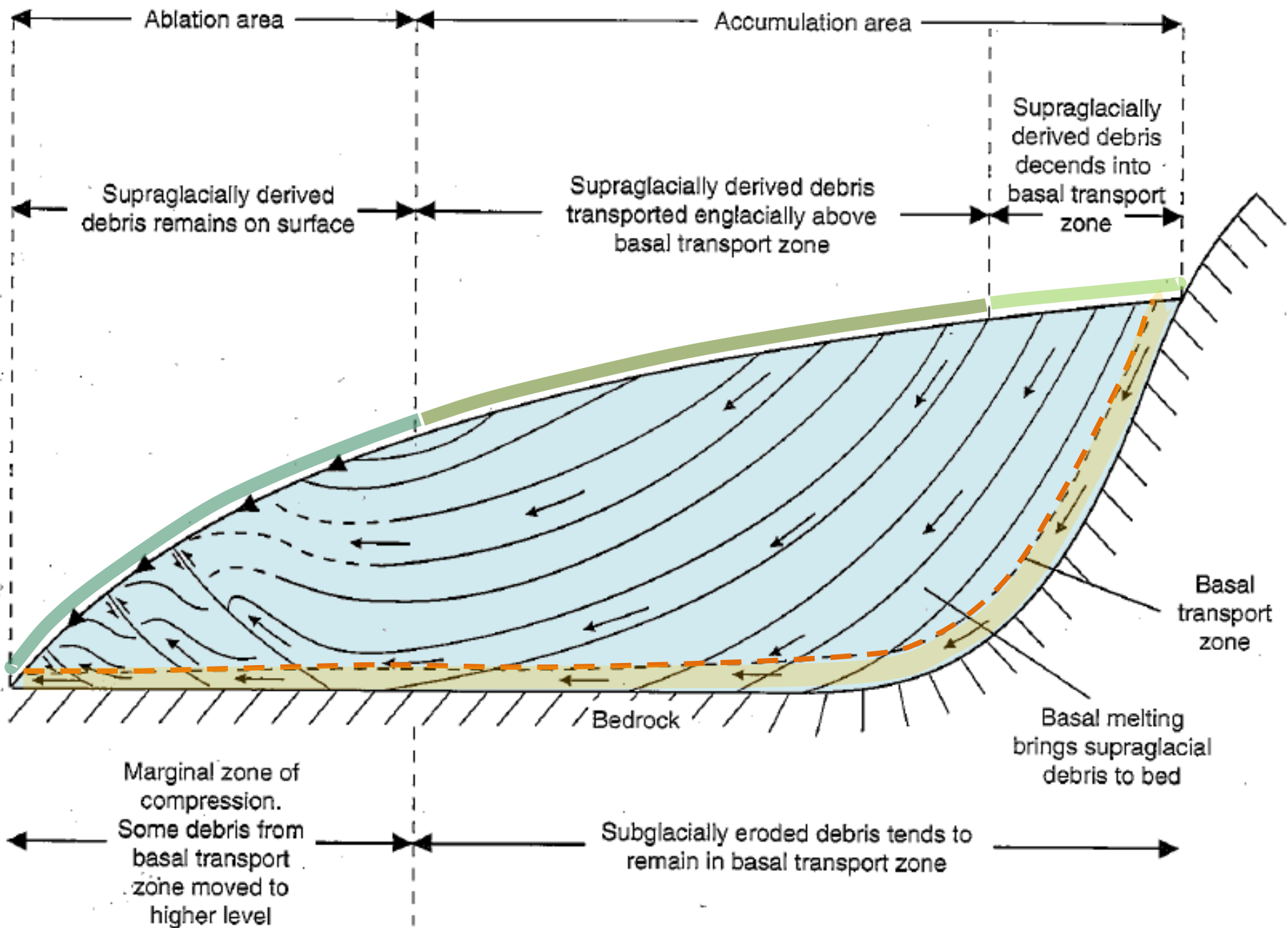


A wide-angle photograph of a massive glacier, likely in the Alps, showing a prominent dark line of debris running down its center. The glacier's surface is heavily crevassed and textured. The text "Entrainment and Transportation of Debris in Alpine Glaciers" is overlaid in white, bold font.

Entrainment and Transportation of Debris in Alpine Glaciers



Basal Debris Entrainment

- Regelation
- Entrainment associated with ice deformation (during development of foliation and during thrusting)
- Glaciohydraulic supercooling

Basal Debris Transportation

- Derived either from the substrate by abrasion or quarrying, or from the surface and transported to the base by downward flow
- Zone of traction: debris is moved along the glacier bed (at the ice-bed interface) This material is “actively transported” and is subject to modification (crushing and abrasion) (Figure 7.7)
- Zone of suspension: debris is transported within the ice above the zone of traction (this material can develop a strong fabric of alignment of anisotropic grains)

