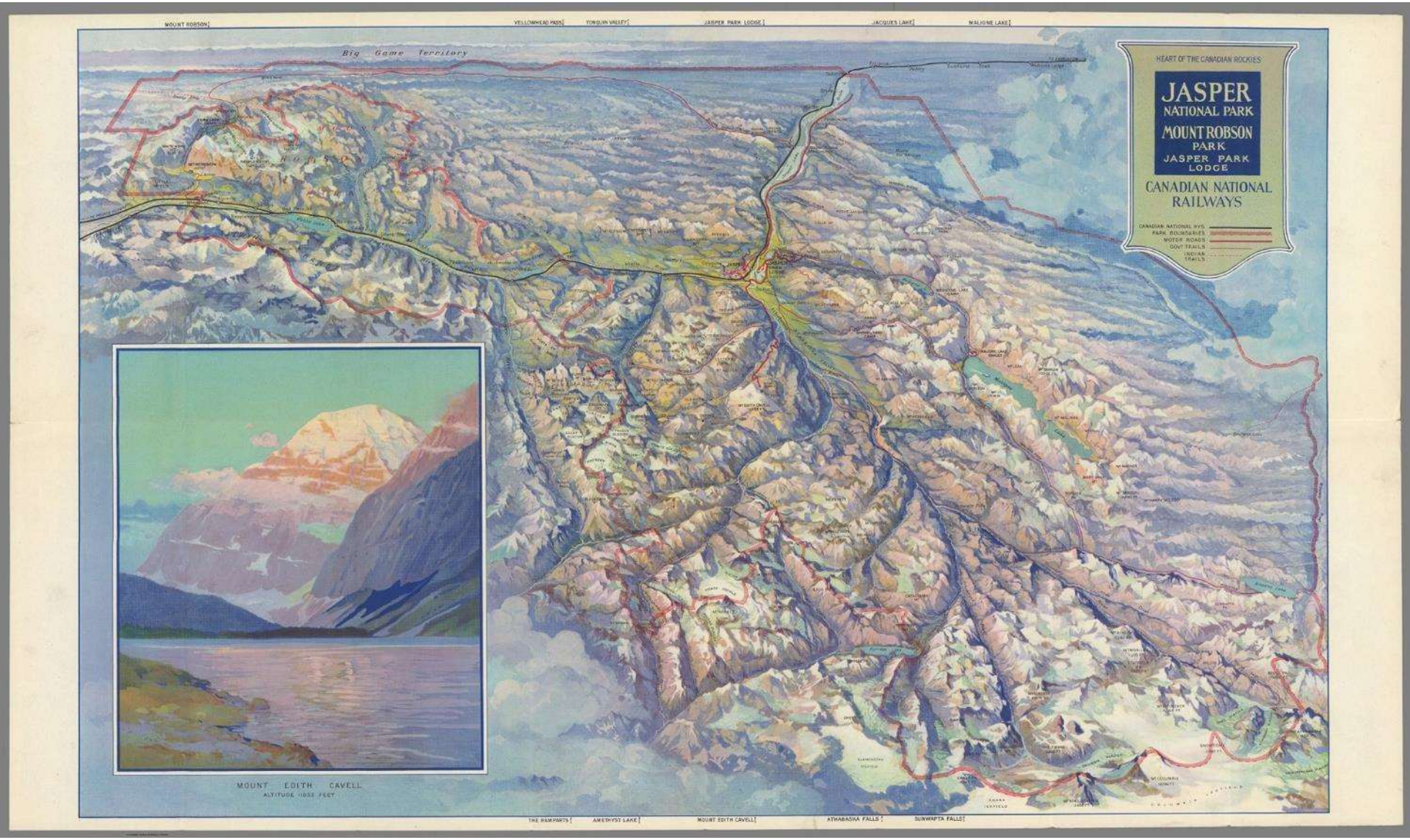
Mountain Cartography



Jasper / Mt. Robson, 1935 (Icefields Parkway first constructed 1931-41)

Is it a map ? …..or a 2.5D graphic

Special attraction and challenges in mountain cartography

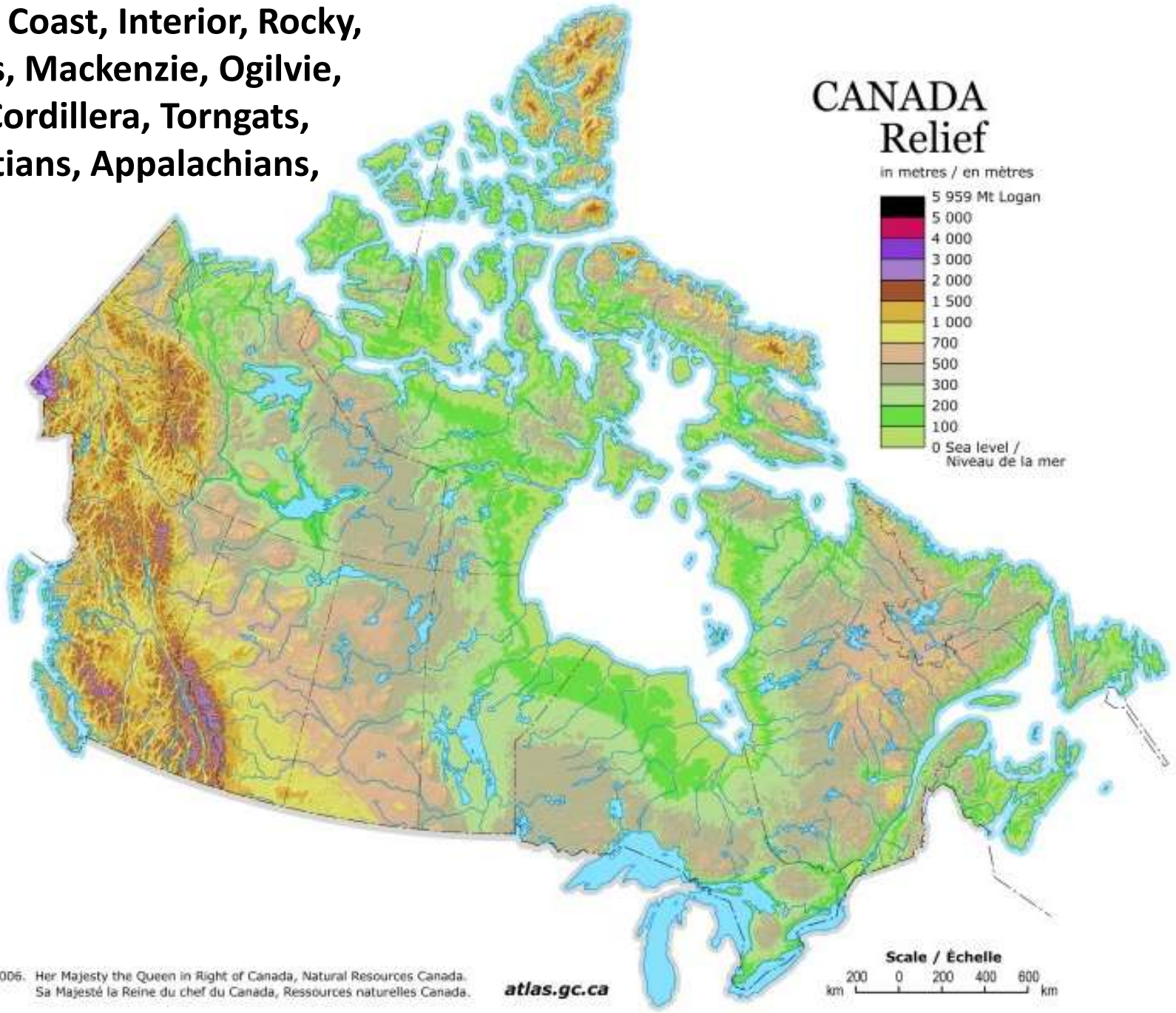
Which relief techniques: hachures, contours, hypsometric tints, shading ?

- Density of hachures and contours lines
- Contrast with colour tint layers, and shading (SW slopes)
- Ridges running NW-SE (equal shading / illumination)
- Issues of colour contrast and density of human features in valleys
- 2D map v 2.5D perspective (visual versus no steady scale)

Mountains and cartography

Caledonian/Acadian mountain building period ~400m yrs BC
Scandinavia, Scotland, Greenland, Newfoundland, Appalachians

Insular, Coast, Interior, Rocky, St. Elias, Mackenzie, Ogilvie, Arctic Cordillera, Torngats, Laurentians, Appalachians,



Brief timelines of mountain mapping

- Early mapping pre-1875
- Photo-topography in Canada 1875-1950
- Federal mapping 1950 -1995
- Private sector 1995 – present

- Planetary mapping (1645 – present)

Brief history of mountain cartography: Early mapping pre-1875

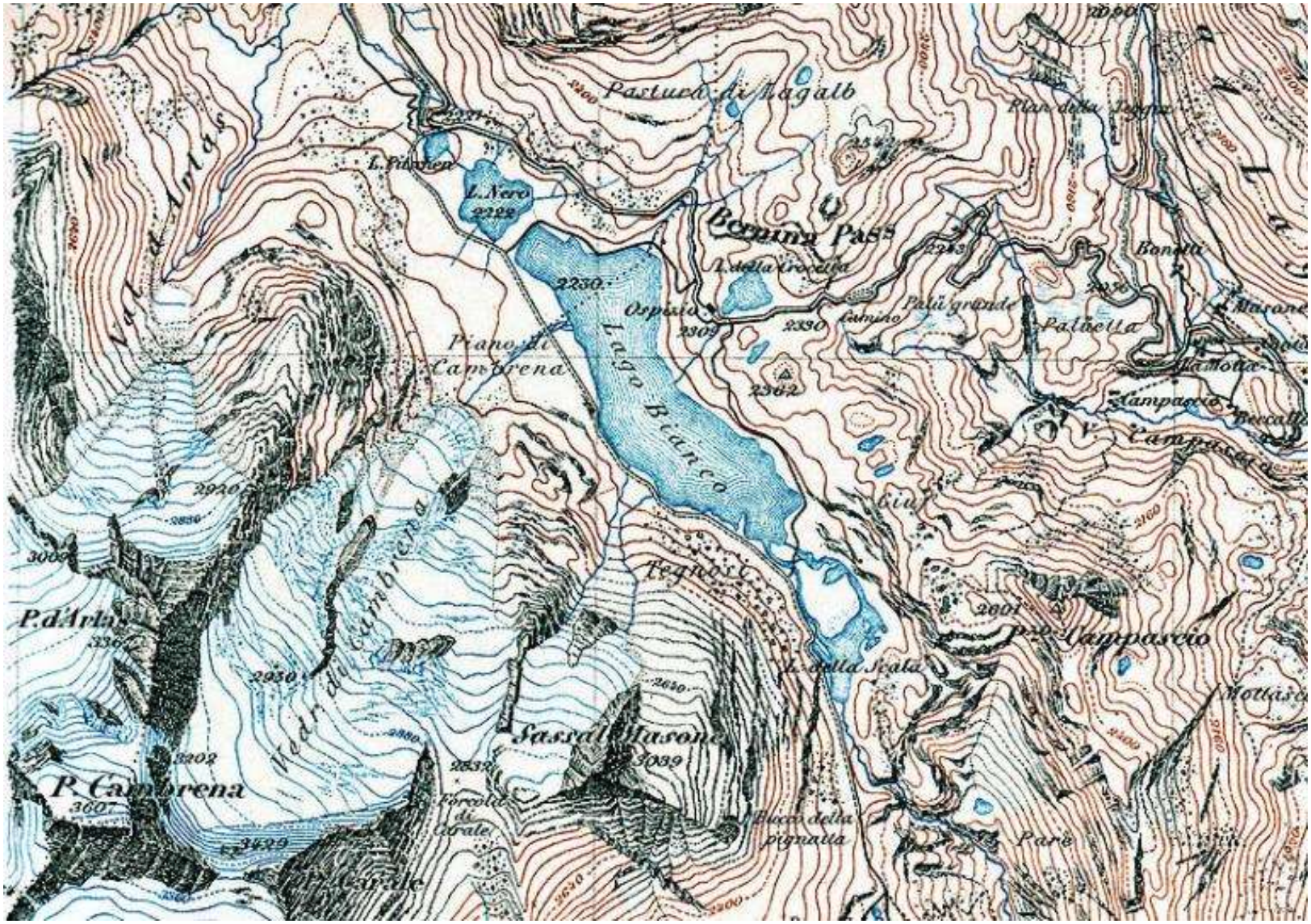
Switzerland, 1737: mountain mapping before surveying

