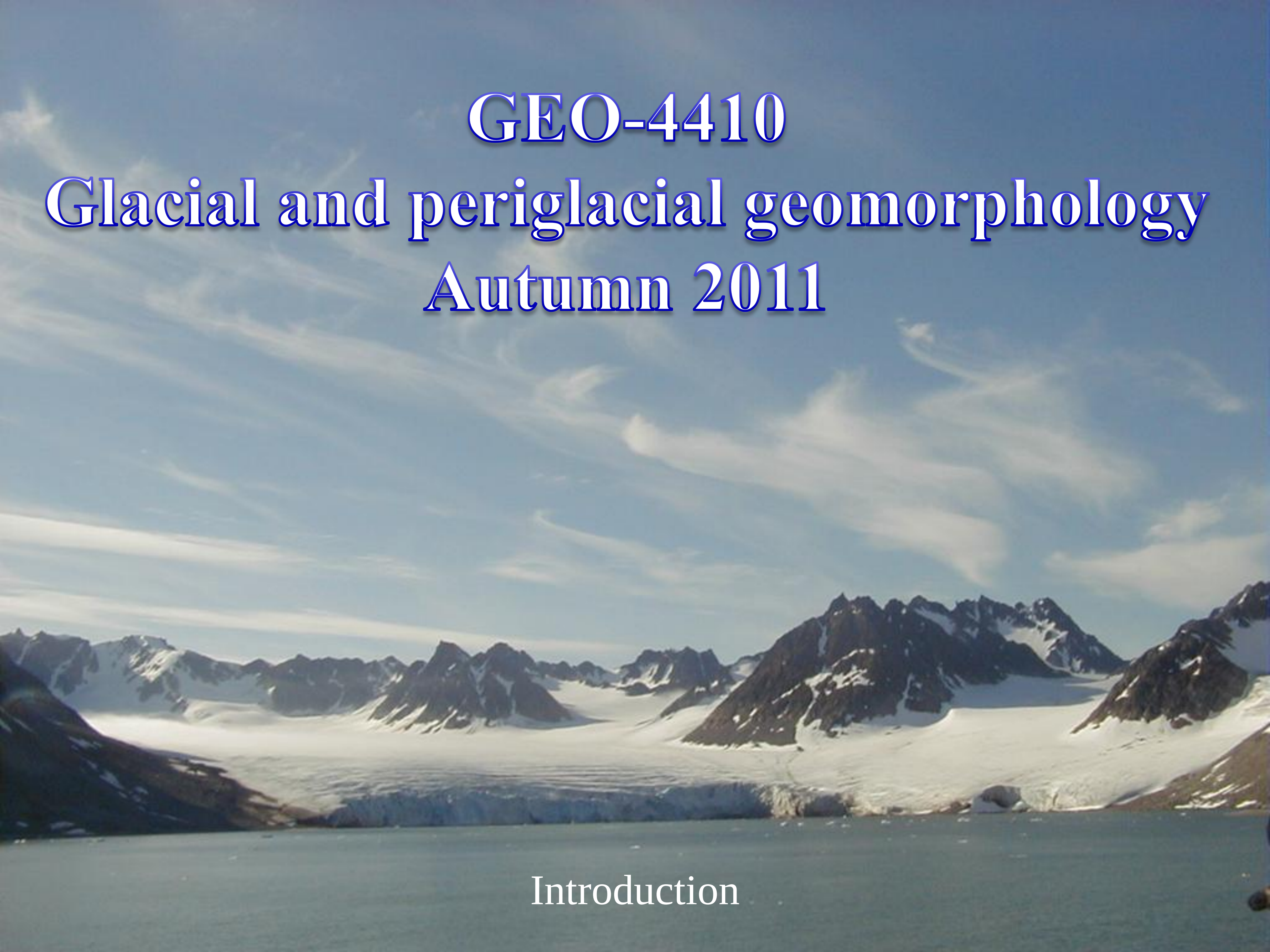
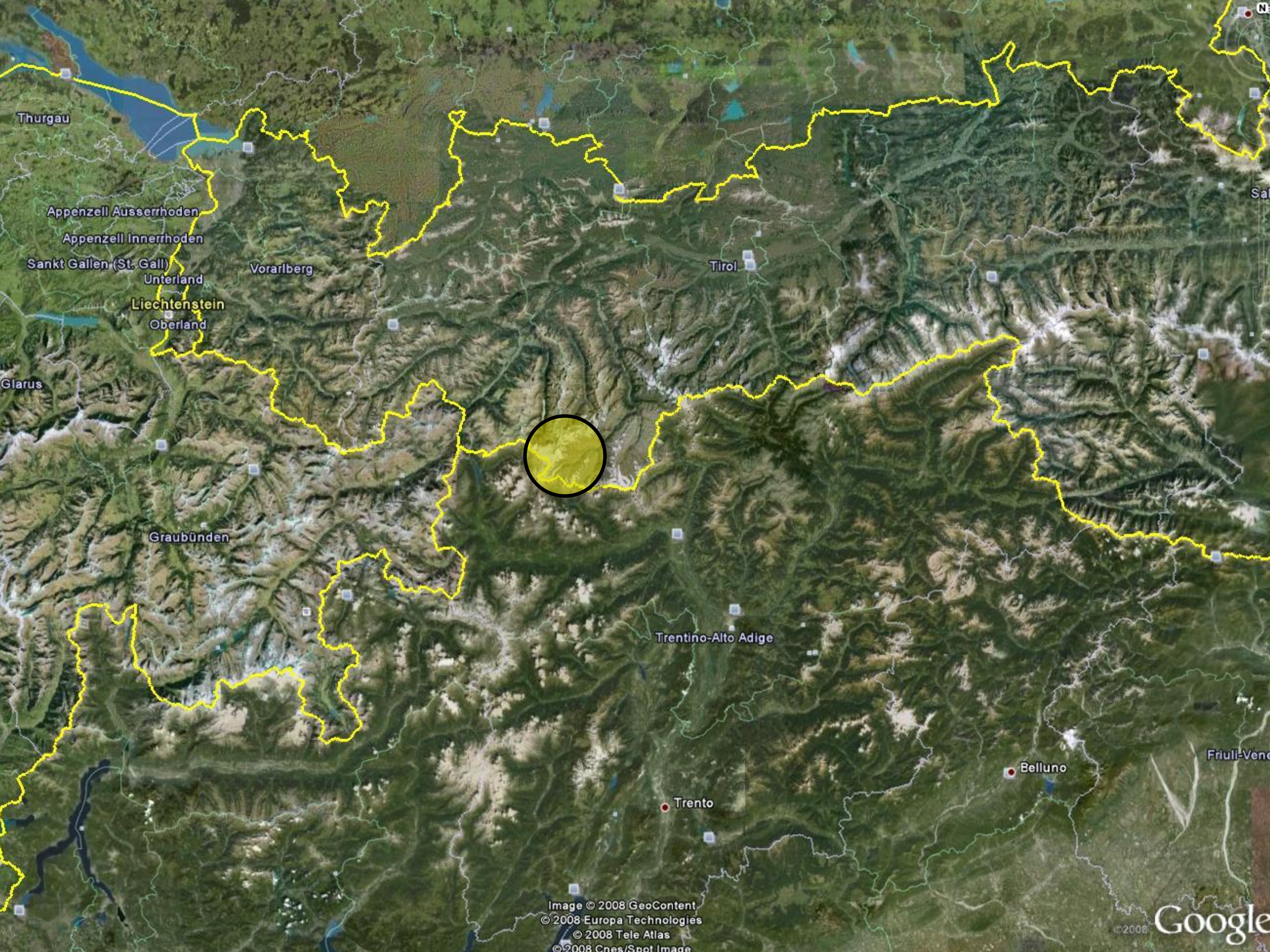