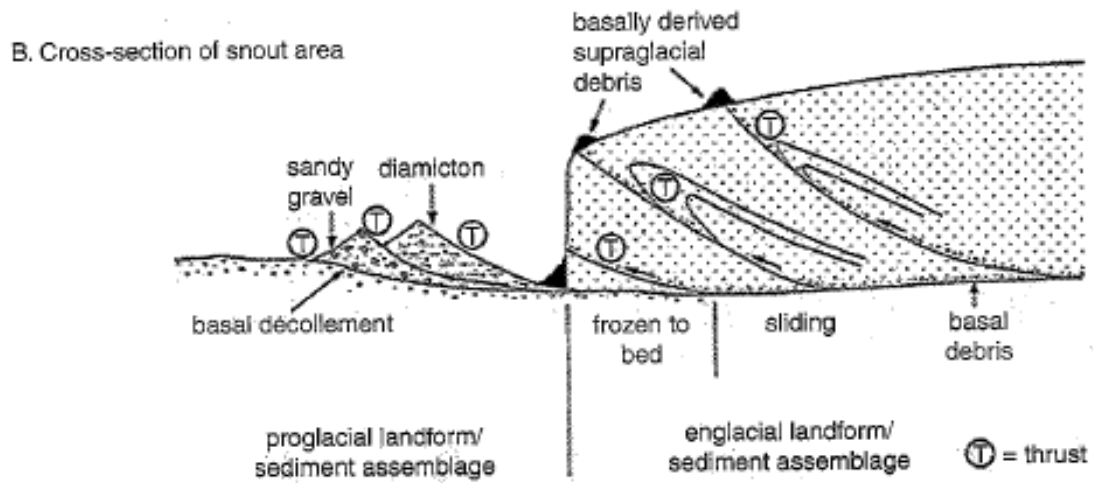
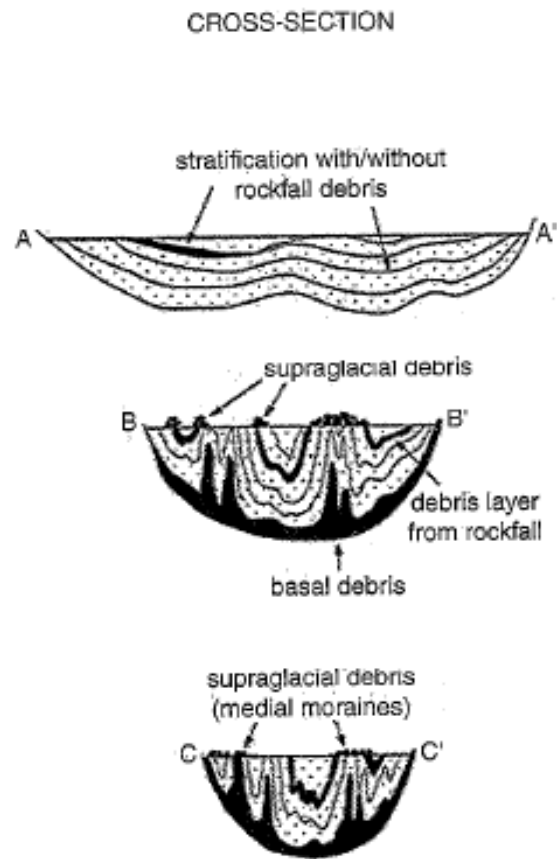
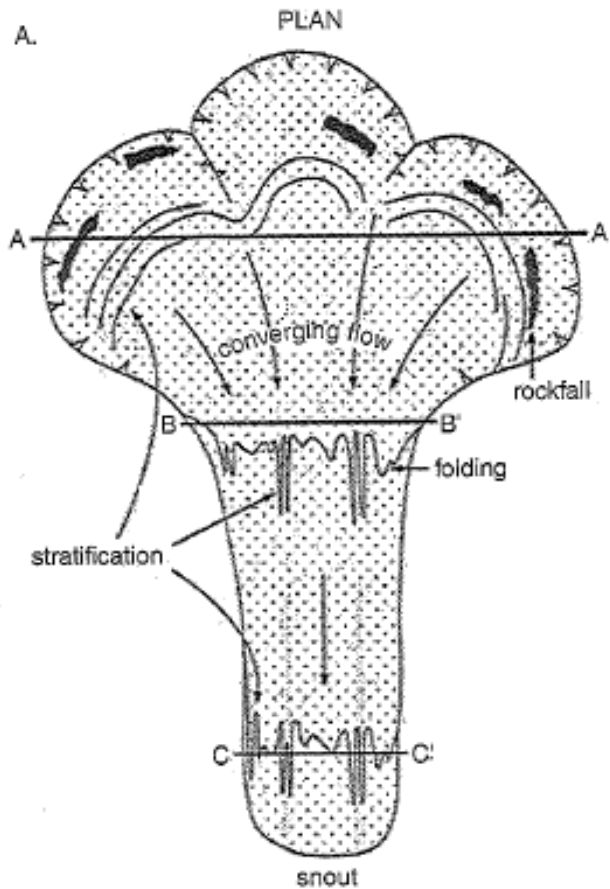
Lamination versus Longitudinal Foliation