Iceland 1815

Dufour hachure maps of Switzerland, 1845-65

http://map.geodataviewer.admin.ch/geodatenviewer.php

Bernina Pass, Switzerland 1877

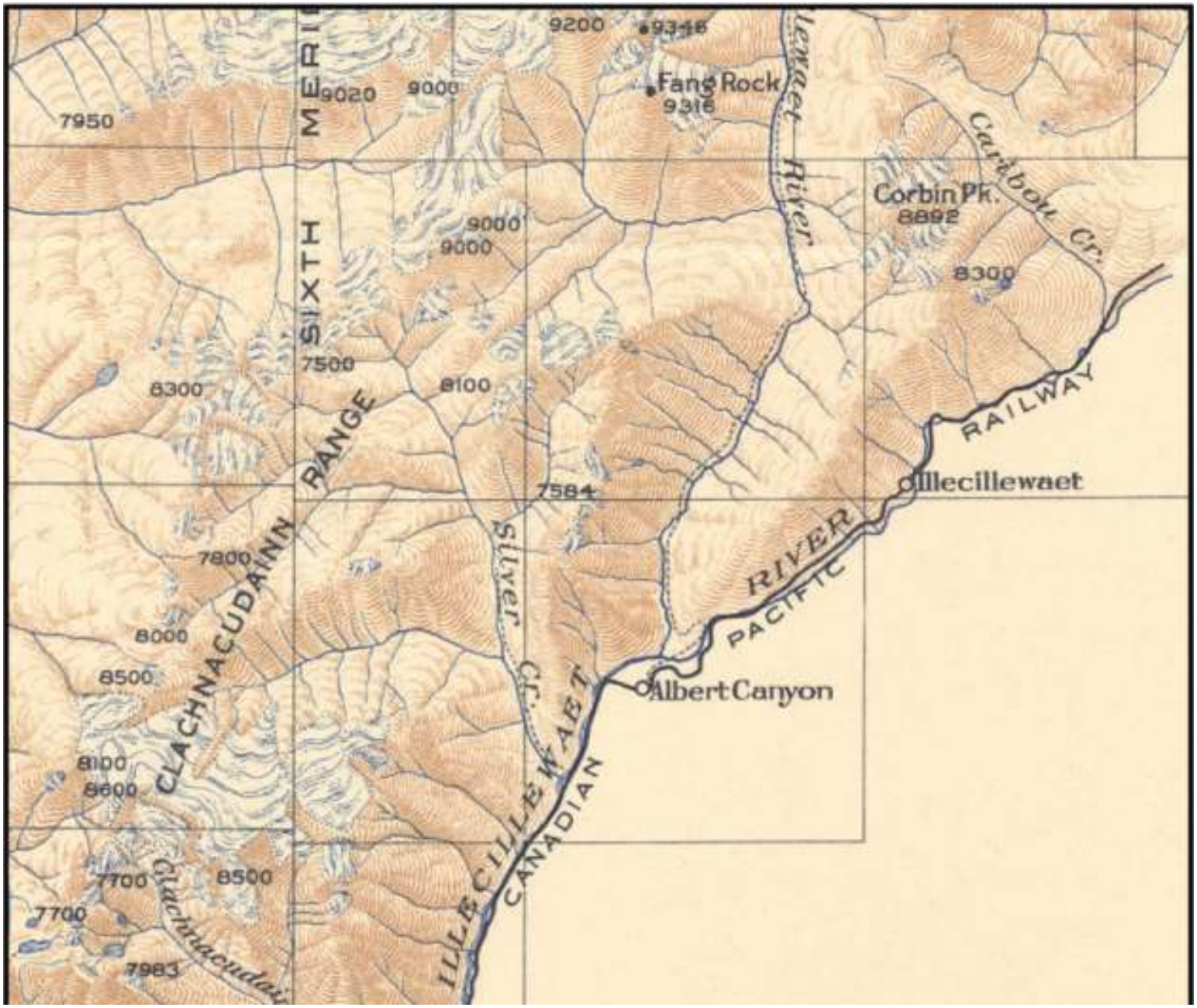


http://map.geodataviewer.admin.ch/geodatenviewer.php


THE FAR WEST
OF
THE BRITISH EMPIRE.
BRITISH COLUMBIA
PACIFIC OCEAN
VANCOUVER I.
UNITED STATES
Qn Charlotte Is
Graham I.
Moresby I.
Nootka Sd
Barclay Sd
Juan de Fuca St
Fraser R.
Athabasca
Lesser Slave L.
Ft Vermilion
Ft Assiniboine
Edmonton
Ft Hope
Douglas
Ft Walla Walla
Mt Rainier
Mt St Helens
Astoria
Columbia R.
Olympia
Peace R.
Hay R.
Slave R.
Resolution
English Miles
West Longitude

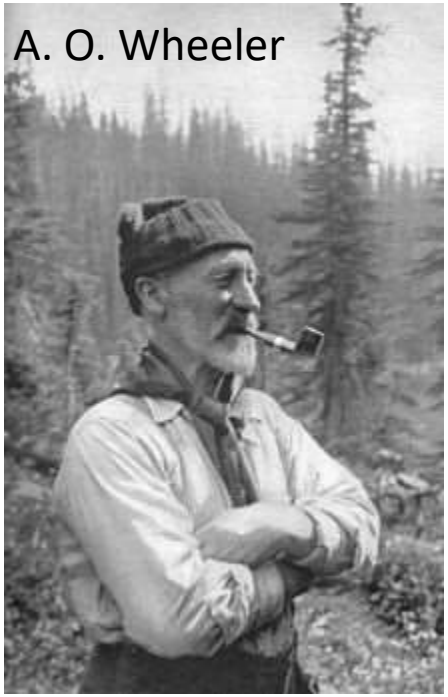
1862

Canada (Selkirks) 1885, part of railway map



Early mapping: Photo-topography, 1885-1950

A technique introduced from France by the surveyor-general (Edouard Deville). Surveyors would place the camera on a mountain peak, point the lens at the horizon and take panoramic shots of the surrounding peaks. Surveyors took photos in the short summer season, then would complete their calculations and mapping in their offices during the winter. **This allowed larger areas to be surveyed more accurately**, in less time, and at one-third the cost of conventional surveying.
It later gave way to aerial photogrammetry.



A. O. Wheeler

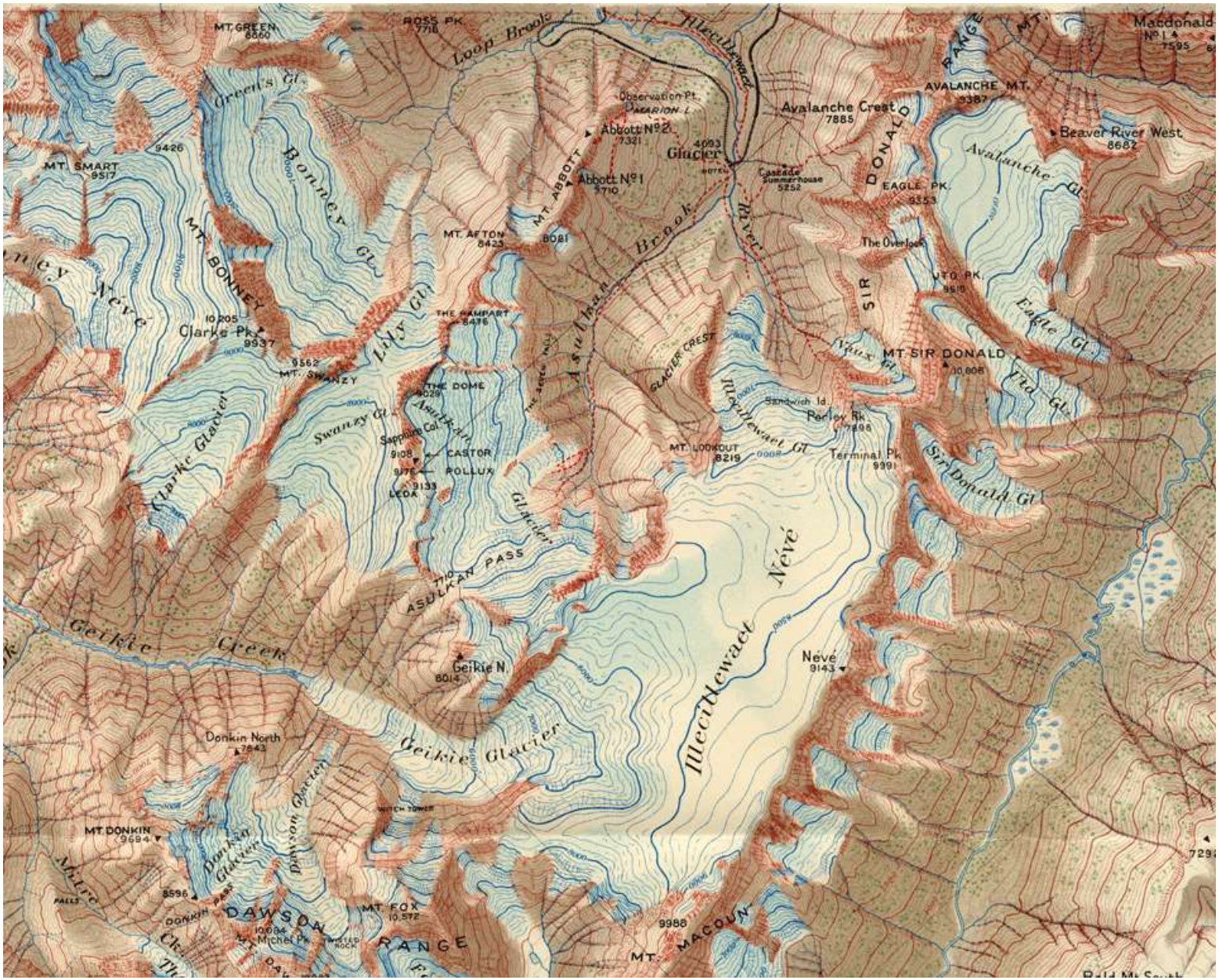
← Founder: Alpine Club of Canada

Early full colour map: Canadian Rocky Mountain

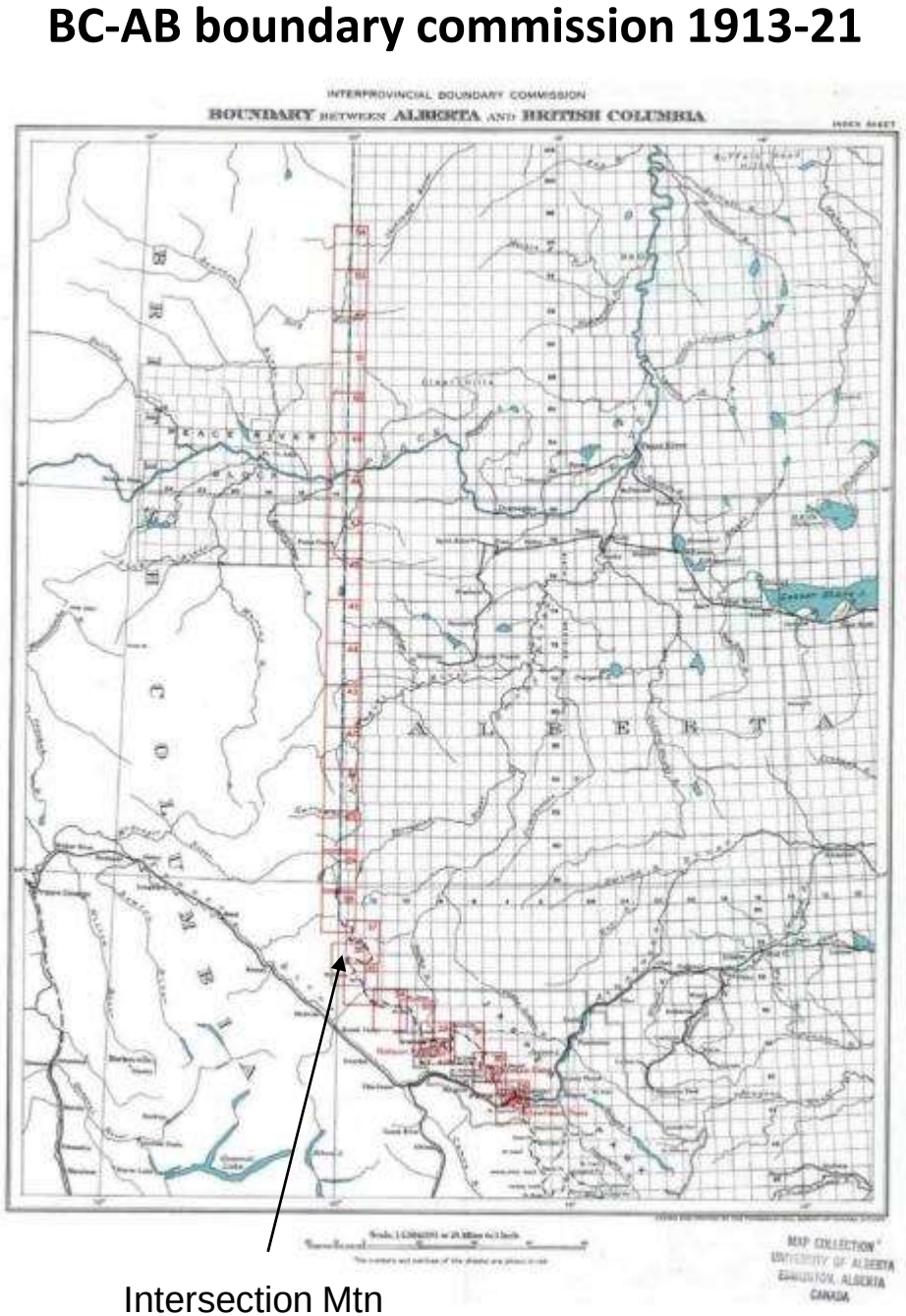
Mapped to entice climbers from Europe (20 maps in the series, Banff to Lake Louise)