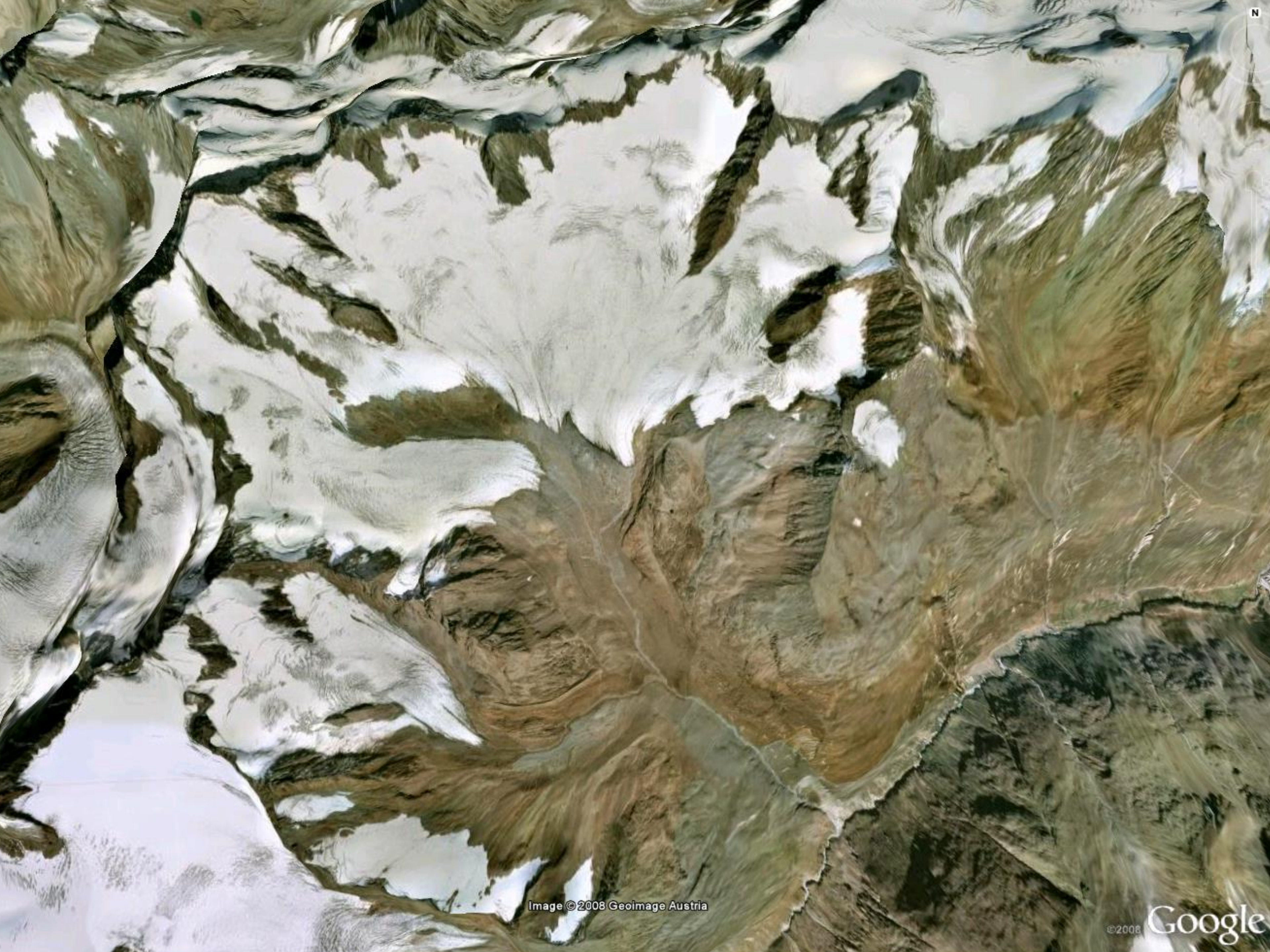
GEO-4410
Glacial and periglacial geomorphology
Autumn 2011