USGS



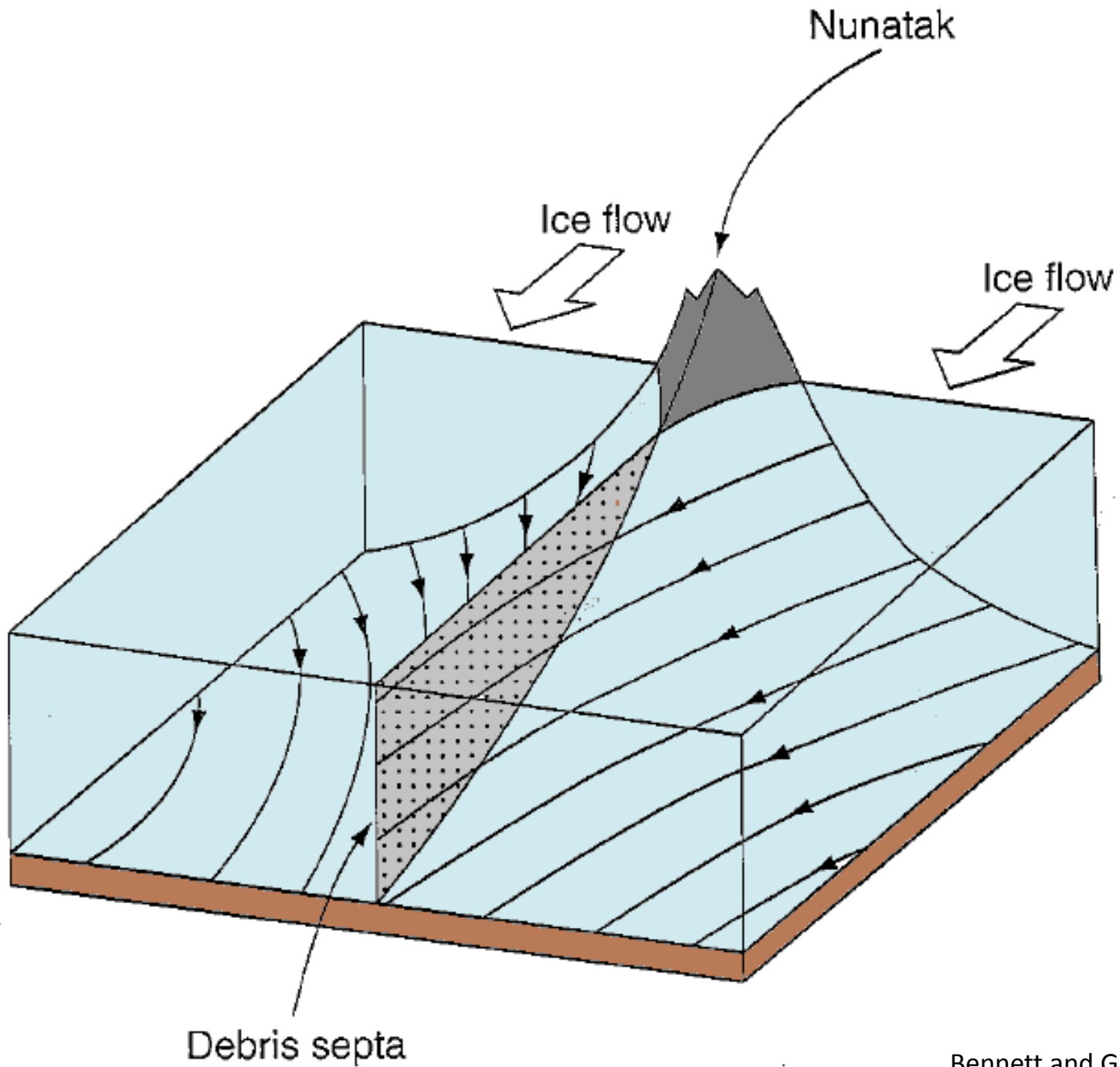
Nick

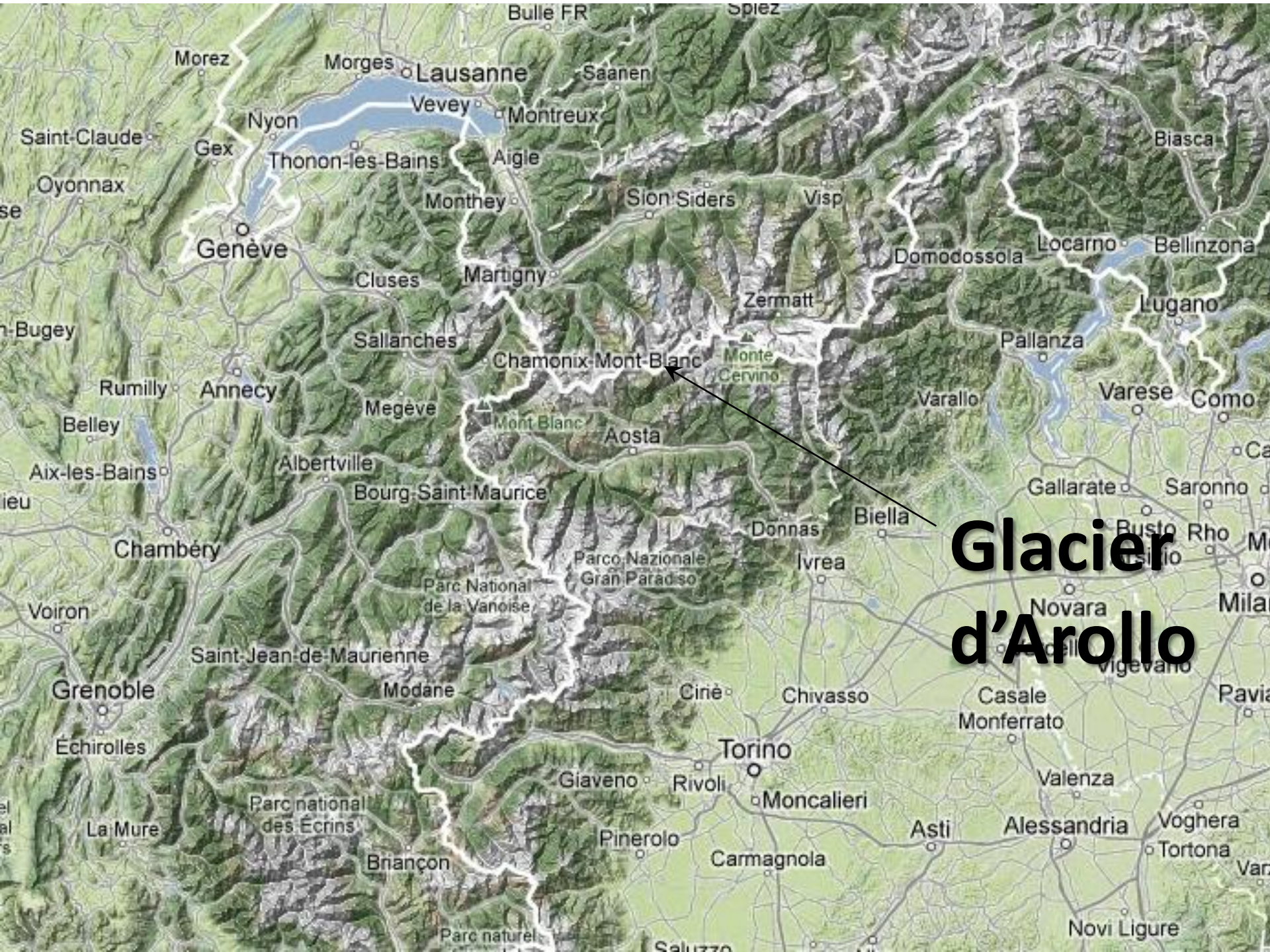


Medial Moraines



Denali National Park, Alaska





Glacier d'Arolla

Morez

Morges

Lausanne

Saanen

Saint-Claude

Nyon

Vevey

Montreux

Oyonnax

Gex

Thonon-les-Bains

Aigle

Monthey

Sion Siders

Visp

Genève

Cluses

Martigny

Domodossola

Locarno

Bellinzona

h-Bugey

Sallanches

Zermatt

Pallanza

Lugano