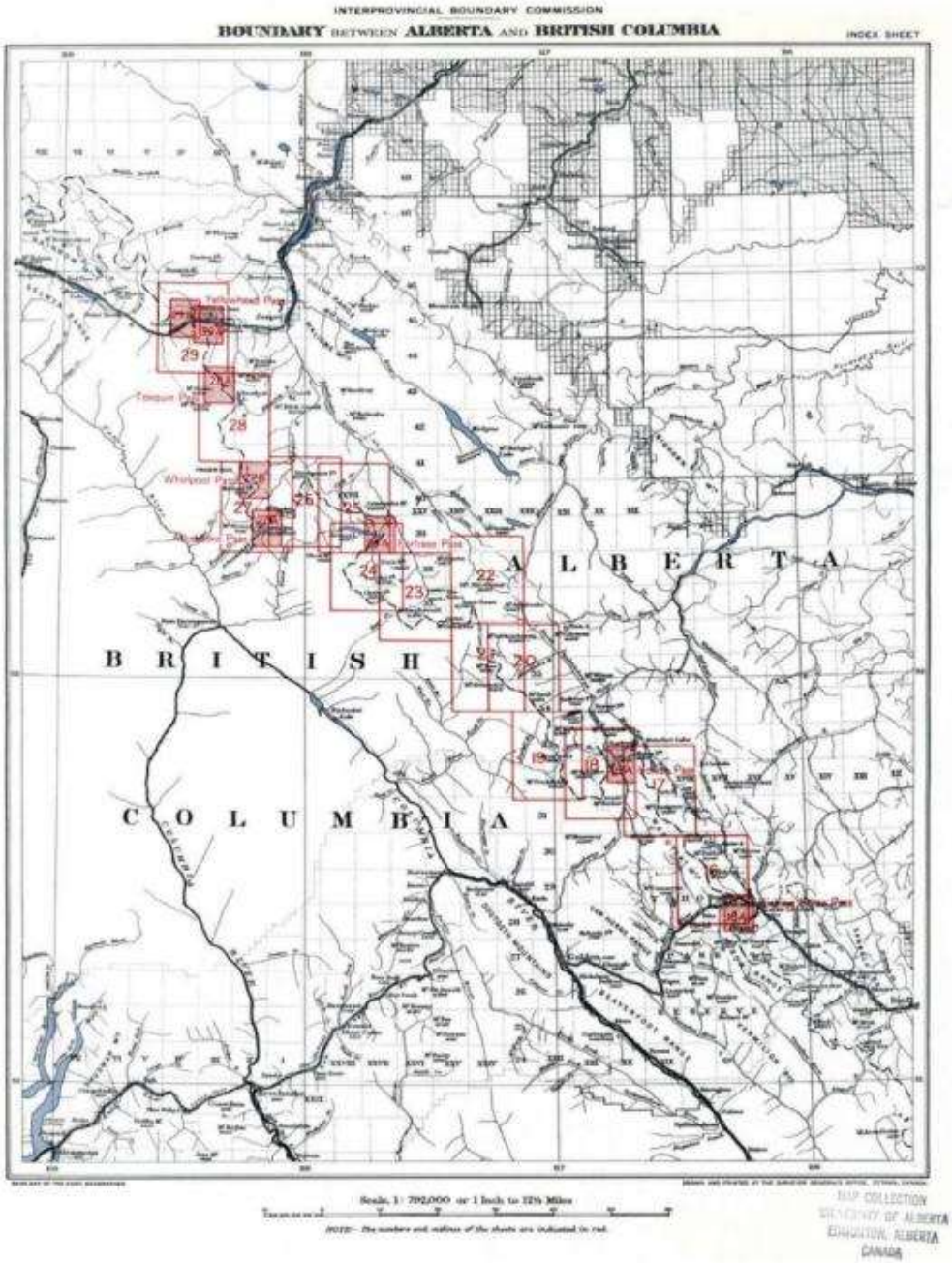
Figure 3: Forty-Mile Creek 1890. Topographical Surveys Branch, Department of the Interior, Ottawa. Triangulation by W.S. Drewry, D.L.S. Topography by J.J. McArthur, D.L.S. 1:40,000

Mapping before aerial photography: Selkirk Range, 1906 (A.O. Wheeler)
UNBC special collections, contours 100'