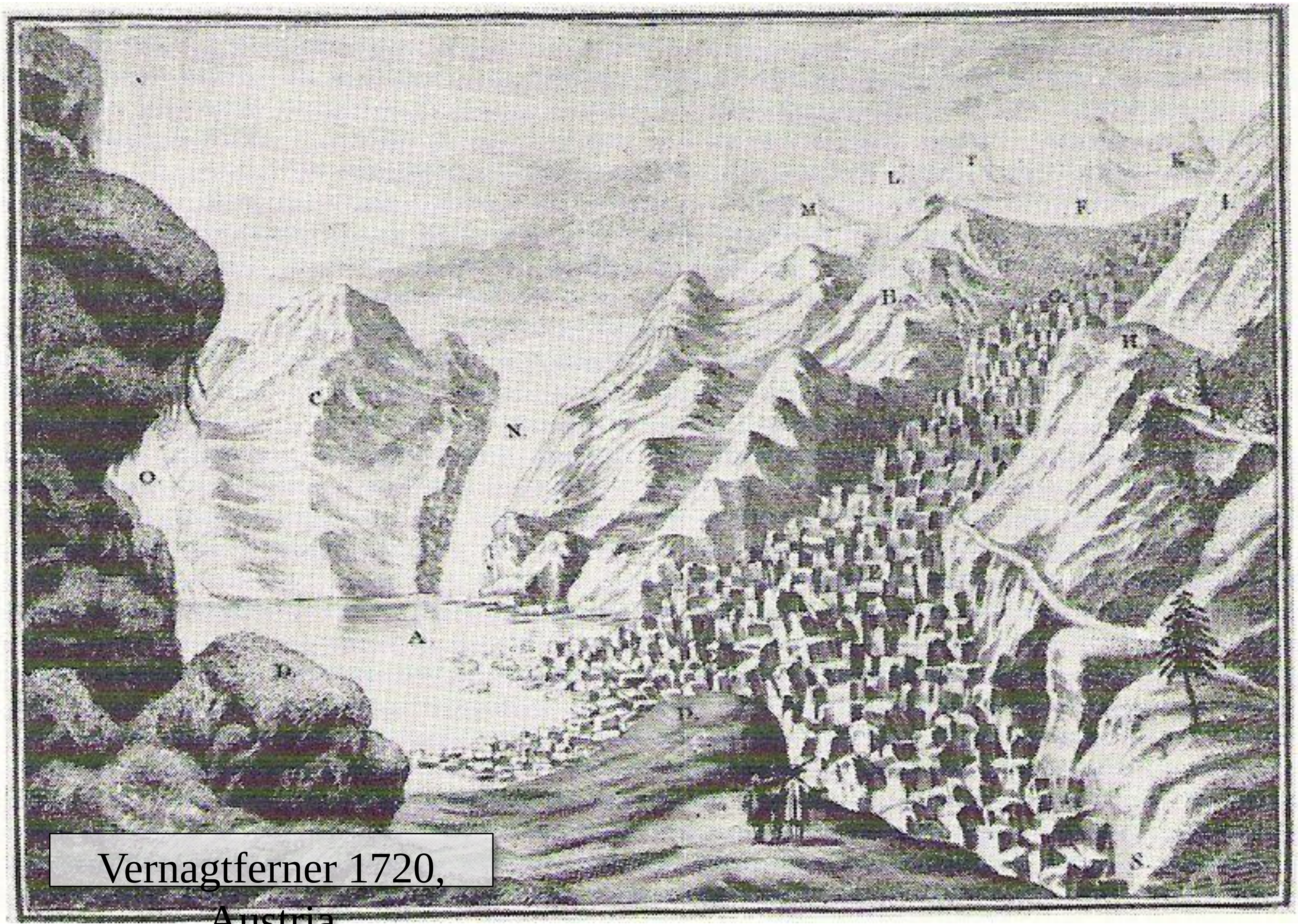
Introduction


Koebenhavn
Hamburg
Image © 2005 MDA EarthSat
© 2005 Google
ointer 54°11'24.10" N 9°11'08.77" E elev -3 m
Streaming 3%
Eye alt 271.10 k


Thurgau
Appenzell Ausserrhoden
Appenzell Innerrhoden
Sankt Gallen (St. Gall)
Unterland
Vorarlberg
Liechtenstein
Oberland
Glarus
Tirol
Graubünden
Trentino-Alto Adige
Trento
Belluno
Image © 2008 GeoContent
© 2008 Europa Technologies
© 2008 Tele Atlas
© 2008 Cnes/Spot Image
Google



