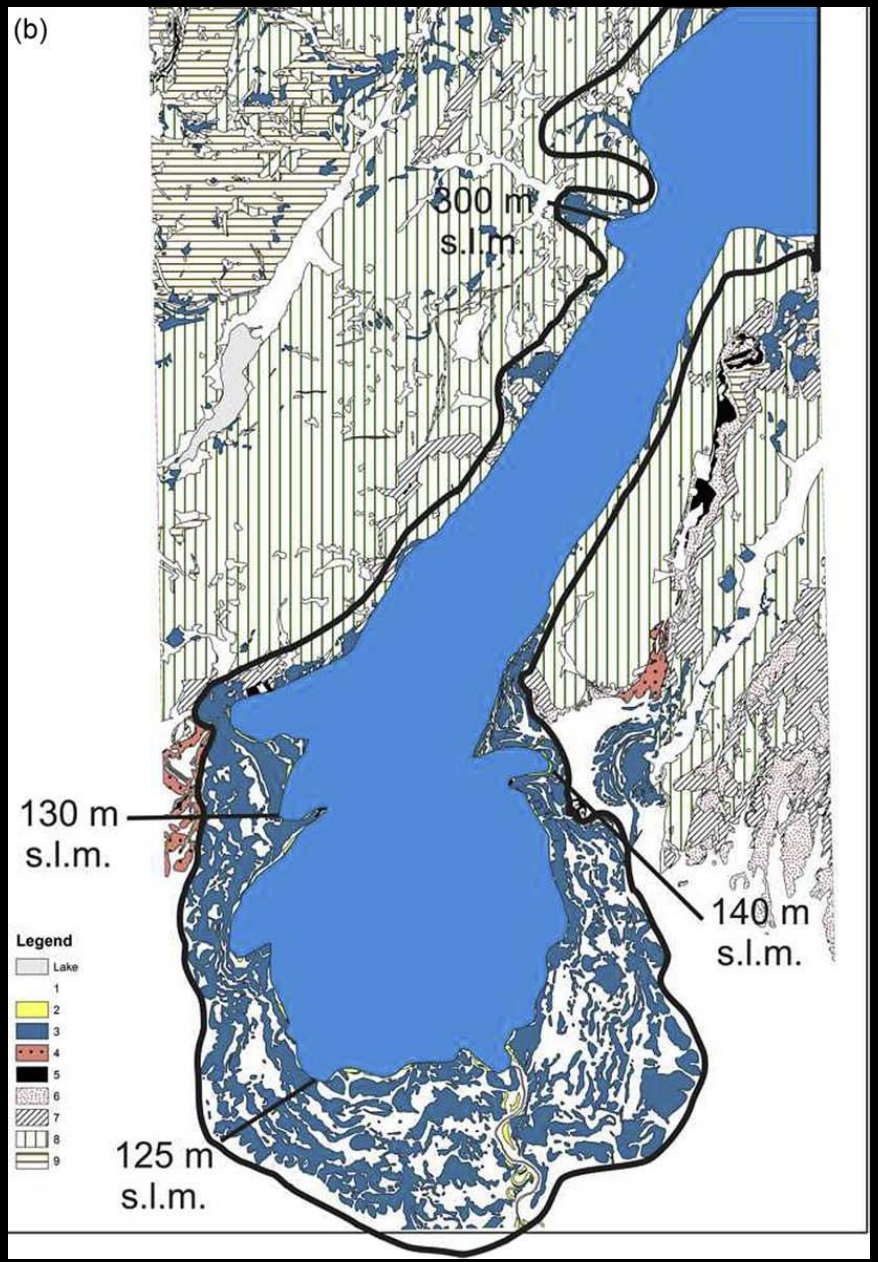

Rocca
di Manerba
glacial threshold
120 m a.s.l.
Paul 14-19
drillings
Bison skull
119 m a.s.l.