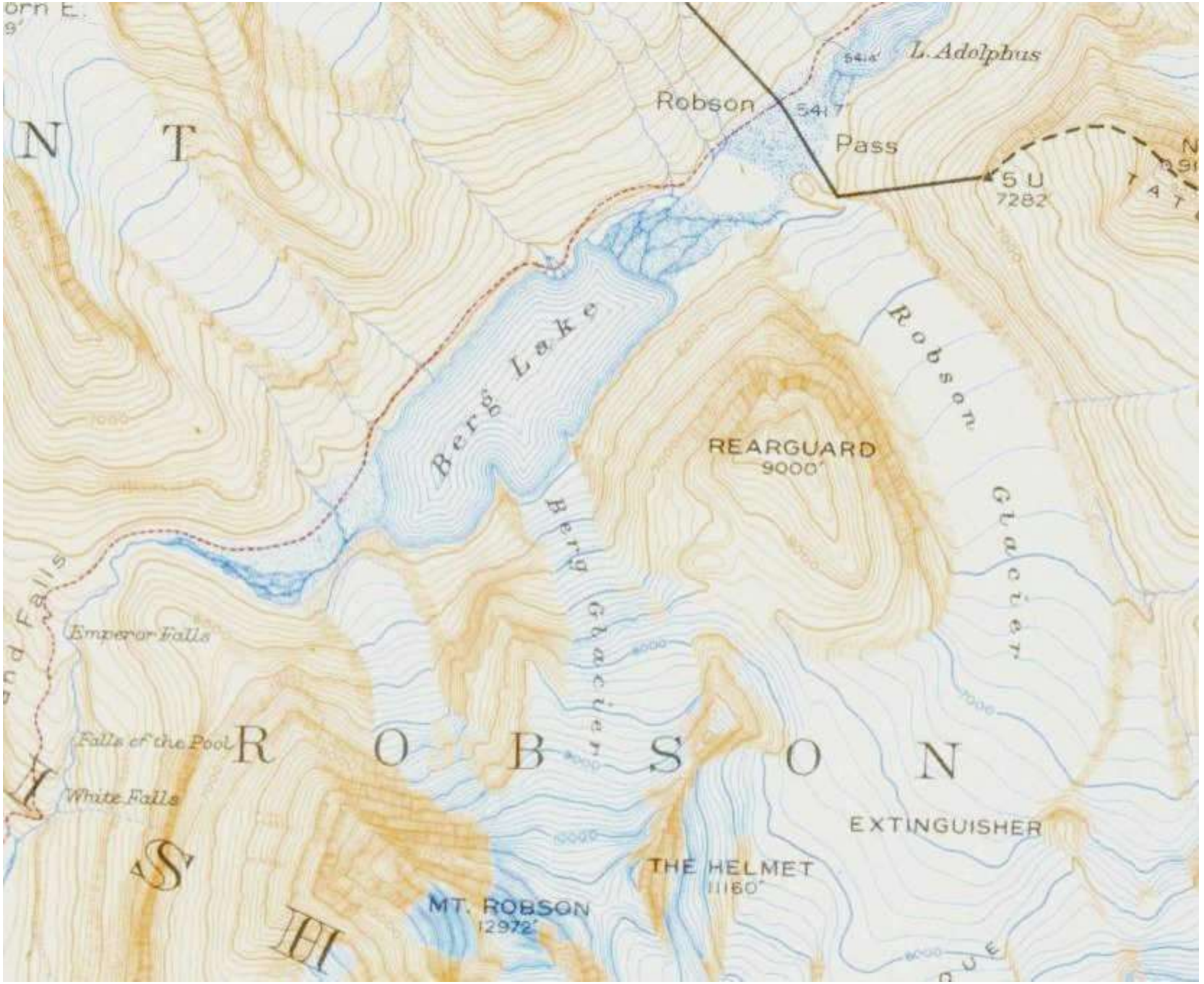
BC-AB boundary commission 1913-21





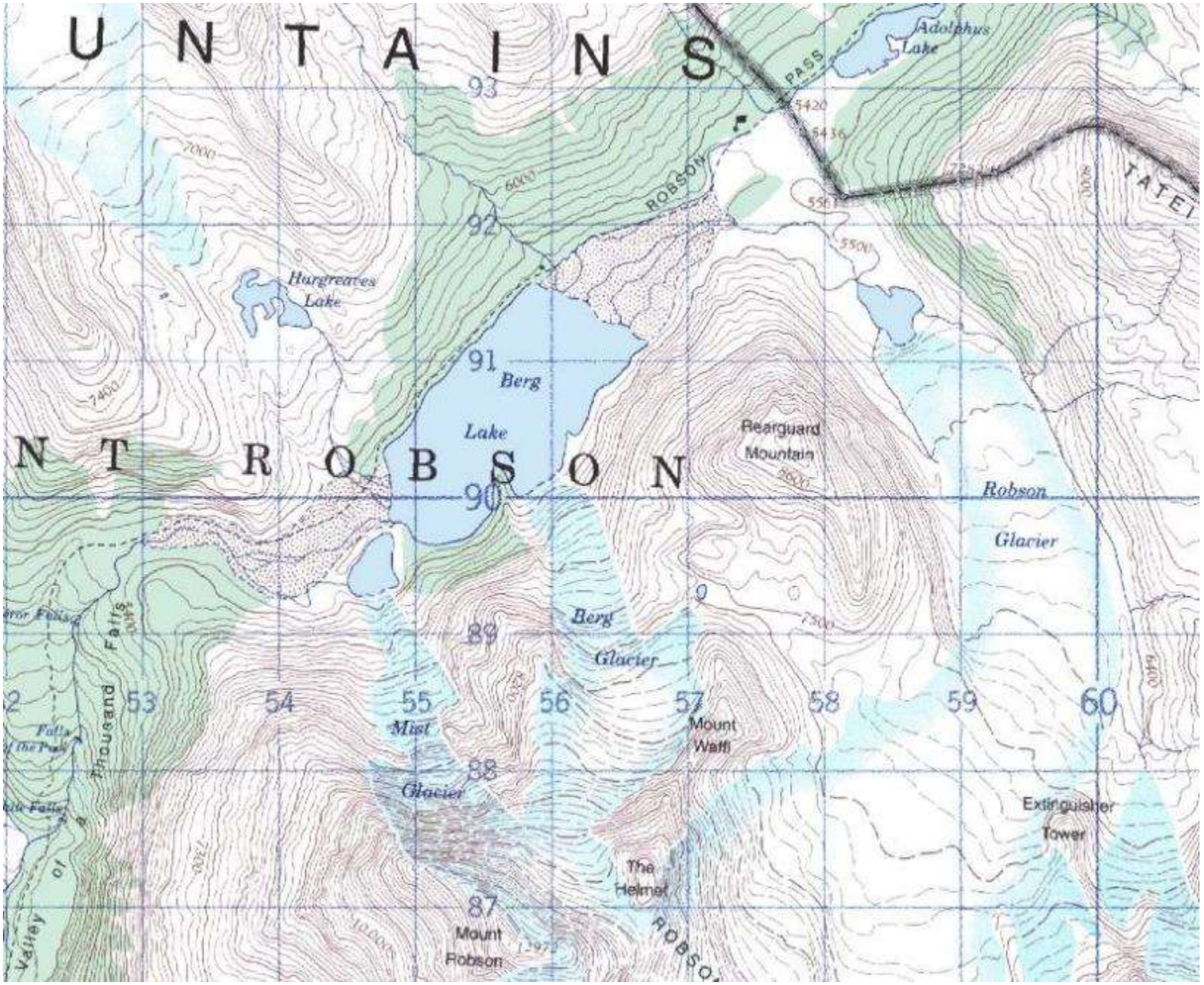
Intersection Mtn

sample map from AB-BC boundary commission map series: Mt. Robson, 1923



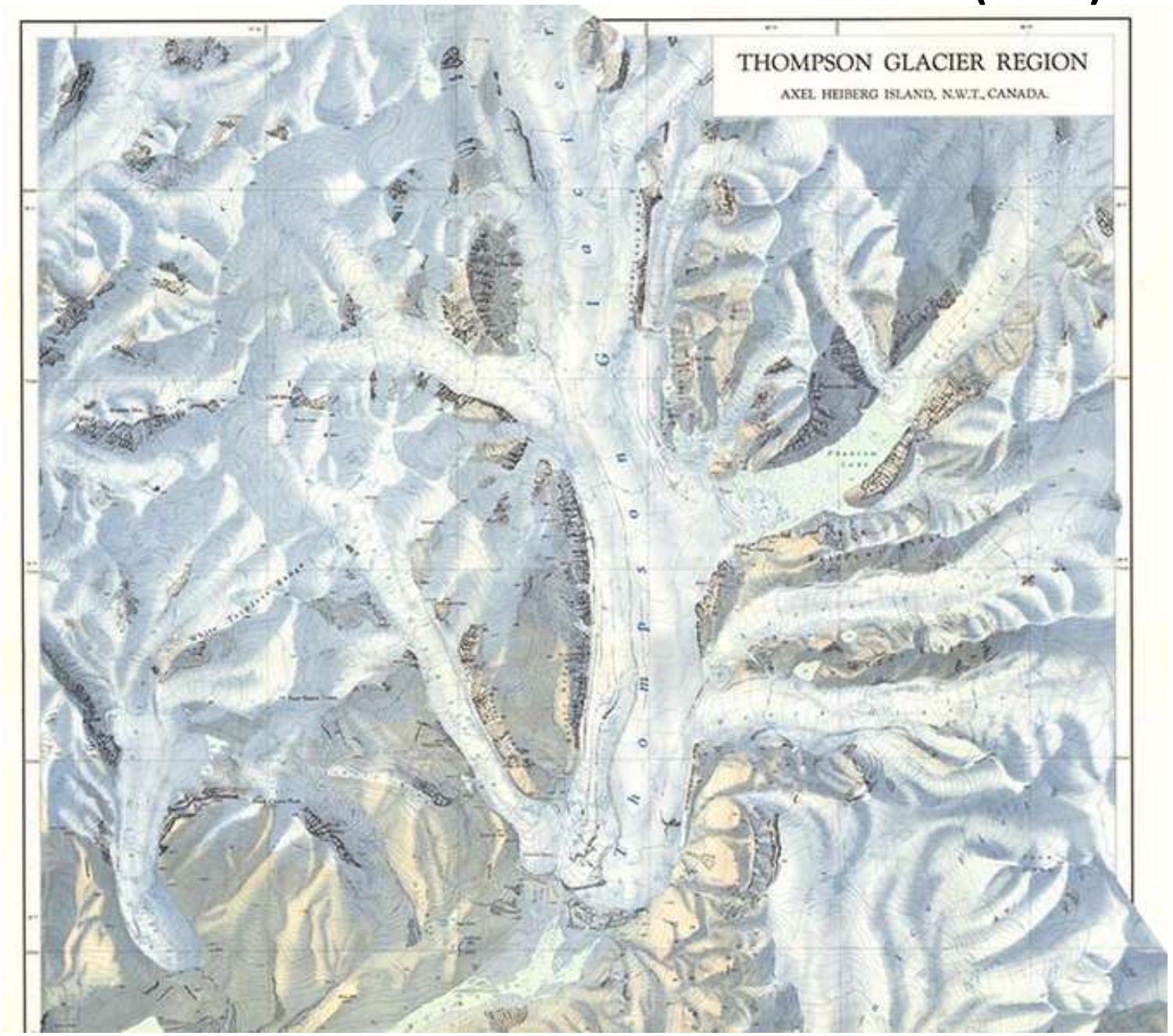
1975 NTS map sheet

Contour interval 100’ (mountains) – now 40m, from aerial photography

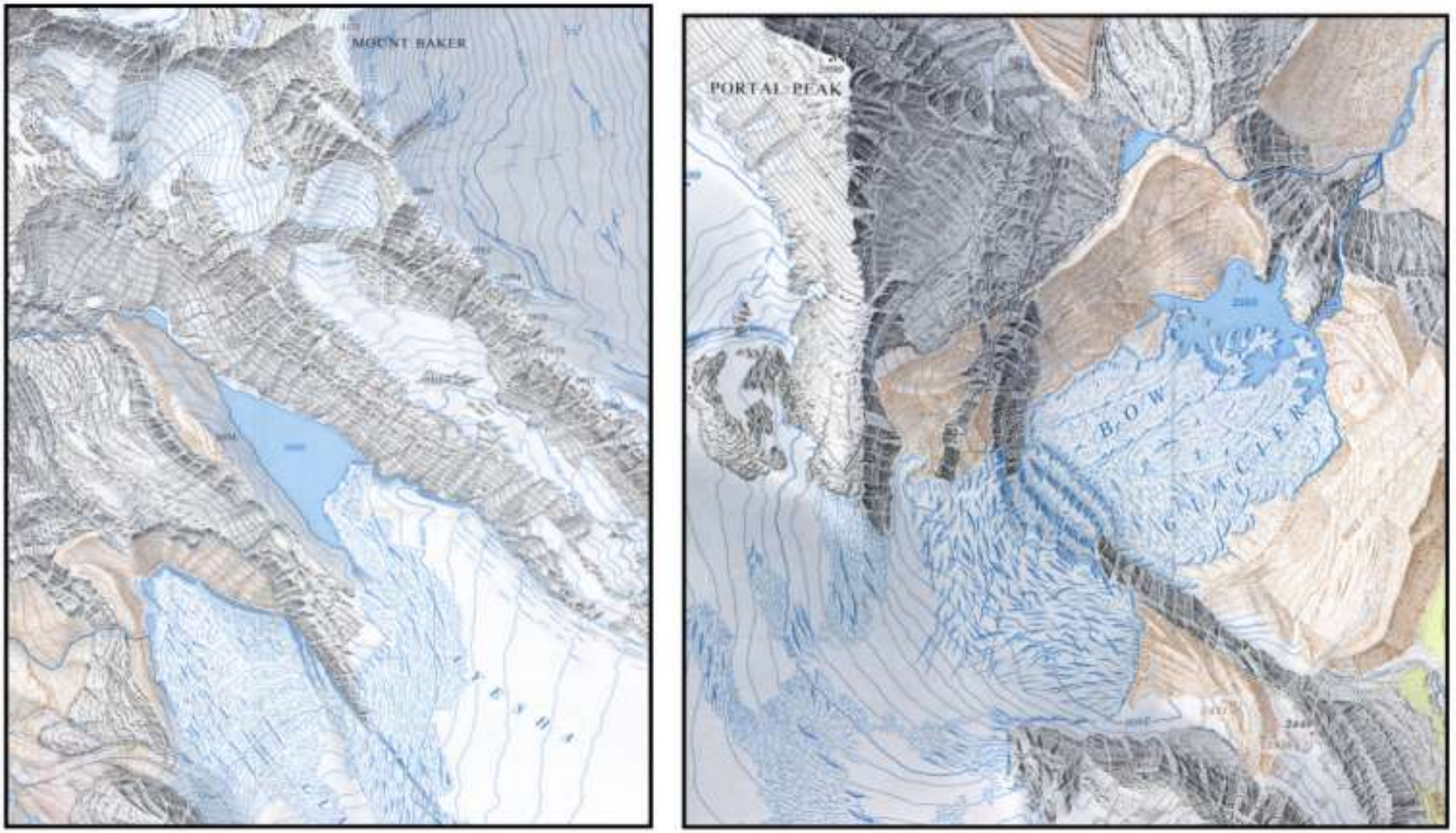


Robson Glacier, Rearguard Mountain and Berg Glacier / Lake – August 2011

Post 1950: Manual shaded relief 1960s-70s (1962)

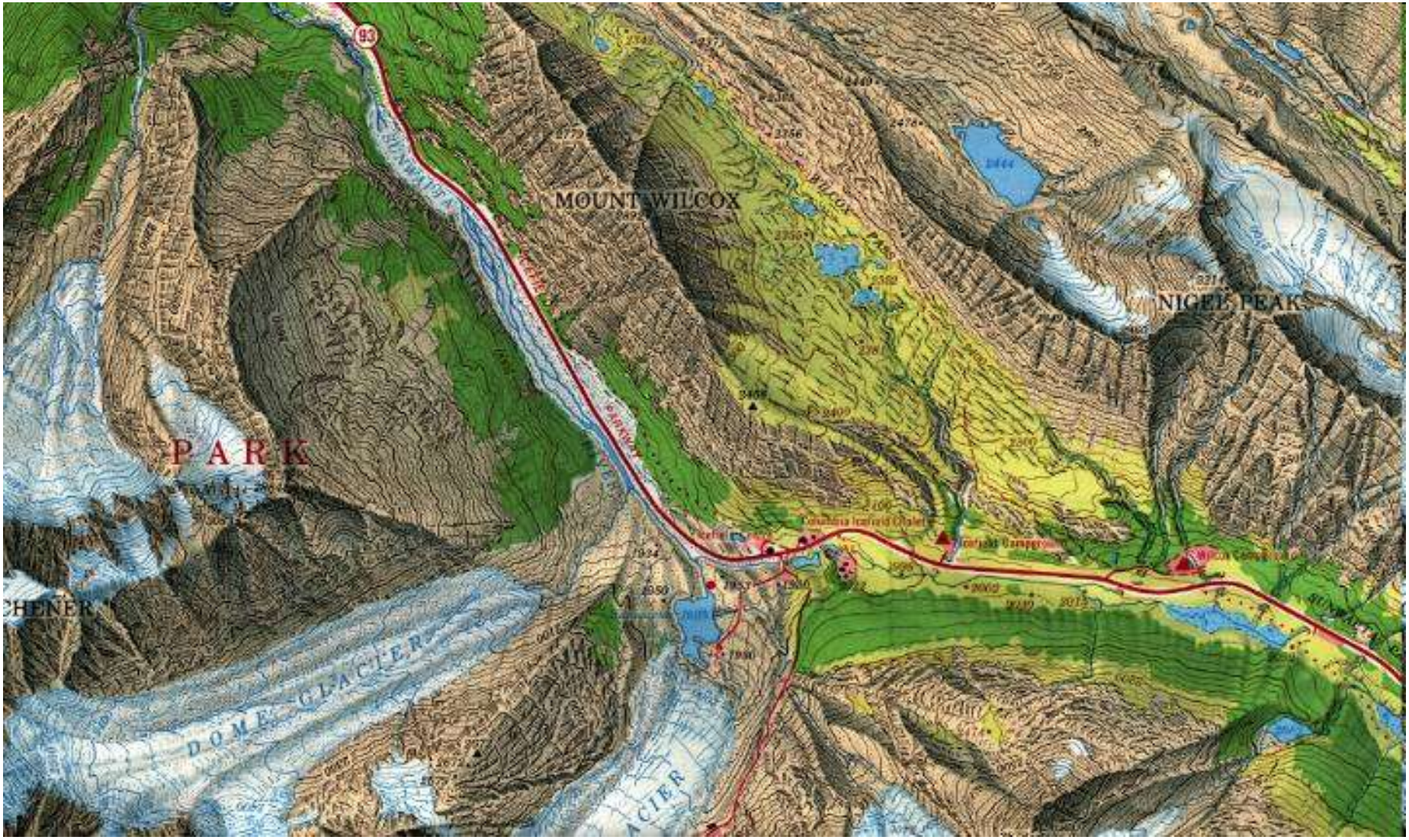


Swiss cartographers 'imported' to train Canadian cartographers on the 'swiss' Method incorporating rock hachures with contours and hillshading - 1975



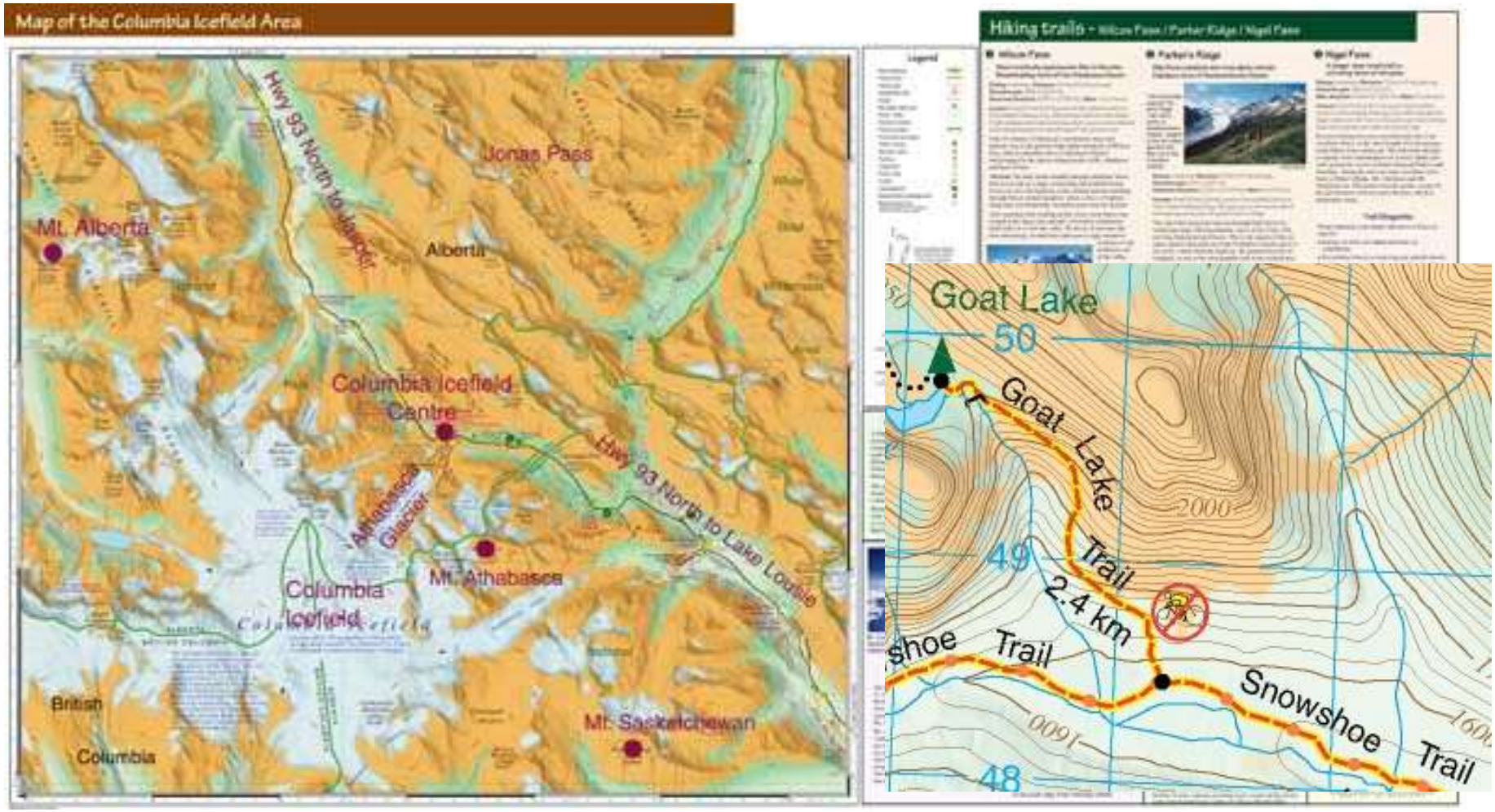
gure 15. Ayesha (left) and Bow Glacier (right) from Peyto Glacier Map – New Edition.