N
Image © 2008 Geoimage Austria
©2008 Google

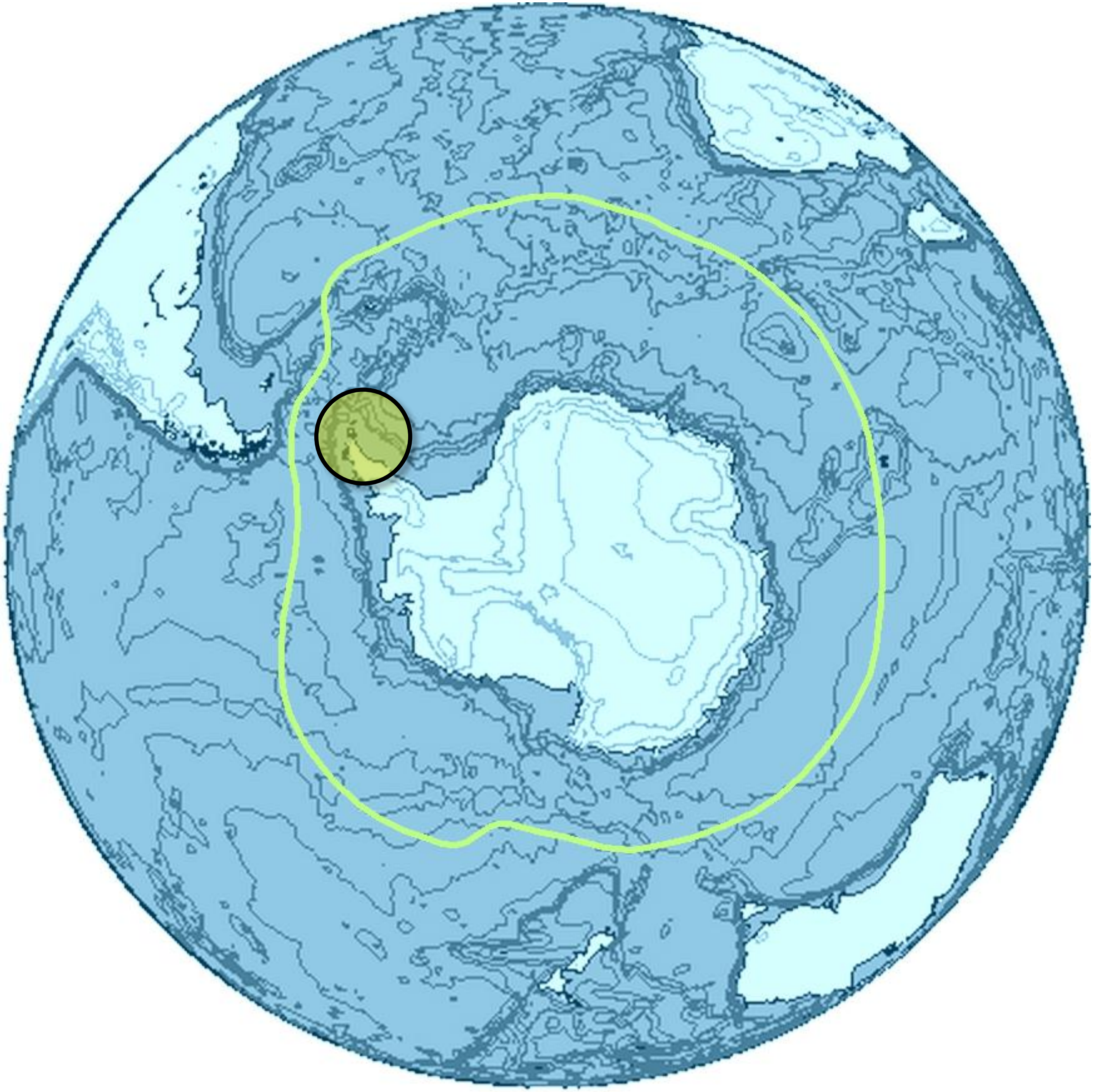


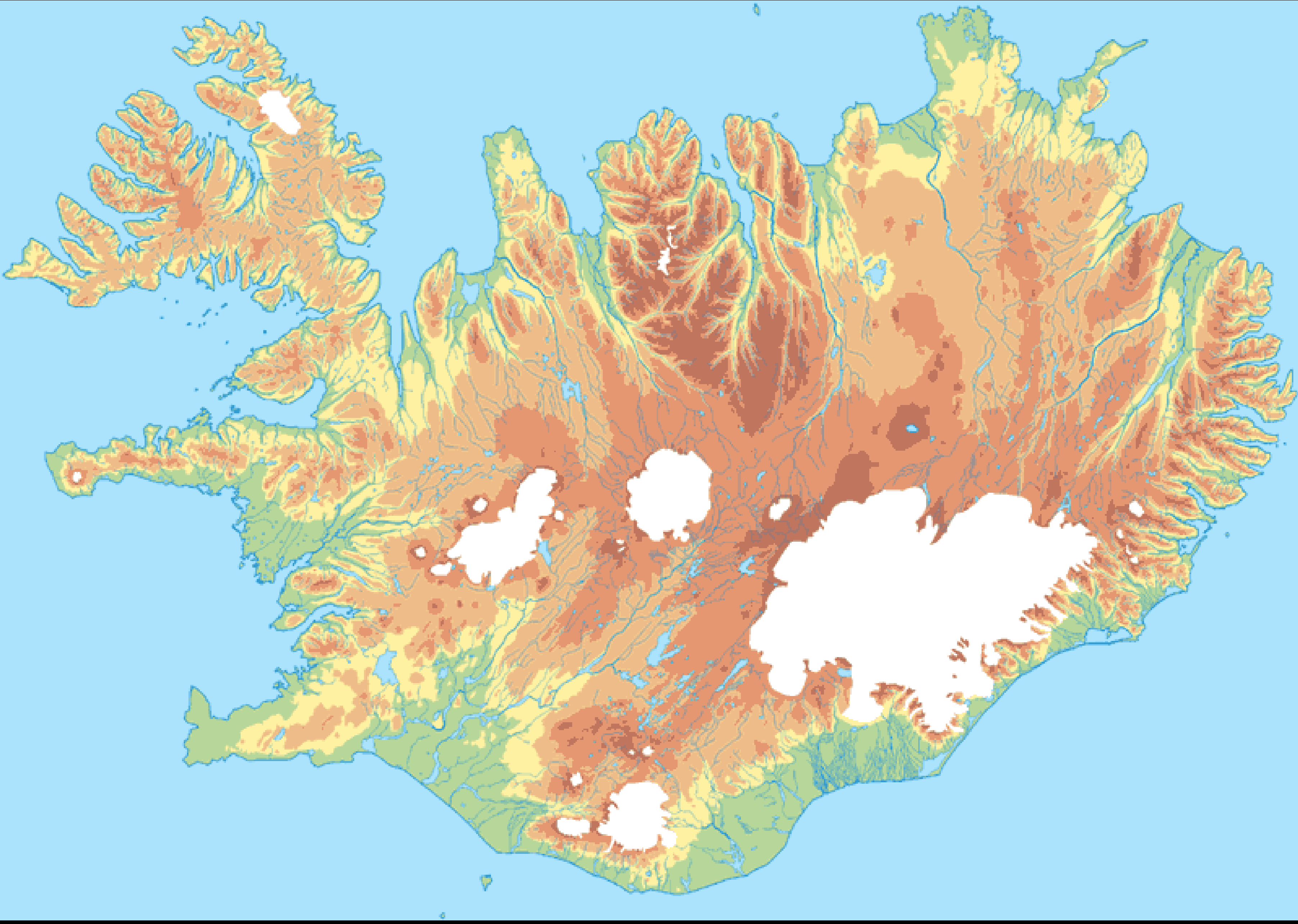
Vernagtferner 1720, Austria

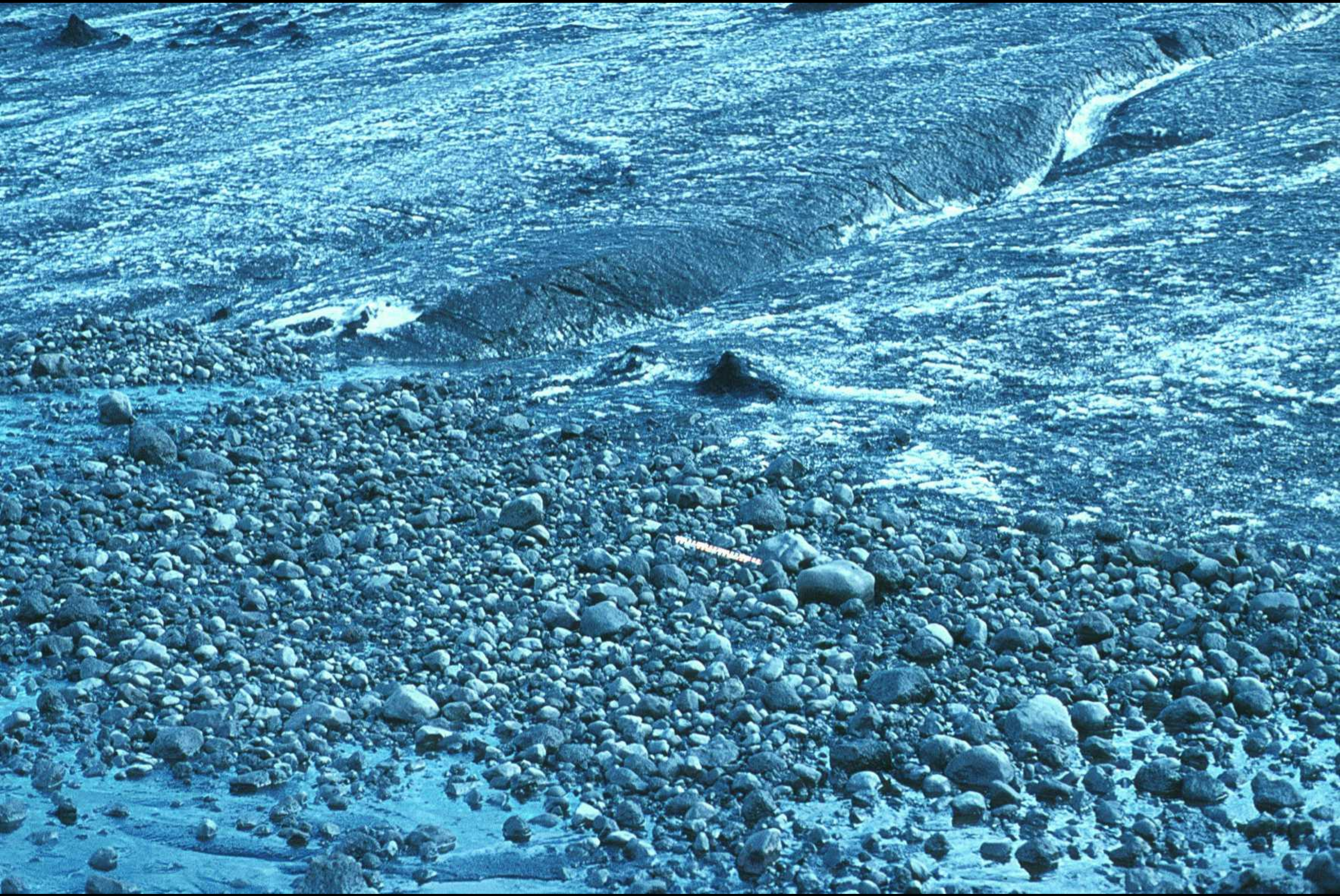

1844

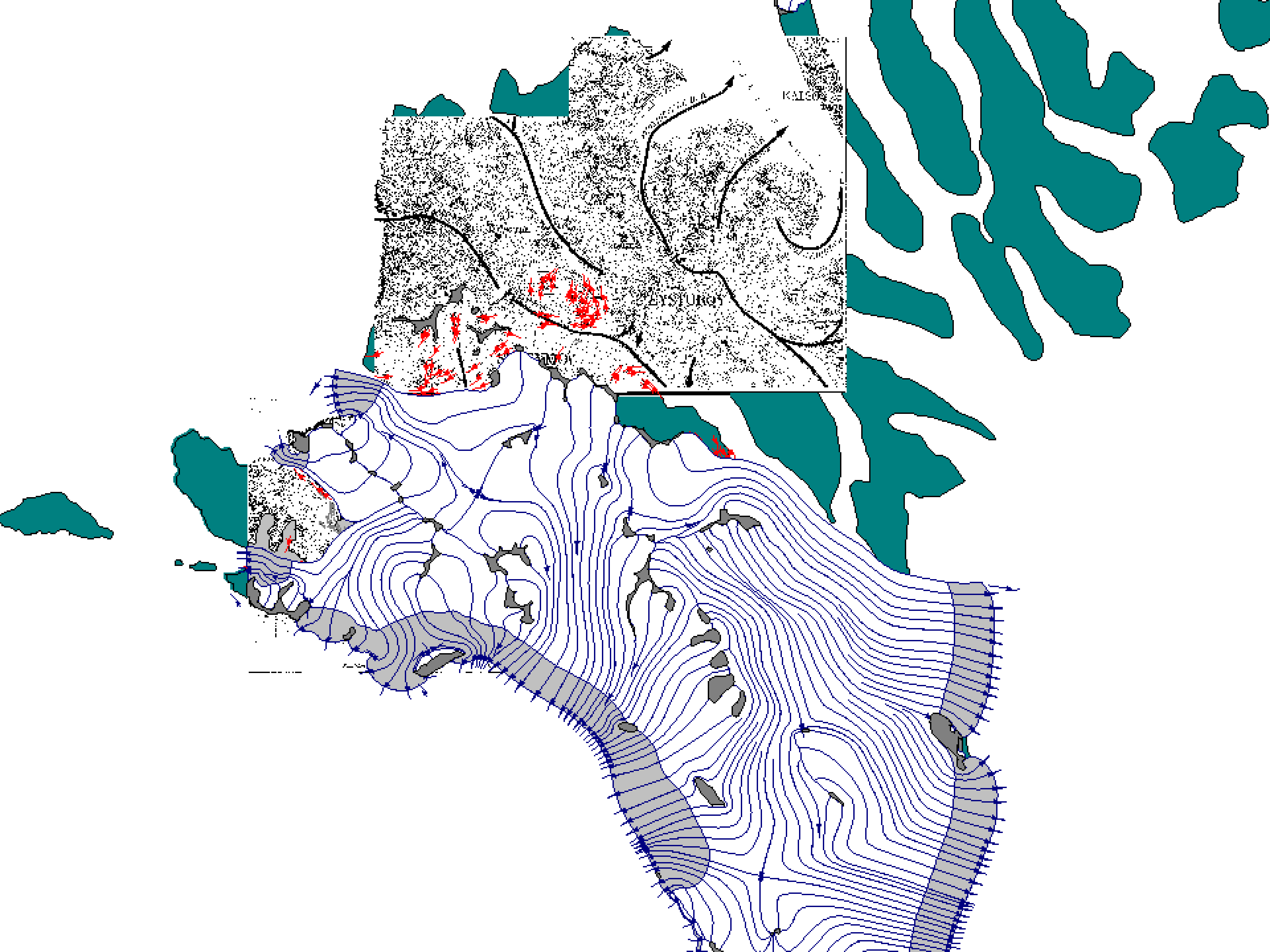

2001


Birkkarspitze
2749 m
Westliche Karwendelspitze
Praxmarerkarspitze
2638 m
Hoher Gleirsch
2492 m
Großer Lafatscher
Brandjochspitze
2599 m
Rumer Spitze
2454 m
Klettersteig
Hafelekarspitze
2334 m
Frau Hitt
Sattel
Langer
Sattel
Pfeishütte
1922 m
AV 221/222
AV 222
Kreuzjöchl
2121 m
AV 219
AV 215
Hafelekar
2269 m
AV 216
AV 217
AV 218
Frau Hitt Warte
1982 m
Seegrube
1905 m
Arzler
Reisse
Höttinger Alm
1487 m
Bodensteinalm
1661 m
Thaurer Alm
1464 m
Achselbodenhütte
1645 m
AV 218
Vintlalm
1567 m
Rumer Alm
1243 m
AV 215
AV 216
Höttinger
Graben
AV 217/218
Enzianhütte
Rauschbrunnen
1088 m
Arzler Alm
1067 m
AV 220
Höttinger
Bild 905 m
AV 216
Gramart
Hungerburg
868 m
Rum
Arzl
AV 215
Alpenzoo
Hötting
Inn
Inn
Innsbruck
Schloß Ambras








EYSTUROY

Waterfall Pingo, Adventdalen, Spitsbergen, Svalbard

Glacial and periglacial geomorphology

Content ?

What do you expect to learn from this course ?