Rumilly

Annecy

Megève

Chamonix-Mont-Blanc

Monte Cervino

Varallo

Varese

Como

Belley

Aix-les-Bains

Albertville

Mont Blanc

Aosta

Gallarate

Saronno

ieu

Bourg-Saint-Maurice

Donnas

Biella

Busto Arsiz
io

Mila

Voiron

Chambéry

Parc National
de la Vanoise

Parco Nazionale
Gran Paradiso

Ivrea

Novara

Mila

Grenoble

Saint-Jean-de-Maurienne

Modane

Cinè

Chivasso

Casale
Monferrato

Pavia

Echirolles

Parc national
des Écrins

Briançon

Giaveno

Rivoli

Torino

Moncalieri

Valenza

Alessandria

Voghera

La Mure

Pinerolo

Carmagnola

Asti

Alessandria

Tortona

Parc naturel

Saluzzo

Novi Ligure



Glacier
d'Arolla

Mont Blanc
de Cheillon

Pigne
d'Arolla

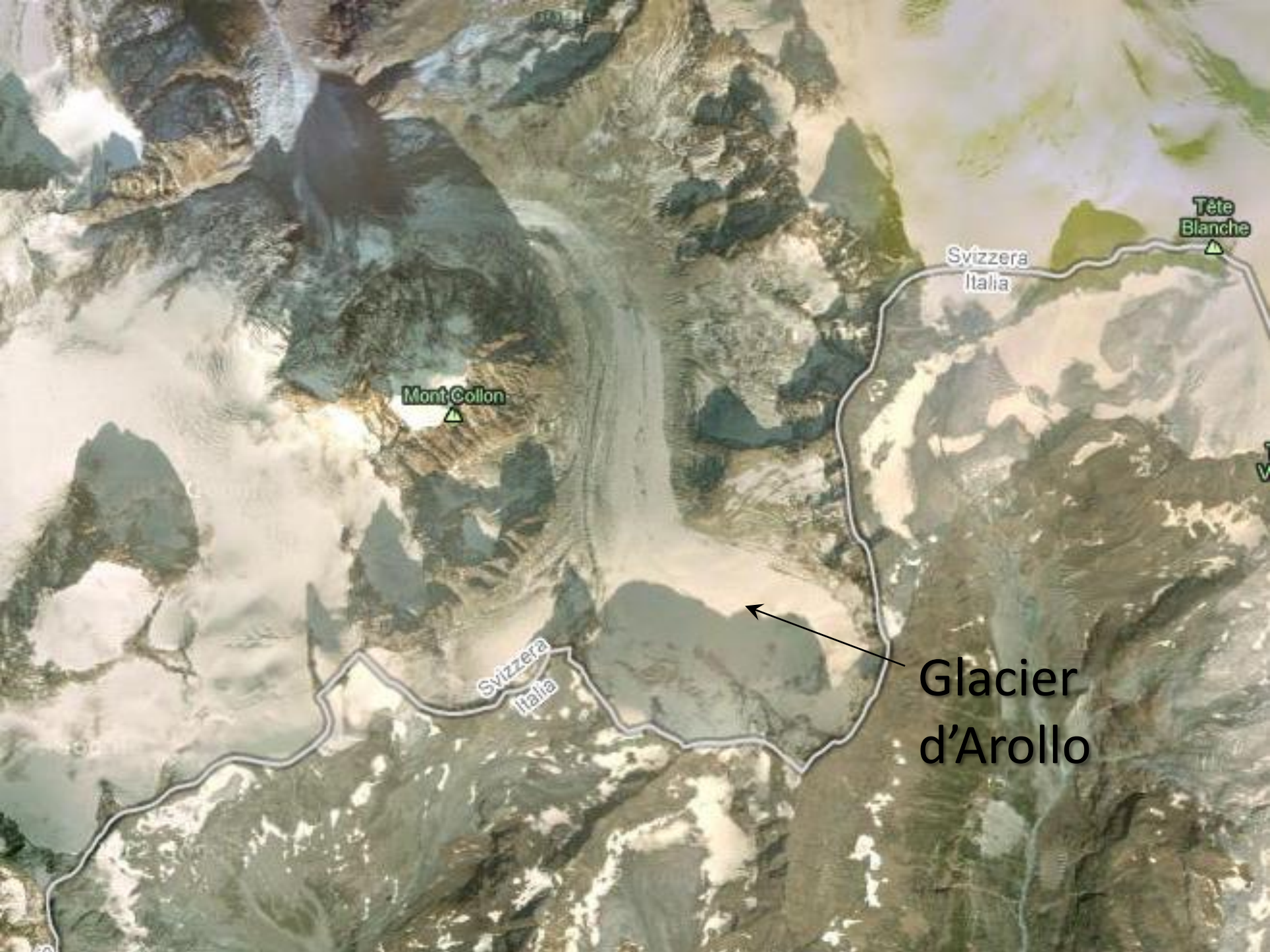
Mont Collon

Tête
Blanche

Lac de
Mauvoisin

La Monta

2 km
2 mi



Mont Collon

Tête Blanche