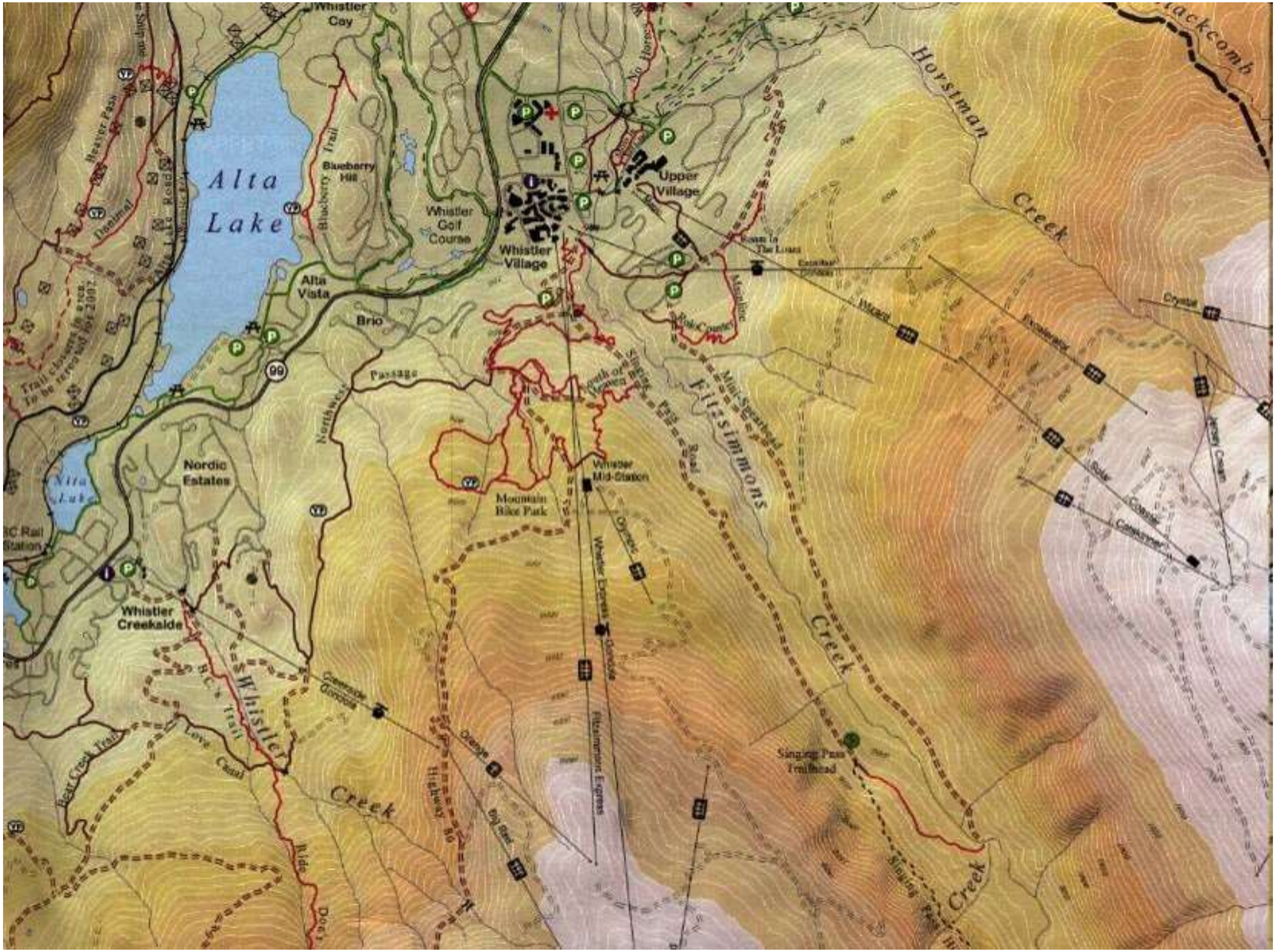
Columbia Icefield, 1981 … contours, shading and rock hachures

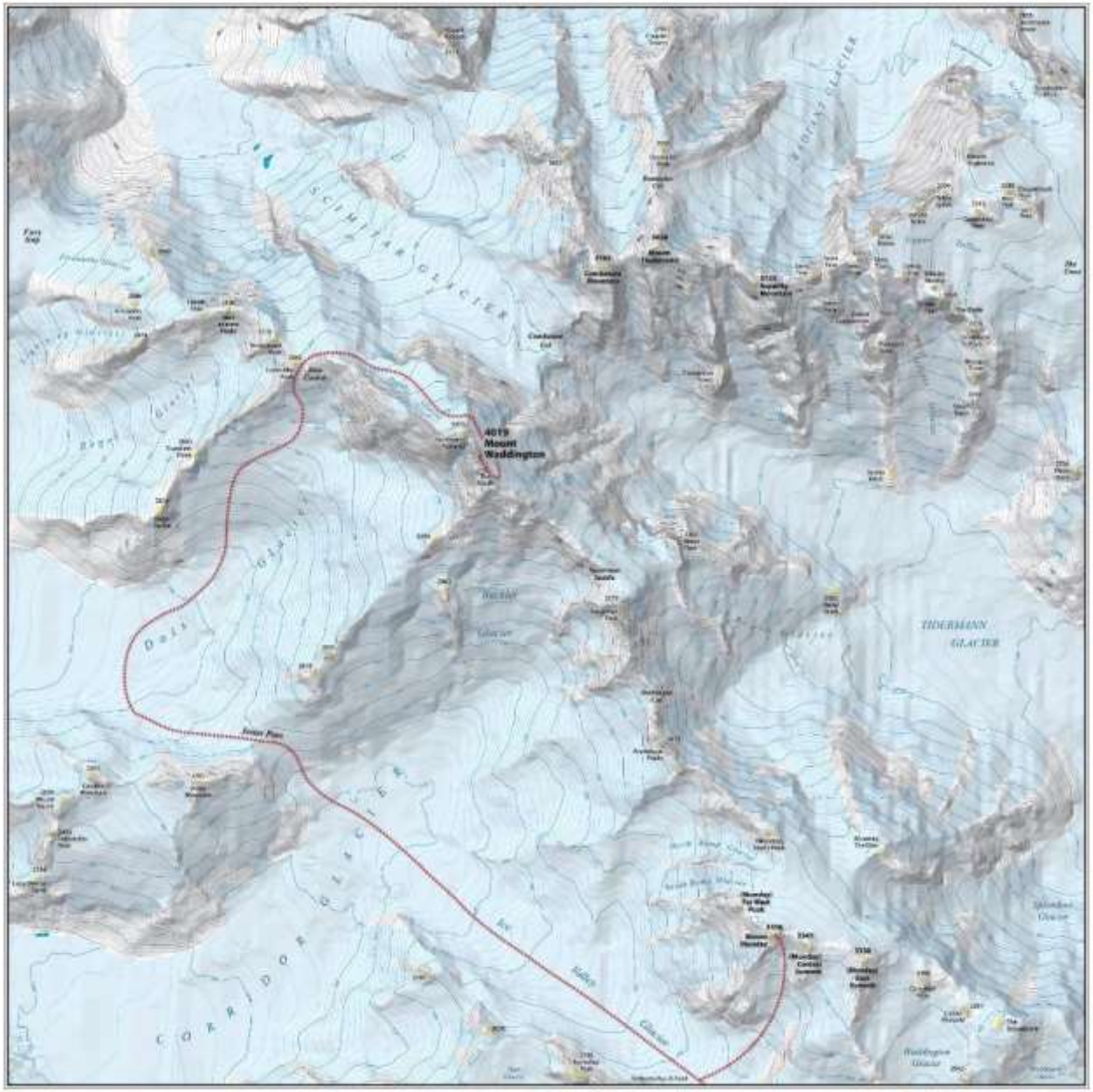


1995: government map-making was left to the private sector

Gemtrek maps: http://www.gemtrek.com




Whistler Cay
Alta Lake
Blueberry Hill
Blueberry Trail
Whistler Golf Course
Whistler Village
Upper Village
Alta Vista
Brio
Nordic Estates
Alta Lake
BC Rail Station
Whistler Creekside
Mountain Bike Park
Whistler Mid-Station
Horstman Creek
Fitzsimmons Creek
Whistler Creek
Singing Pass Trailhead
Singing Pass Road
Northwest Passage
Whistler Express Gondola
Creekside Gondola
Bear Creek Trail
Love Canal
Wizard
Excelerator
Solar Coaster
Catskinner
Crystal
Blackcomb
Trail closures in area. To be rerouted for 2007.
Highway 86
Big Red
Orange
Fitzsimmons Express