General weekly structure :

- 1 hour lectures
- 2 hour seminar/discussion
  1. Presentation of paper (objective)
  2. Discussion (pro et contras)
  3. The road ahead (what should be done next?)

Matthews, J. A. (2005). "'Little Ice Age' glacier variations in Jotunheimen, southern Norway: a study in regionally controlled lichenometric dating of recessional moraines with implications for climate and lichen growth rates."

Holocene 15(1): 1-19.

A new approach to regional lichenometric dating is developed and applied to ' Little Ice Age' moraine- ridge sequences on 16 glacier forelands in Jotunheimen, southern Norway. Lichenometric- dating curves, based on the Rhizocarpon subgenus, are constructed independently for west, central and east Jotunheimen. Although there are differences between the subregions, a composite regional moraine chronology for Jotunheimen identifies 12 episodes of moraine formation in AD 1743 - 1750 (the regional ' Little Ice Age ' glacier maximum), 1762 - 1771, 1782 - 1790, 1796 - 1802, 1811 - 1818, 1833 - 1838, 1845 - 1854, 1860 - 1868, 1871 - 1879, 1886 - 1898, 1915 - 1922 and 1927 - 1934. Spatial and temporal patterns in glacier behaviour between the subregions and between Jotunheimen and the neighbouring Jostedalsbreen are explained in terms of the interaction of annual to decadal variations in summer temperature and winter precipitation: glacier advances and moraine- formation events driven primarily by winter- precipitation variations exhibit subregional patterns while summer- temperature forcing affects more synchronous glacier behaviour across the region. Regionally controlled lichenometric dating improves the accuracy of dating by up to about +/- 20 years on relatively old moraines and is dependent on regional patterns in the rate of lichen growth. On relatively young surfaces, mean cumulative growth rate declines from about 0.75 mm yr(-1) in maritime west Jotunheimen to about 0.55 mm yr(-1) in continental east Jotunheimen (though the differential in growth rate is less on older surfaces).

Riseborough, D., N. Shiklomanov, et al. (2008). "Recent advances in permafrost modelling."
Permafrost and Periglacial Processes 19(2): 137-156.

This paper provides a review of permafrost modelling advances, primarily since the 2003 permafrost conference in Zurich, Switzerland, with an emphasis on spatial permafrost models, in both arctic and high mountain environments. Models are categorised according to temporal, thermal and spatial criteria, and their approach to defining the relationship between climate, site surface conditions and permafrost status. The most significant recent advances include the expanding application of permafrost thermal models within spatial models, application of transient numerical thermal models within spatial models and incorporation of permafrost directly within global circulation model (GCM) land surface schemes. Future challenges for permafrost modelling will include establishing the appropriate level of integration required for accurate simulation of permafrost-climate interaction within GCMs, the integration of environmental change such as treeline migration into permafrost response to climate change projections, and parameterising the effects of sub-grid scale variability in surface processes and properties on small-scale (large area) spatial models.