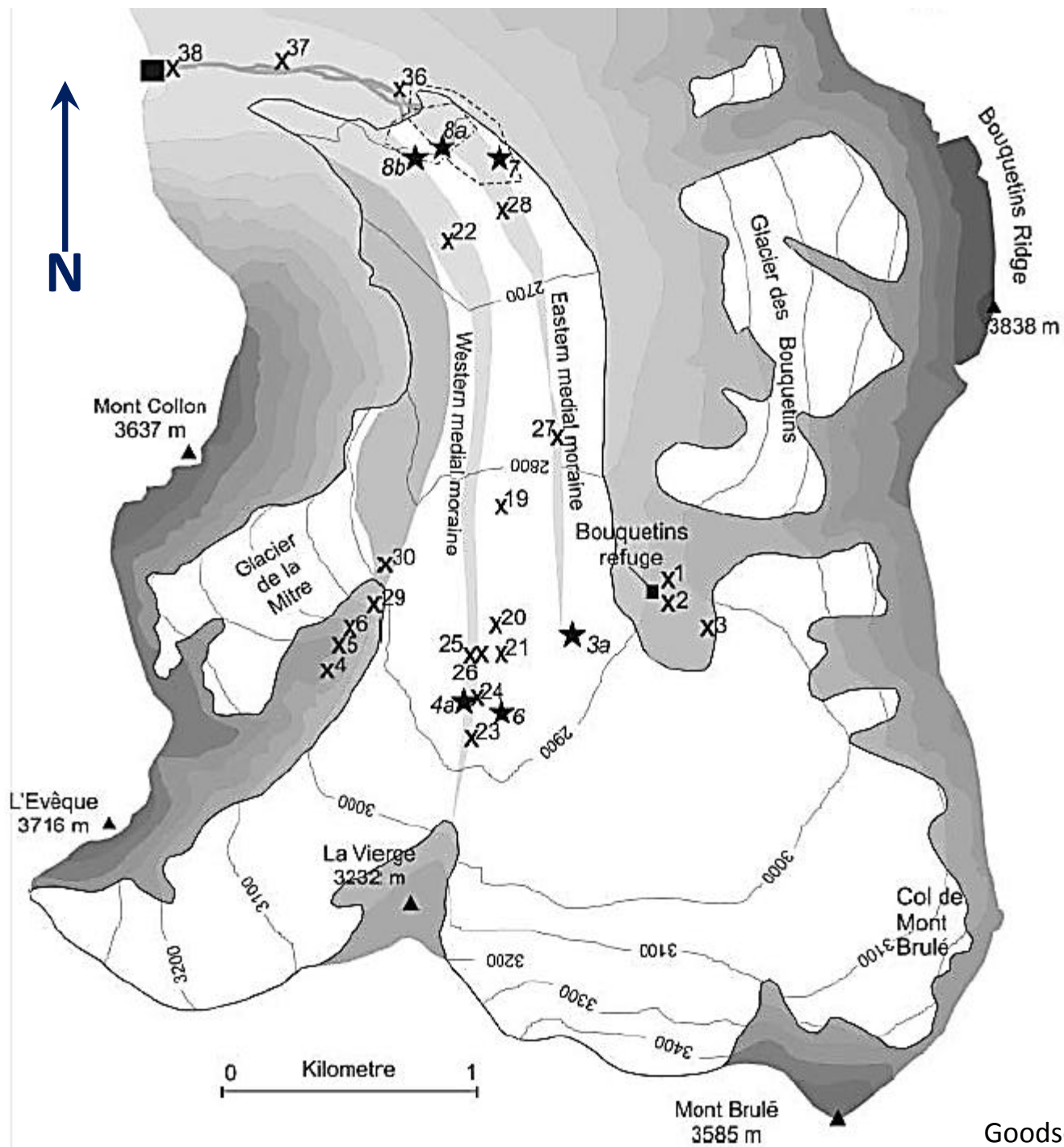
Svizzera
Italia

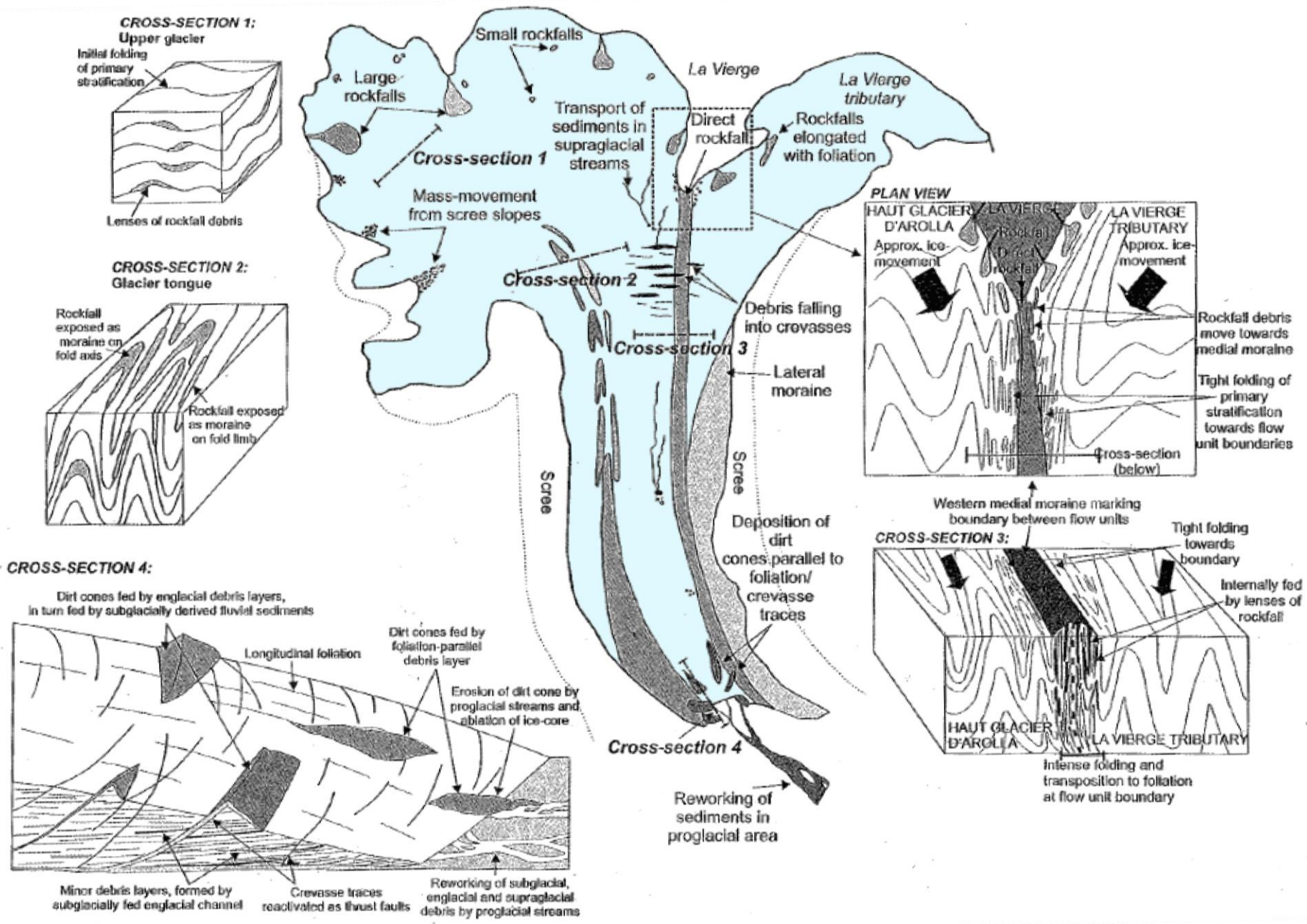
Svizzera
Italia

Glacier
d'Arolla

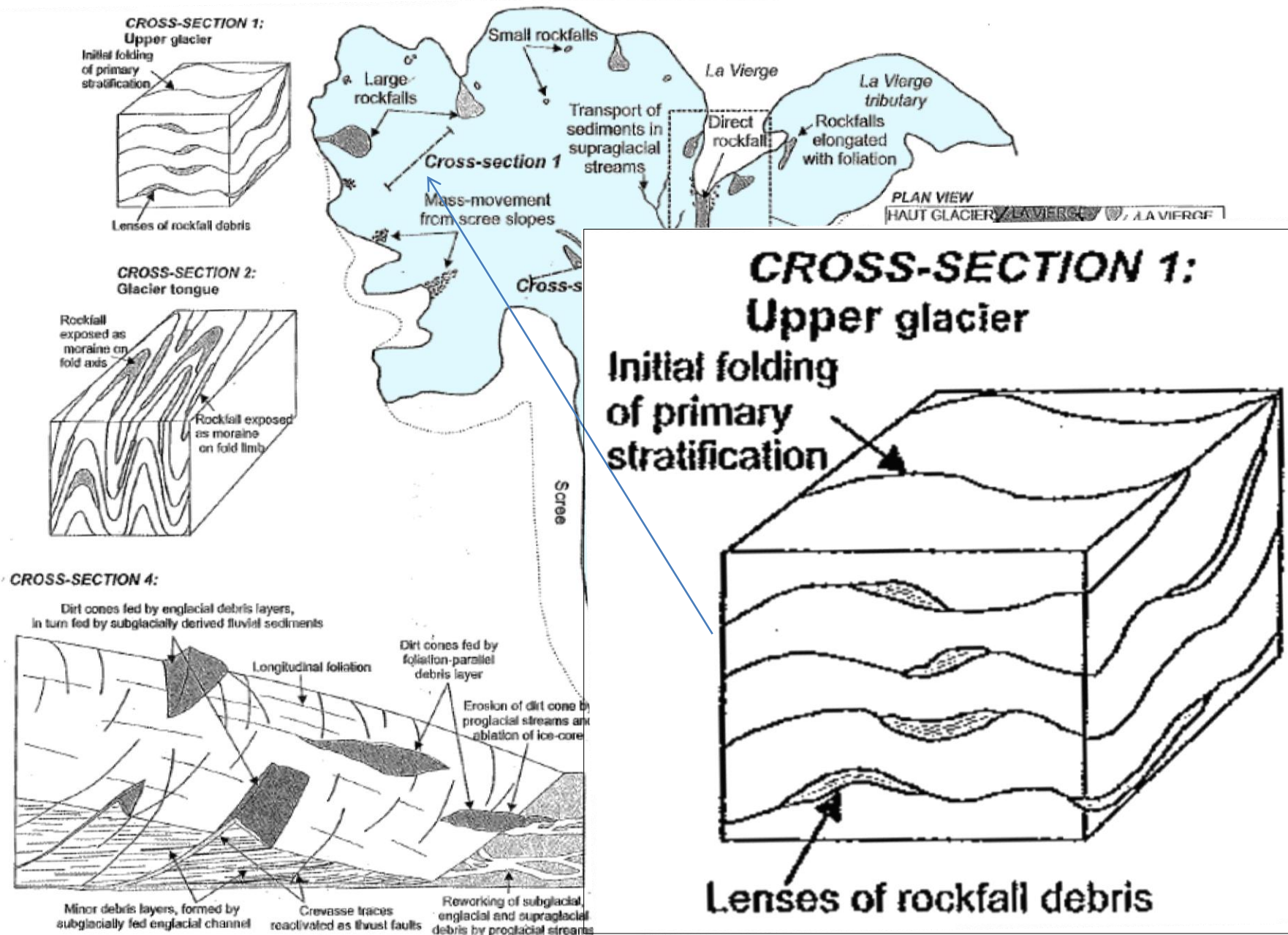










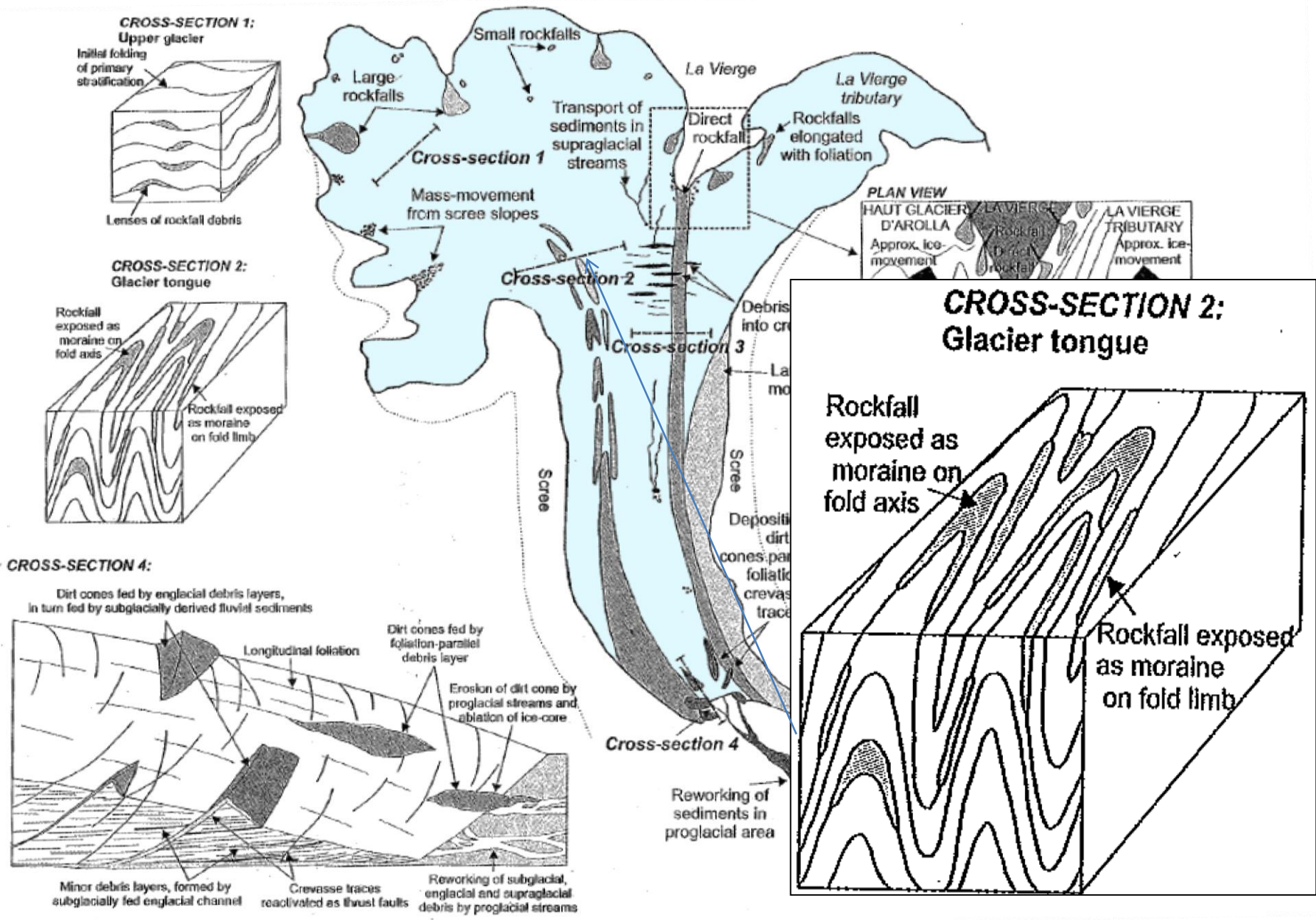




Doug

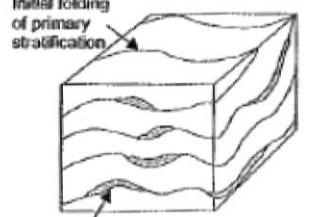


Nick



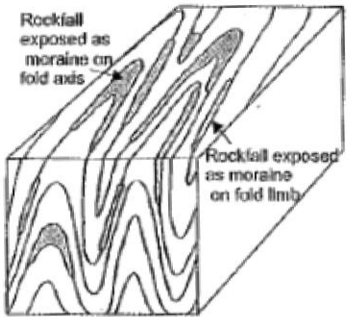
CROSS-SECTION 1:

Upper glacier



Lenses of rockfall debris

CROSS-SECTION 2:
Glacier tongue

