IAG Webinar Northern Europe

Date: 4 March 2022 at 09:00 – 12:45 CET

Coordinators: Dr. Katja Laute and Dr. Achim A. Beylich
Geomorphological Field Laboratory (GFL), Selbustrand, Norway

INTERNATIONAL GEOMORPHOLOGY WEEK 2022

09:05 – 09:30

Widespread glacial erosion on the Scandinavian passive margin

Dr. Vivi Kathrine Pedersen, Department of Geoscience, Aarhus University, Denmark

The topography in Scandinavia features enigmatic high-elevation low-relief plateau regions dissected by deep valleys and fjords. These plateau regions have long been interpreted as relict landforms of a preglacial origin, whereas recent studies suggest they have been modified significantly by glacial and periglacial denudation. Here I explore whether late Pliocene–Quaternary source-to-sink analyses can be used to untangle this scientific conundrum. Our results suggest that onshore valley and fjord erosion falls >60% short of the offshore glacially-derived sink volume. Erosion on the inner shelf cannot accommodate this mismatch, implying that the entire Scandinavian landscape and adjacent shelf have experienced significant glacial erosion.

09:30 – 09:55

A journey through the buried landscapes shaped by the Fennoscandian Ice Sheet

Dr. Benjamin Bellwald, Volcanic Basin Petroleum Research (VBPR), Oslo, Norway

2D reflection seismic profiles and sediment cores have previously been the most common data types to interpret the shallow subsurface in the marine realm. 3D reflection seismic data have given birth to the discipline of seismic geomorphology, and allow studying ancient, buried geomorphological surfaces. Here I show the huge variety of buried landform assemblages shaped by the Fennoscandian Ice Sheet that were mapped out on recently collected high-resolution 3D reflection seismic data. The data allow establishing new models for geological processes with meter-scale resolution, including subglacial erosion and glacial lake outburst floods on the shelf, as well as megaslides, turbidites and contourites on the slope.

09:55 – 10:20

Rivers that don't fit the mold: restoration of disconnected non-equilibrium semi-alluvial rivers

Dr. Lina Polvi Sjöberg, Umeå University, Sweden

Northern Fennoscandia's landscape is heavily influenced by Pleistocene glaciation and subsequent rapid Holocene deglaciation and isostatic uplift. In this seminar, I will discuss how glacial legacies of coarse-grained depositional glacial landforms and abundant lakes affect channel morphology. Because of these glacial legacies, many rivers don't fit the mold of rivers used for theories of sediment connectivity, channel equilibrium, resilience and recovery, and alluvial channel patterns. Since virtually all rivers in northern Sweden were channelized for timber-floating, restoration projects, attempting to restore habitat complexity and channel-floodplain connectivity, require an understanding of catchment-specific fluvial processes with a glacial legacy.

10:20 – 10:45

Capturing the influence of large wood on fluvial bedload transport with RFID tracers and linear mixed modelling

Dr. Georgina Bennett, Geography, University of Exeter, UK

Bedload transport is a fundamental process by which coarse sediment is transferred through landscapes by river networks. We investigated the influence of large wood in the river channel on grain scale sediment transport dynamics. We tagged 957 cobble – pebble sized particles and 28 pieces of large wood with RFID tracers in an alpine mountain stream in Colorado and monitored the transport distance of tracers annually over three years. Linear mixed modelling (LMM) demonstrated a clear influence of large wood on likelihood of entrainment and deposition, and the transport distances of sediments.

11:10 – 11:35

Fluvial bio-geomorphic succession in a channelised river – Implications for river management and restoration approaches

Dr. Rossa O'Briain, Inland Fisheries, Dublin, Ireland

Across Europe, rivers are being 'restored' to improve ecological and hydromorphological conditions to meet criteria defined by the EU Water Framework Directive. Strong feedbacks between plants and geomorphology, recently described as fluvial biogeomorphic succession, influence channel morphology and hydraulics through their effect on land forming processes. These interactions are potentially important to the restoration of degraded rivers, through their positive effect on physical habitat quality and provision of diverse living space for riverine biota. Here, we provide a case study from Ireland documenting fluvial biogeomorphic succession in a channelized lowland stream and consider its implications for river management and restoration approaches.

11:35 – 12:00

Topographic controls on ice flow and recession for Juneau Icefield (Alaska/British Columbia)

Dr. Bethan Davies, Royal Holloway University of London, UK

Alaskan glaciers are losing dramatic volumes of ice, dominating sea-level rise from glaciers. We inventoried 1050 glaciers and 401 lakes of the Juneau Icefield region for the year 2019. We found that 63 glaciers had disappeared since 2005, with a reduction of glacier area of 422 km^2. Glaciological mapping showed areas of glacier fragmentation, where glaciers separated from tributaries via lateral recession, and disconnected within areas of former icefalls. Geomorphological mapping demonstrates that the present-day icefield has a similar thermal and ice-flow regime to the 'Little Ice Age' icefield. These data document the interactions between topography and glacier change.

12:00 – 12:25

Morphometry of Icelandic glaciovolcanoes: Types, evolution, and degradation

Dr. Gro B.M. Pedersen et al., Nordic Volcanological Center, University of Iceland, Reykjavík, Iceland

The geomorphometry of a volcano preserves a record of the interplay between constructional and destructional processes, providing important constraints for the evaluation of future activity and hazard assessment. Glaciovolcanoes are considered to have distinctive characteristics due their ice-confining eruption environment. We present the first thorough morphometric analysis of a large number of glaciovolcanoes, consisting of a database of 155 edifices formed during the last 0.78 Ma within the Icelandic neovolcanic zones. The analysis provides insights into the diversity of glaciovolcanoes, their formation, evolution and how they compare to other volcanic landforms such as shields, composite volcanoes and submarine volcanoes.