Paul 14-19 drillings
Outwash
plain
Morainic arc



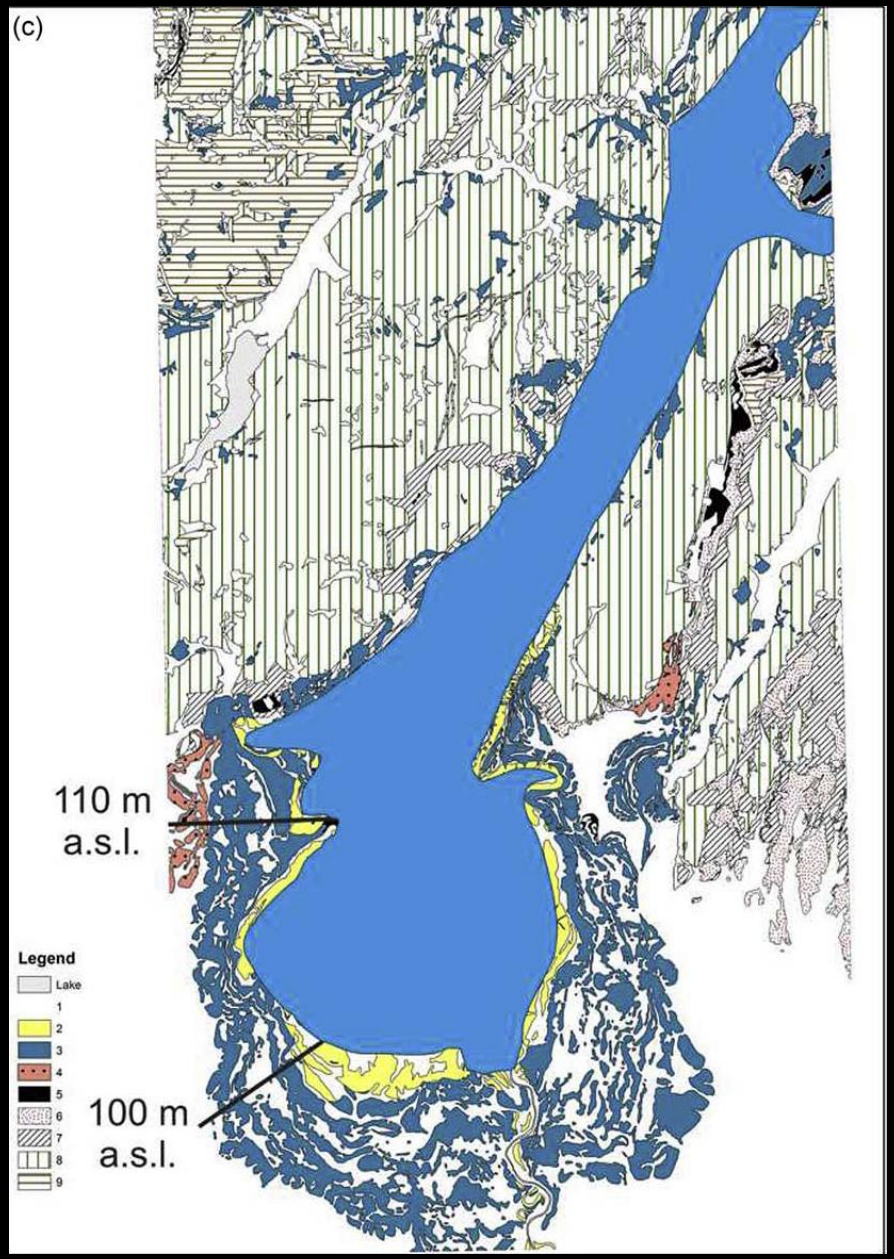
Evolution of the ice-contact lake paleo-Garda.

a) Maximum extent of the Garda glacier lobe during the Last Glacial Maximum.



Evolution of the ice-contact lake paleo-Garda.

b) Manerba advance culmination.



Evolution of the ice-contact lake paleo-Garda.

c) early collapse and ice-contact lake formation.