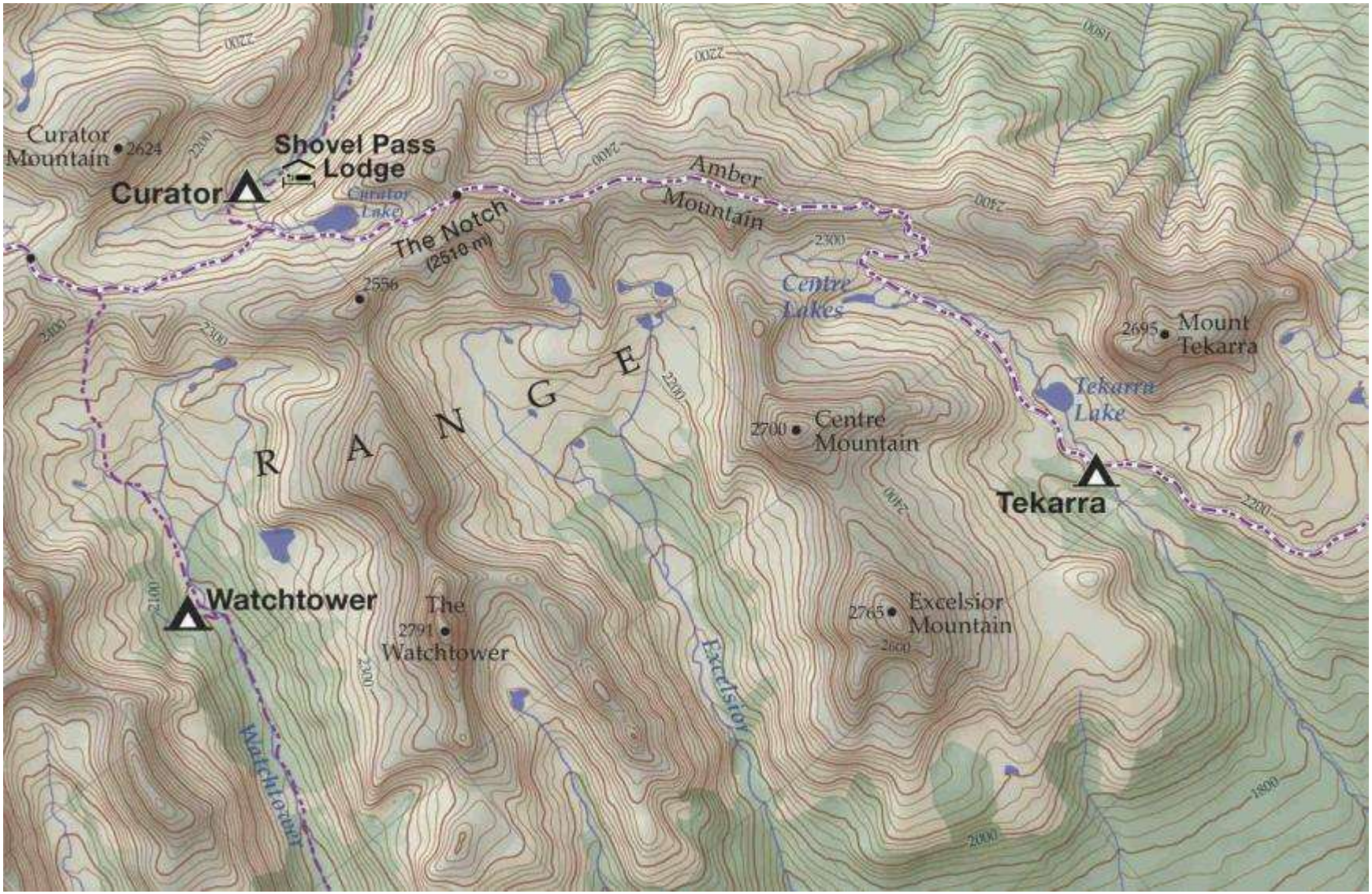


Mt. Waddington- highest mountain entirely in BC

Note striping in the DEM on icefields

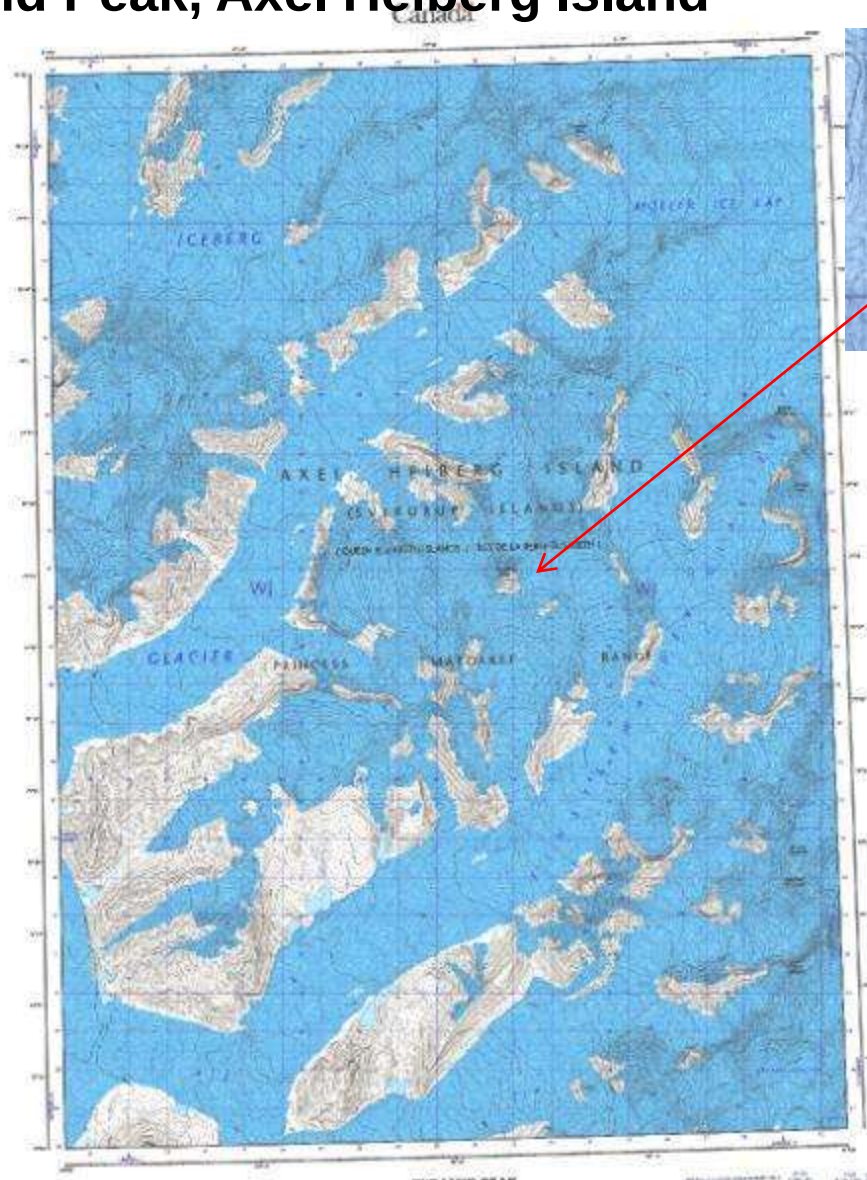
BC TRIM DEM

Skyline trail, Jasper National Park, 2013 (Mike Mitchell)



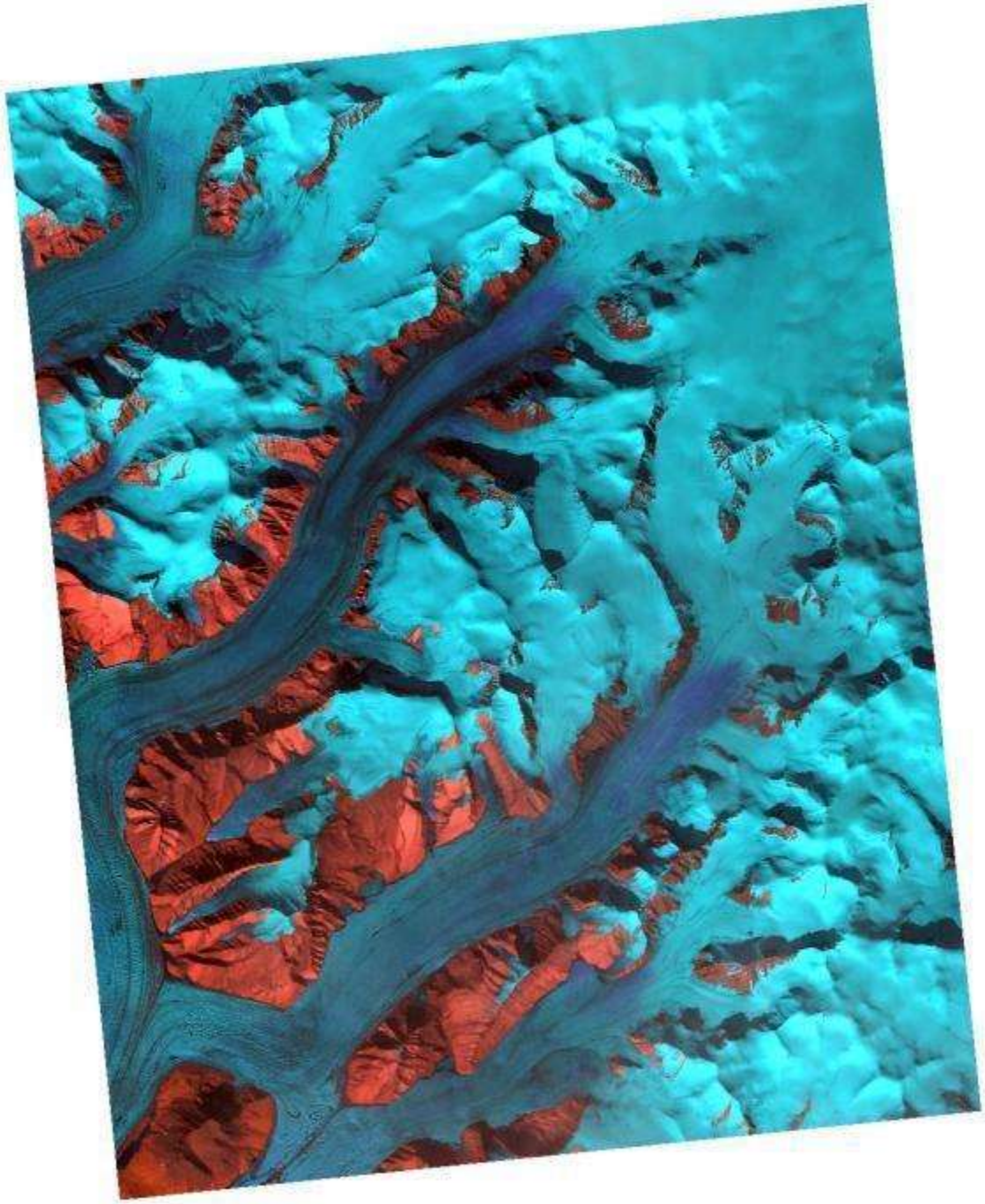
Area 1: Pyramid Peak, Axel Heiberg Island

Our final map sheet to complete the 1:50,000 topo series

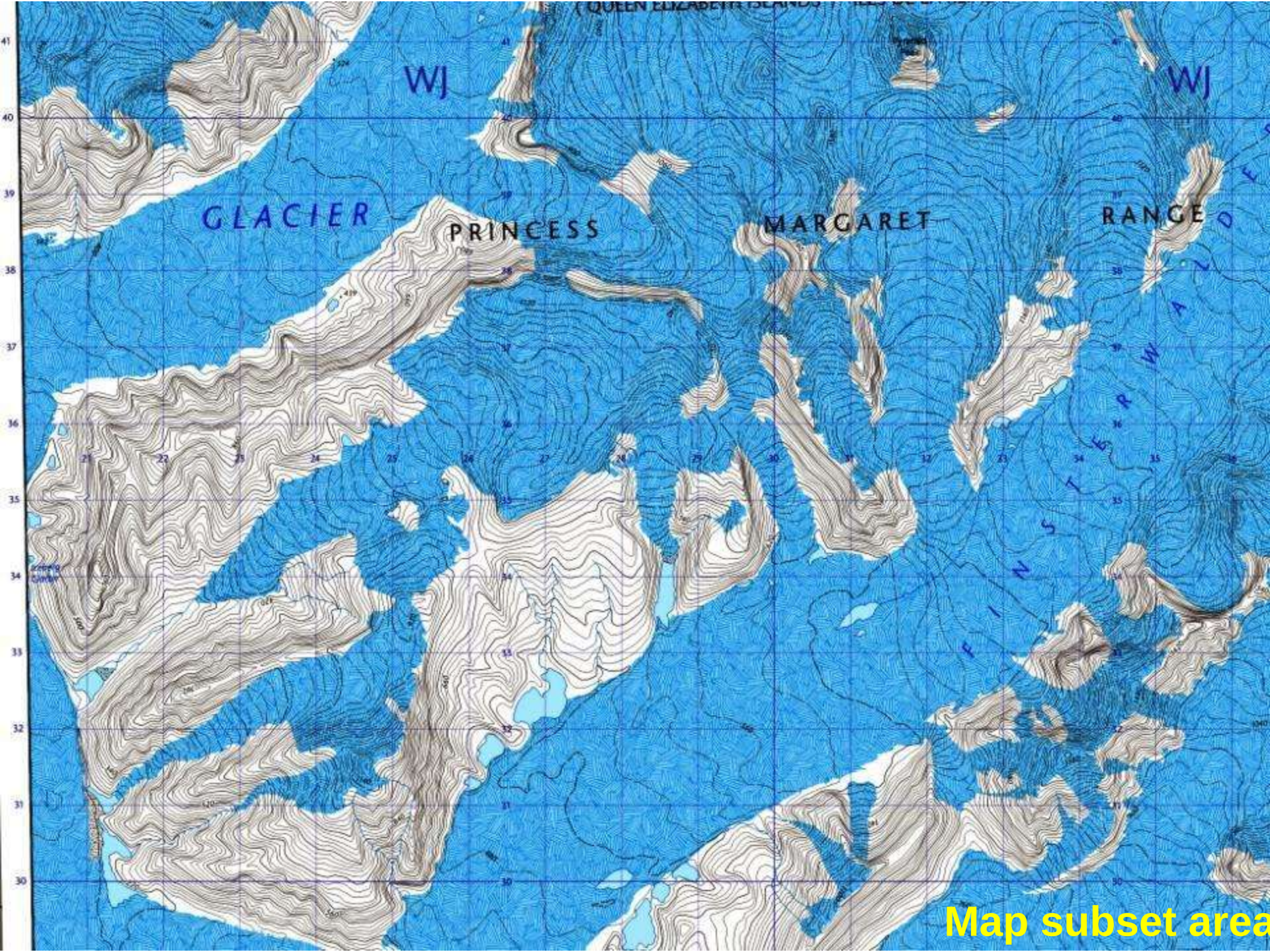


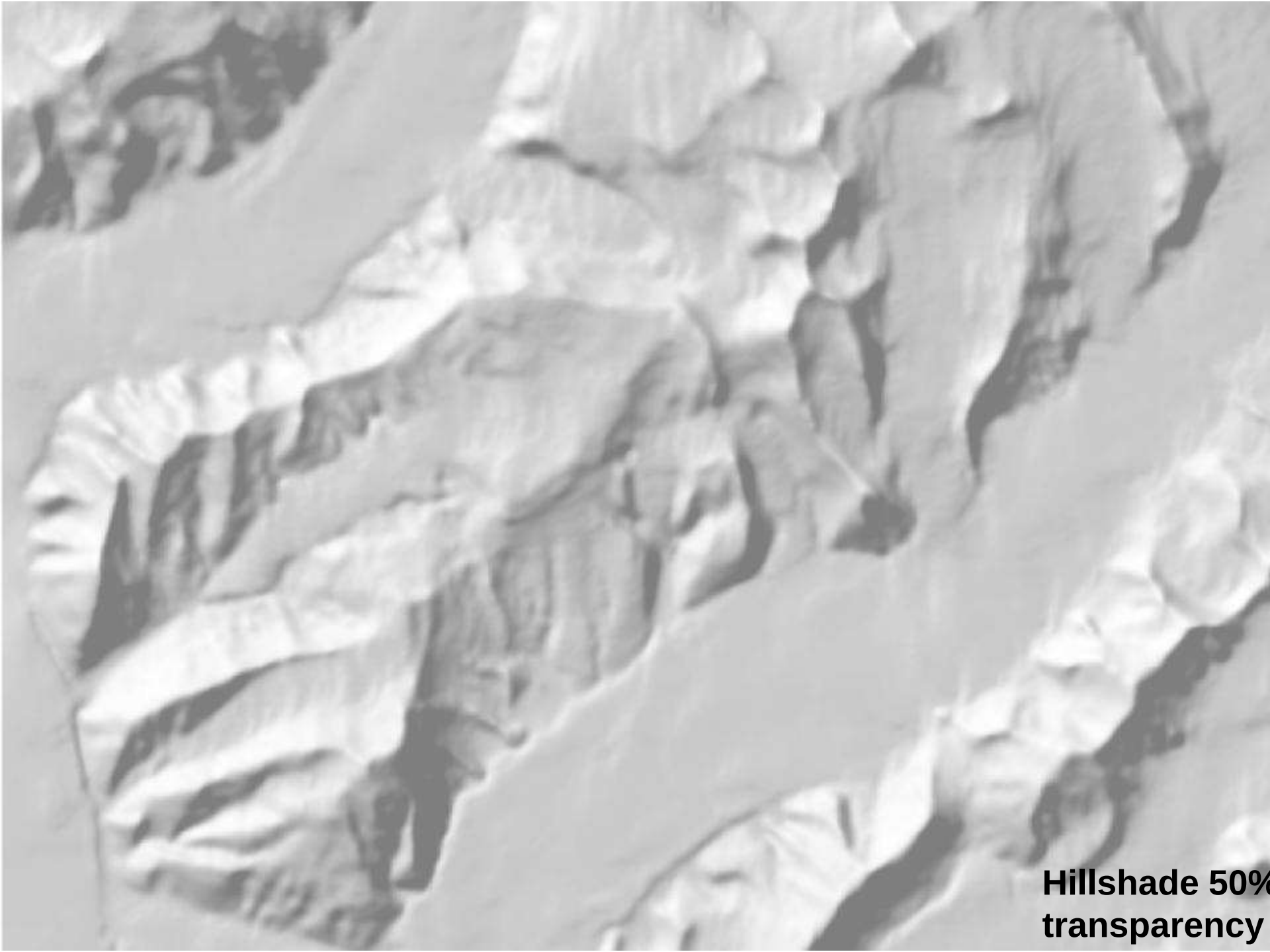
NTS map 059H12

Pyramid Peak (2012)

