Geophysical Research Abstracts
Vol. 12, EGU2010-740, 2010
EGU General Assembly 2010

Geomorphological and sedimentological record of accelerated deglaciation of small mountain glacier, Ragnarbreen, Svalbard

Marek Ewertowski
Institute of Geoecology and Geoinformation, Adam Mickiewicz University, Poznan, Poland (evert@amu.edu.pl)

Most of the Svalbrad glaciers have been in retreat since the end of the Little Ice Age (LIA). Hence, they give a good opportunity to study the geomorphological and sedimentological record of deglaciation. The aim of the study is to describe main landsystem elements of Ragnar glacier and relate them to different stages of the glacier recession.

The Ragnar glacier is located in the Svalbard archipelago, in the central part of the West Spitsbergen Isle, in the north branch of Billefjorden. Ragnar is a small ($\sim$ 6 km2), outlet glacier, which current clean ice edge has retreated ca. 1500 m from the position related to the maximum LIA extent. Fieldworks of the study comprised detailed geomorphological mapping and sedimentary works.

Four main elements of the landsystem of the Ragnar glacier can be distinguished:
1) Clean glacier surface. Currently, the ice surface of Ragnar glacier is almost completely debris-free and with only several supraglacial streams.
2) Ice–marginal lake. The lake started to form after 1980 year. Since that time, its length has reached 1000 m. Distant (from the ice-edge) part of the lake is shallow (< 2 m) with several small islands. Part proximal to the current ice edge is deeper (up to 16 m) and devoid of islands. At the bottom of the lake some ice (probable of glacier origin) was detected.
3) Lateral moraines – were developed along the both valley sides, from frontal moraine complex – to ca. 2 km upward the glacier valley.
4) Frontal moraine complex. This complex comprises of several chains of ridges and depressions and is relatively distinct - elevated about 35 m above the valley bottom.

The elements of the landsystem of the Ragnar glacier have undergone several transformations since the LIA maximum:
1) Formation of the frontal moraine complex can be related to the state of dynamic equilibrium of the glacier during the LIA maximum. During formation of the complex and shortly after it the main depositional agents were intense debris flows, which are recorded by thick covers of the old debris flow deposits. Nowadays, despite of ice-cores, frontal moraine complex is much more stable than the lateral moraines or ice-marginal lake.
2) As a consequence of lowering of the clean glacier surface and formation of the distinct lateral moraines, the debris delivering from the valley sides is limited only to very narrow zone of the glacier (i.e. only to the lateral moraine).
3) Accelerated recession of the ice mouth and limitation in delivery of debris from sides of the valley caused that amount of deposits released in the ice front is small.
4) Increasing amount of water flowing from the glacier was blocked by frontal moraine complex and the ice marginal lake was created.
5) The debris cover on the lateral moraines is relatively thin. In addition, as a consequence of the clean ice surface lowering, slopes of the lateral moraines are very steep. It causes that mass movement processes (especially debris flows) are ubiquitous. Contemporary, lateral moraines are the elements undergoing the most intense transformations.

Observations made in the Ragnar marginal zone revealed spatial-temporal changes in distribution of the sediments and landforms. They also add some premises that in the first stage of deglaciation debris flow and other mass wasting processes are most common. In the later phase glaciolacustrine and glaciofluvial deposition also plays important role in transformation of landforms and sediments.