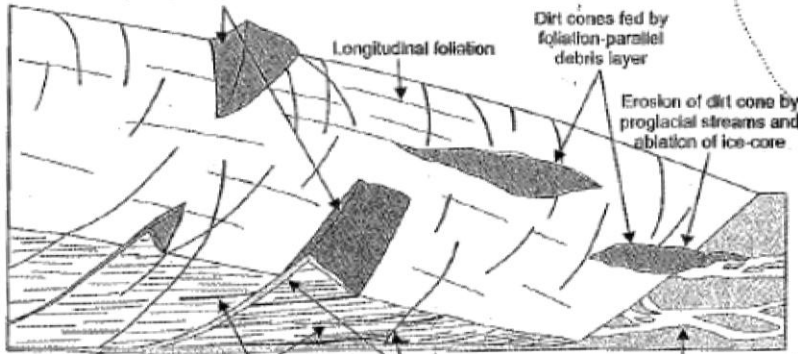


Rockfall exposed as moraine on fold axis

Rockfall exposed as moraine on fold limb

CROSS-SECTION 4:

Dirt cones fed by englacial debris layers, in turn fed by subglacially derived fluvial sediments



Dirt cones fed by foliation-parallel debris layer

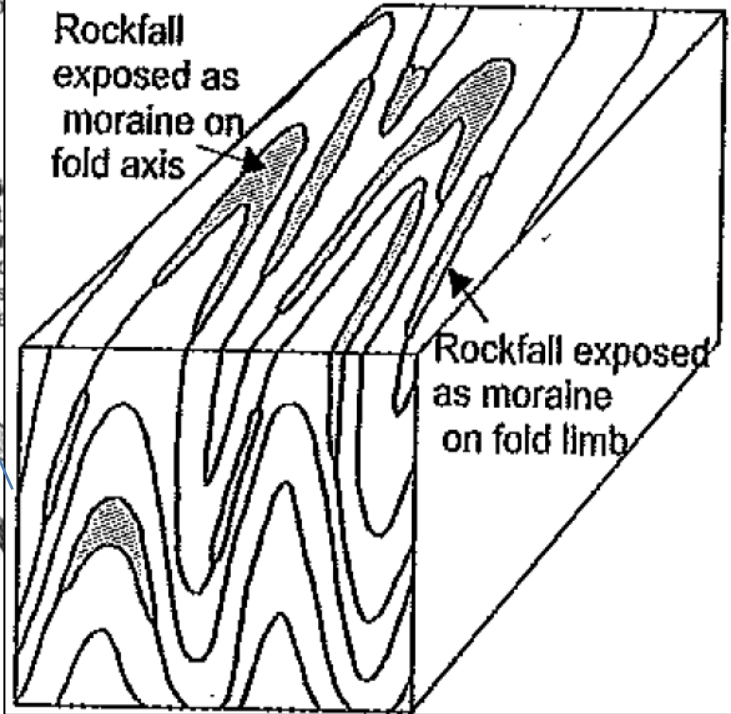
Erosion of dirt cones by proglacial streams and ablation of ice-core