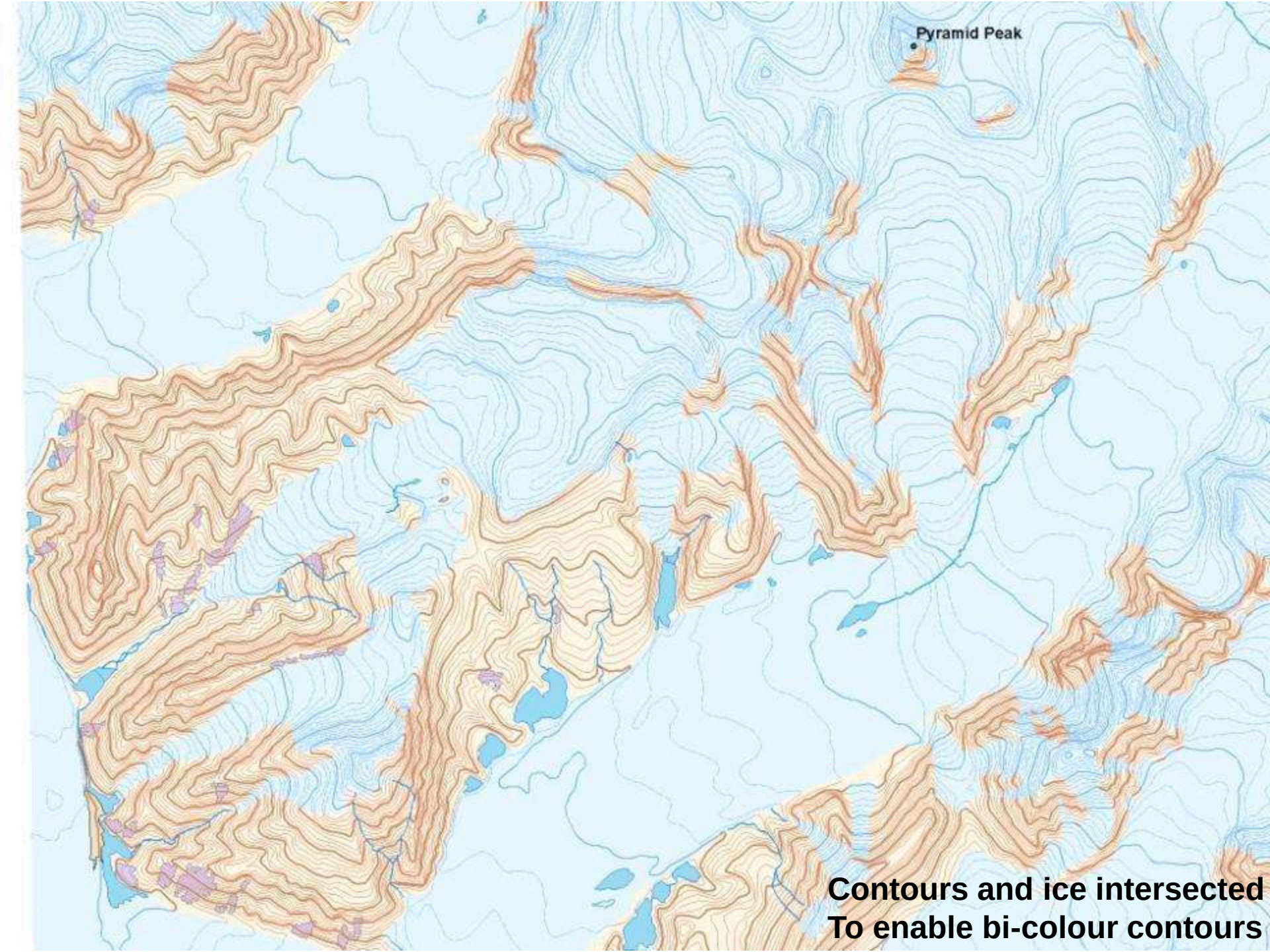


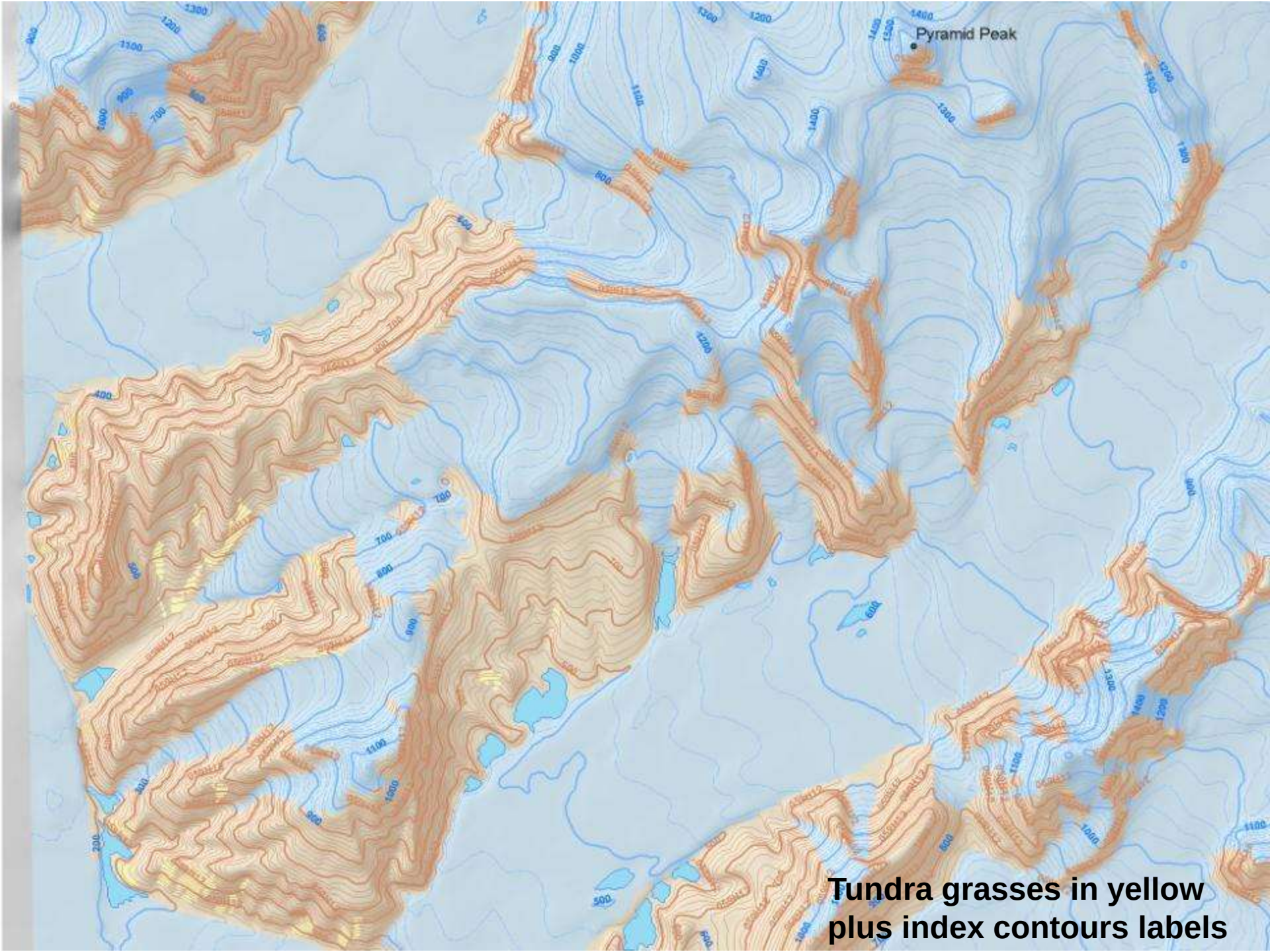
NASA 2000
Landsat 7


WJ
WJ
GLACIER
PRINCESS
MARGARET
RANGE
Map subset area


Hillshade 50%
transparency

map scan
with shading


Pyramid Peak
Contours and ice intersected
To enable bi-colour contours


Pyramid Peak
Tundra grasses in yellow
plus index contours labels

International Mountain workshop commission- biennial workshop
Berchtesgaden, Austria-Germany

http://www.mountaincartography.org/activities/workshops/index.php

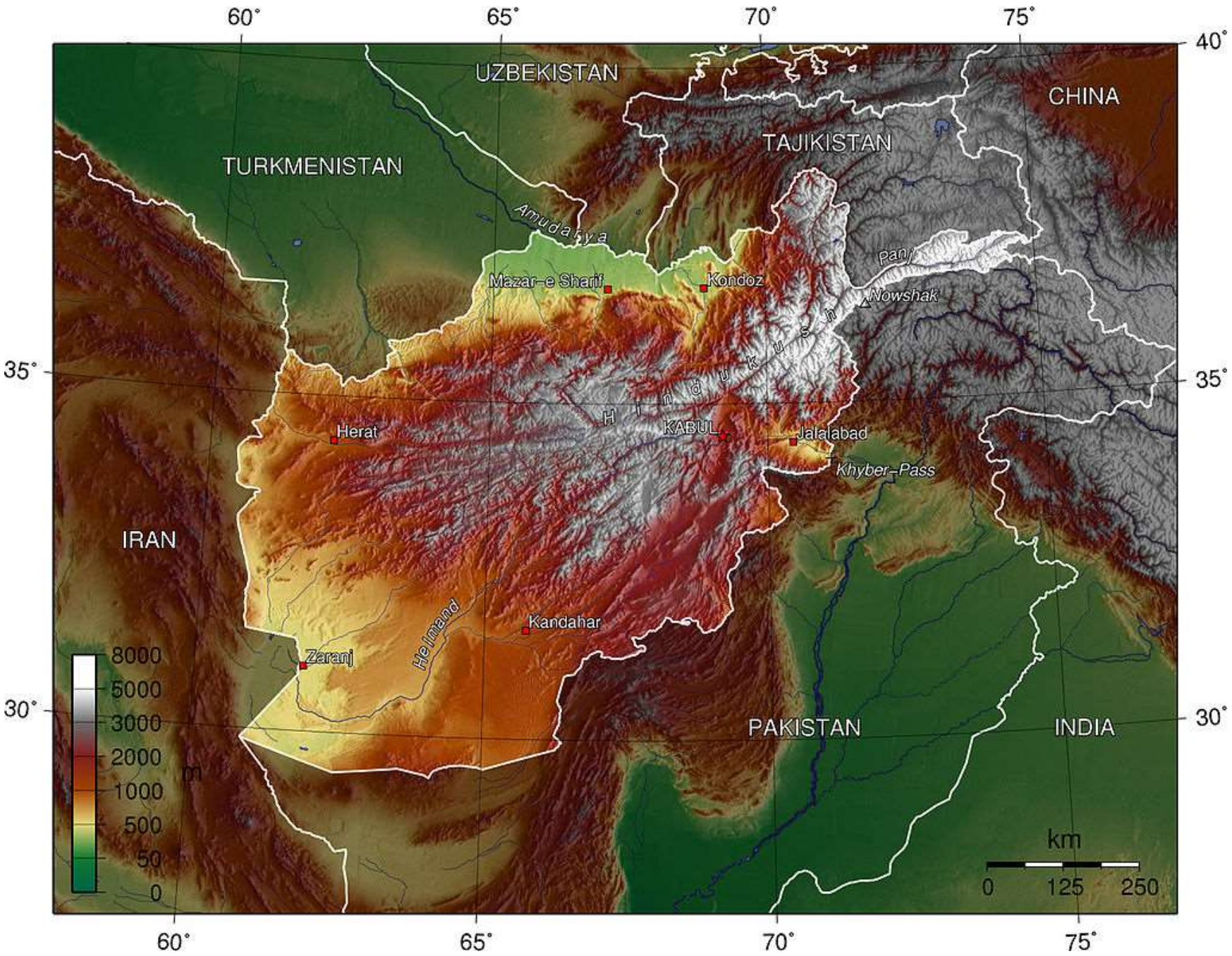
New Zealand: Geographx, Roger Smith ‘Mapsmith’ – NZ track maps

https://geographx.co.nz/services-products/printed-maps/milford-track-2/

Tom Patterson http://shadedrelief.com/maps-and-data.html

Bernhard Jenny: http://www.reliefshading.com/


OSTTIROL-ÖSTERREICH
HOHE TAUERN
VENEDIGER GRUPPE
GLOCKNER GRUPPE
VIRGENTAL
KALSERTAL
DEFEREGGENTAL
NATIONALPARK
SCHOBERGRUPPE
ISELTAL
VILLGRATER BERG
HOCHPUSTERTAL
OBERES DRAUTAL
LIENZER DOLOMITEN
LESACHTAL
KARNISCHE ALPEN
Matrei
Huben
Ainet
Lienz
Sillian
ÖSTERREICH
Südtirol (ITALIA)
Osttirol
SCALE VARIES ACROSS OBLIQUE PERSPECTIVE
Eric Knight maps


60°
65°
70°
75°
40°
35°
30°
UZBEKISTAN
CHINA
TAJIKISTAN
TURKMENISTAN
Amudarya
Panj
Mazar-e Sharif
Kondoz
Nowshak
Hindukush
Herat
KABUL
Jalalabad
Khyber-Pass
IRAN
Kandahar
Helmand
Zaranj
PAKISTAN
INDIA
8000
5000
3000
2000
1000
500
50
0
m
km
0
125
250

