



A new assessment of distribution and activity of permafrost landforms in the Tröllaskagi peninsula, northern Iceland

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The formation of rock glaciers and ice-cored moraines is constrained to areas subjected to permafrost, and the presence of such landforms is commonly used as a direct indicator of present or former permafrost conditions. In Iceland, a rock glacier inventory was derived from air photo interpretation by Guðmundsson (2000), and in this context the extent of possible ice-free areas especially during Pleistocene in northern Iceland was controversially discussed.

In the present study we used recently published air photos (2002-07), ALOS PALSAR data (2007), MODIS land surface temperature data (2003-2010) and field mapping, and re-examined the Tröllaskagi peninsula for permafrost landforms. In this re-examination, active rock glaciers are defined by steep front slopes and deep surface ridges and furrows indicating movement, which is also shown by the ALOS PALSAR data. These landforms are related to clear source areas, facilitating material supply. Inactive rock glaciers are mapped based on the same criteria as the active rock glaciers, but where no surface movement is detectable. The active and inactive permafrost landforms were categorized as one group, namely intact landforms, because of difficulties in establishing whether a landform is moving or not based on singular aerial imagery, and also to expand the sample for statistical purposes. Relict rock glaciers, however, show distinct collapse structures and often have extensive vegetation cover. The formation of these landforms is discussed in relation to existing glaciers or creep in talus slopes, distinguishing between moraine-derived and talus-derived landforms. Ice-cored moraines are here characterized as over-sized moraines in front of small glaciers, and are stable geomorphic features in permafrost environments where the moraine sediment is thicker than the active layer. Ice-cored moraines are considered active features when they appear stable, but do not necessarily possess indications of creep.

This study will discuss present and relict permafrost distribution based on the mapped rock glacier and ice-cored moraines in Tröllaskagi. In addition, various characteristics of the landforms such as the state of activity are given. This study supports the previous inventory which indicated evidence of typical rock glacier formation at low elevations, indicating long ice-free and cold periods prior to the onset of the Holocene Atlanticum.