EGU2020-8967
https://doi.org/10.5194/egusphere-egu2020-8967
EGU General Assembly 2020

Post-Little Ice Age retreat of glaciers triggered rapid paraglacial landscape transformation in Sørkapp Land (Spitsbergen)

Justyna Dudek[1,2] and Mateusz Czesław Strzelecki[1,3]
[1]University of Wroclaw, Institute of Geography and Regional Development, Poland
[2]Jagiellonian University, Institute of Geography and Spatial Management, Poland
[3]Bekker Fellow Alfred Wegener Institute for Polar and Marine Research, Potsdam

Contemporary climate warming in the Arctic affects the dynamics of the entire environment, including components of the cryosphere: permafrost and glacier systems. The change in the structure of the polar landscape since the termination of the Little Ice Age (ca. 1900) was expressed by widespread retreat of glaciers, progressive exposure of glacial landforms at ice margins and opening ice marginal zones to increasing paraglacial and periglacial processes operating synchronously in adjacent areas.

The main aim of the presented study was to determine the course and spatial diversity of landscape transformation in the Sørkapp Land peninsula (Spitsbergen) as a result of glacier recession in the periods 1961-1990-2010 based on existing remote sensing data. Using photogrammetric methods of data processing combined with GIS techniques, the rates of proglacial and ice-marginal terrain change following deglaciation have been determined.

For the mentioned research period, the area of the marginal zones almost doubled from 53 km² to 99 km². The dynamics of landscape transformation in these zones manifested in rapid reduction in the surface elevation of ice-cored moraines (with mean decrease of 0,18-0,22 m per year) and the forms underlain by the dead-ice. This process was enhanced by mass movements and debris flows. Within marginal zones, the area of subglacial landforms and sediments increased by 31 km² from 8 km² in 1961 to 39 km² in 2010.

Larger volume of proglacial waters and associated intensification of denudation, transport and accumulation of sediments entailed area increase of sandurs and proglacial riverbeds (which almost tripled from 3,5 km² to over 10 km²). Further redeposition and remobilization of material in some places also promoted enhanced sediment aggradation in coastal environment forming new beaches and spit systems.