Lost Art
Cartography
Marcel Morin, NS

Provincial LiDAR +
ESA Sentinel
satellite imagery
(10m pixels)

Annapolis Valley,
Wolfville/Grand Pre

Summary of Mountain cartography methods:

All relief methods used, especially shaded relief, contours, panoramas

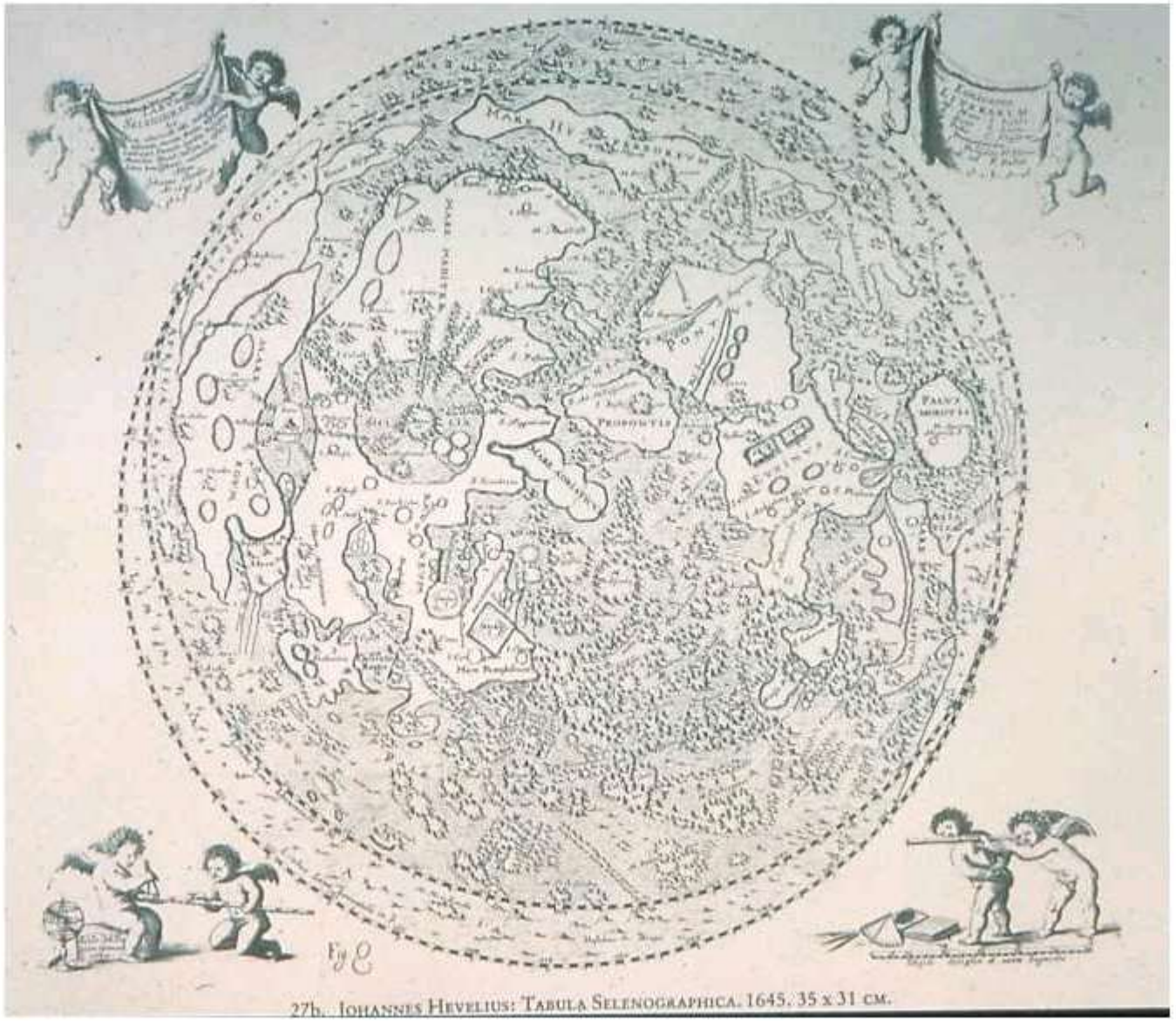
Online topographic map viewers / mountain countries

Switzerland: http://map.geodataviewer.admin.ch/geodatenviewer.php

New Zealand: https://www.topomap.co.nz/

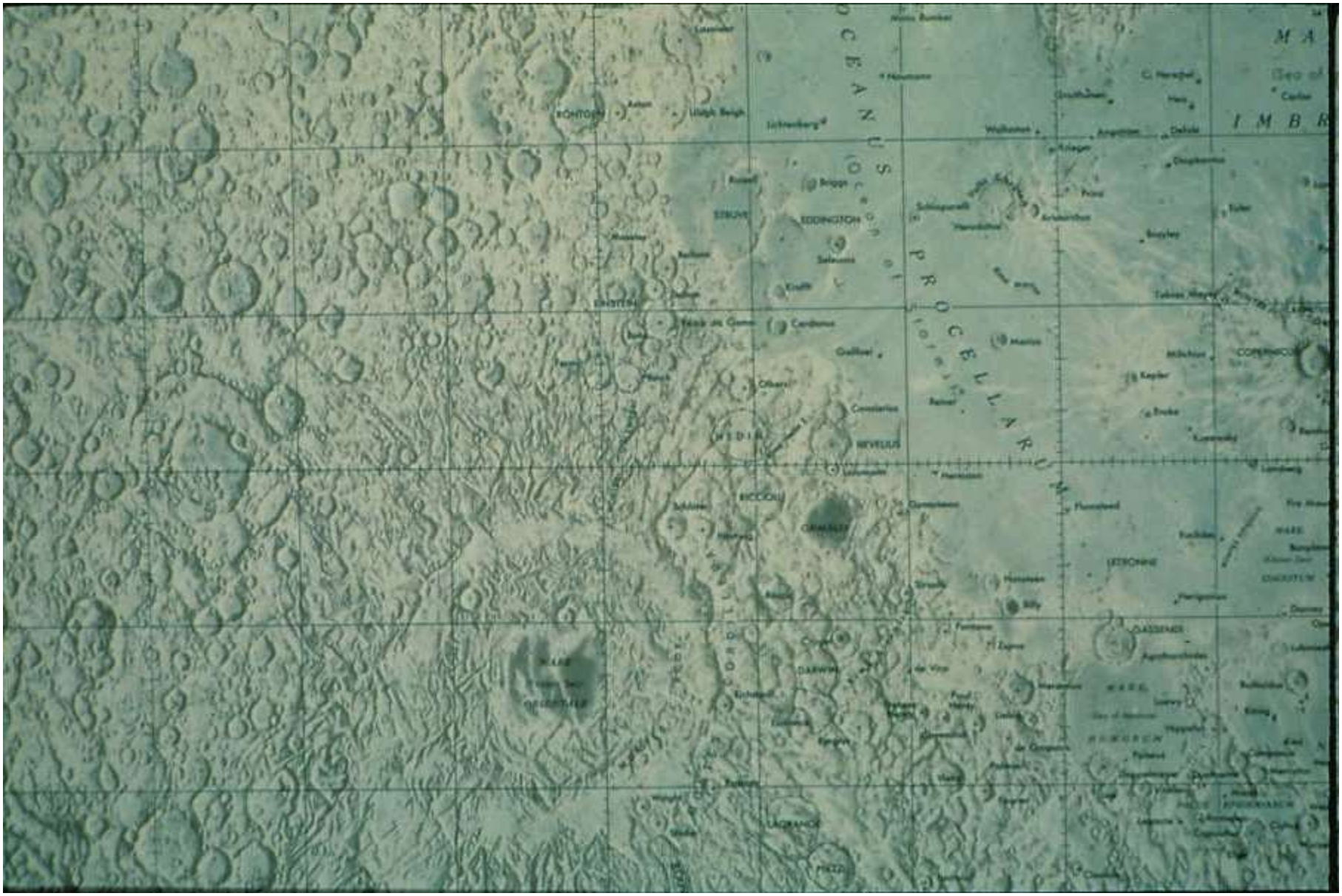
Norway statkart: http://www.norgeskart.no

Mapping the Planets: The Moon, 1645



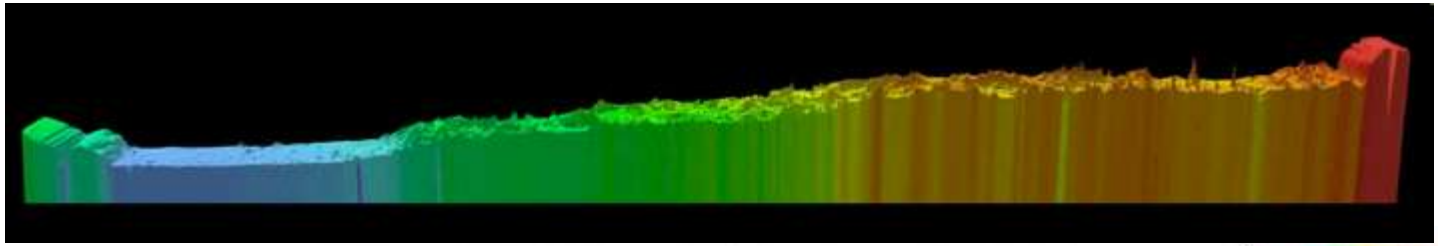
From telescopes, with hills, ‘rivers’ and libration zones

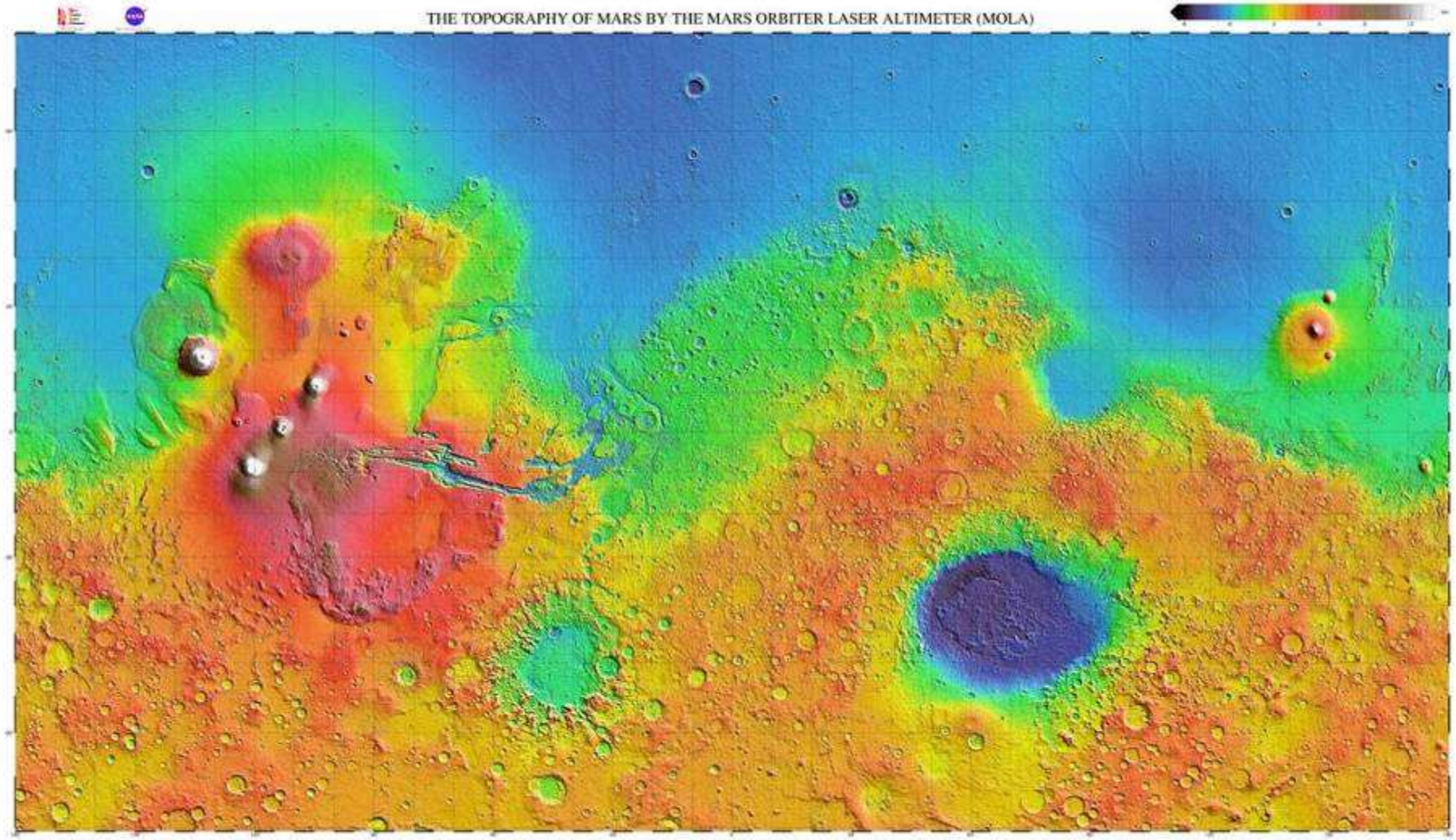
1970 – used to plan future moon landings, 1:10,000,000



1968 Soviet example, 1:1,000,000 shaded relief

MARS: DEM resolution in z = 30cm! (N. Pole to S. Pole transect)





https://www.google.ca/mars/

Elevation, Panchromatic, Thermal