Minor debris layers, formed by subglacially fed englacial channel

Crevasse traces reactivated as thrust faults

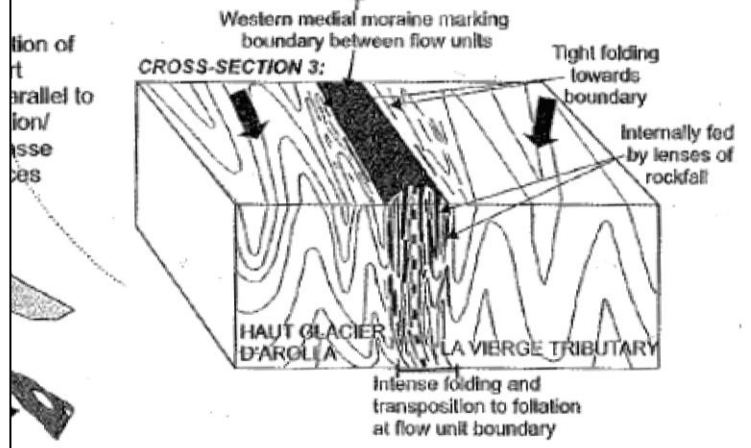
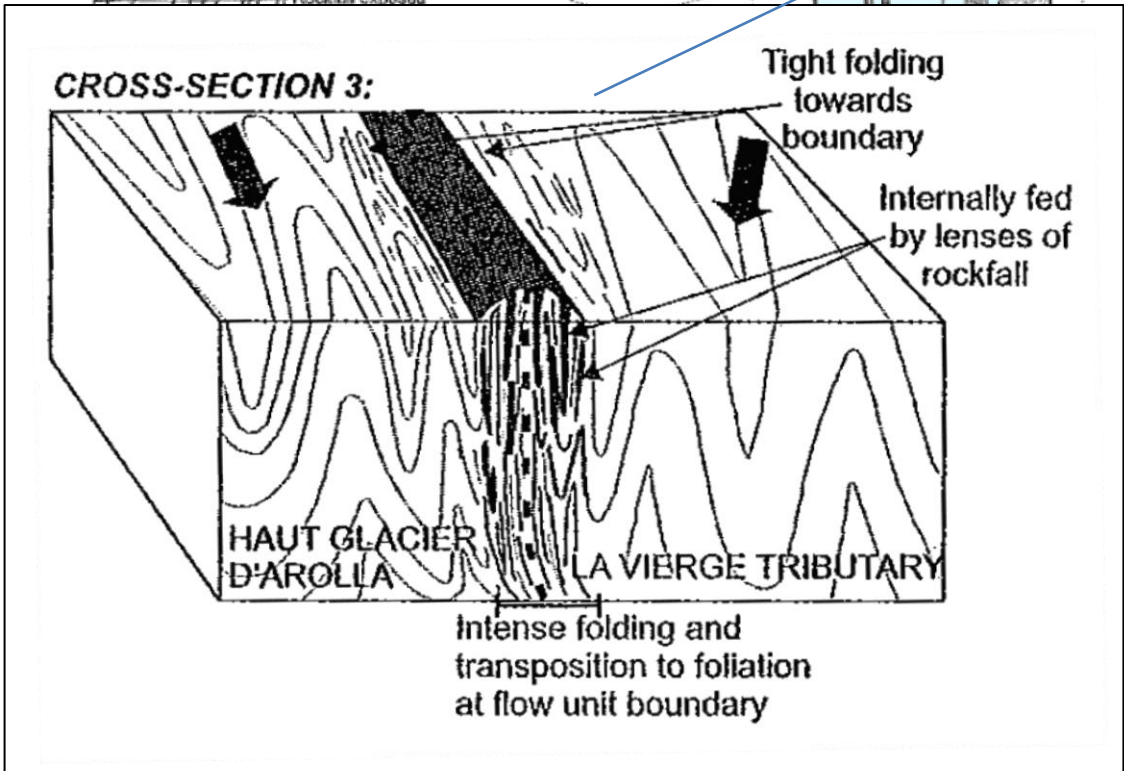
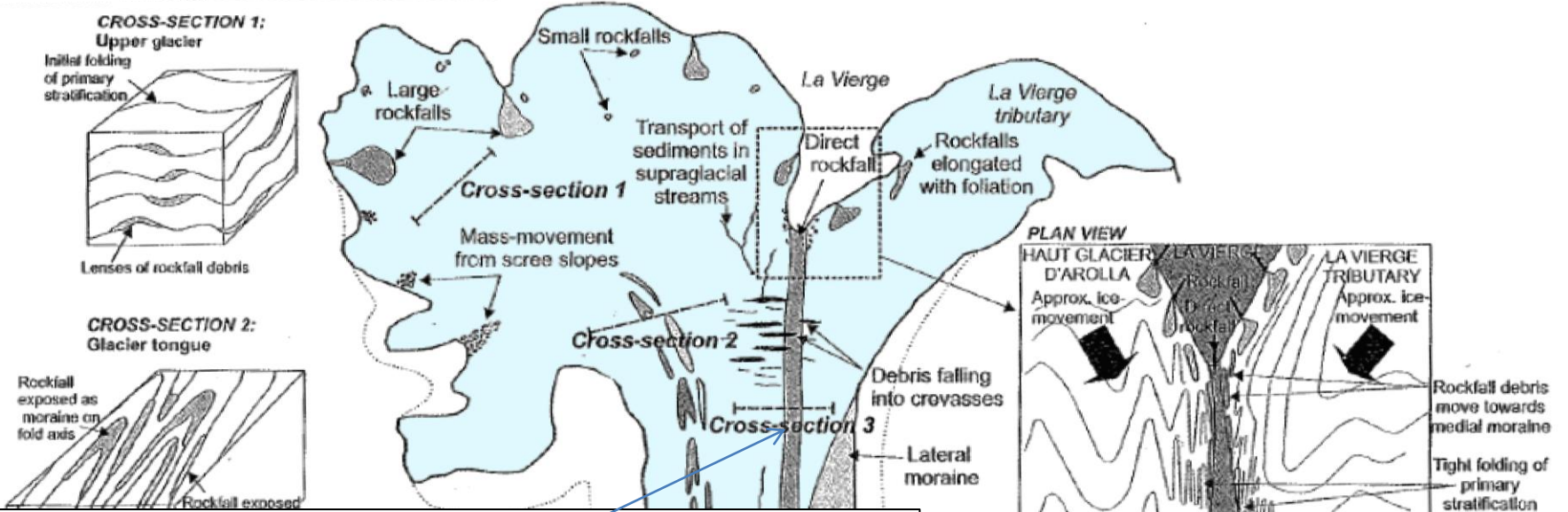
Reworking of subglacial, englacial and supraglacial debris by proglacial streams

CROSS-SECTION 2:
Glacier tongue



Rockfall exposed as moraine on fold axis

Rockfall exposed as moraine on fold limb



CROSS-SECTION 4:

Dirt cones fed by englacial debris layers,
In turn fed by subglacially derived fluvial sediments

