GEOMORPHIC RESPONSES TO PERMAFROST THAWING UNDER RAPID CLIMATE CHANGE: THE CASE OF THE RUSSIAN ALTAI MOUNTAINS

Hanne Hendrickx[1], Jan Nyssen[2], Britta Sannel[3], Rudi Goossens[4], Frank Lehmkuhl[5], Valery Babin[6], Jean Bourgeois[7], Amaury Frankl[8],

[1] Ghent University, Belgium, hannehendr@gmail.com
[2] Ghent University, Belgium, jan.nyssen@ugent.be
[3]Stockholm University, Sweden, britta.sannel@natgeo.su.se
[4]Ghent University, Belgium, rudi.goossens@ugent.be
[5]Aachen University, Germany, flehmkuhl@geo.rwth-aachen.de
[6]Gorno-Altaisk State University, Russia, babin@gasu.ru
[7]Ghent University, Belgium, jean.bourgeois@ugent.be
[8] Ghent University, Belgium, amaury.frankl@ugent.be

In cold regions, climate change related permafrost thawing is causing geomorphic processes to intensify. This is especially the case in mountain regions, where several studies indicate increased geomorphic activity with the recent thawing of permafrost bodies [1, 2, 3]. In addition to the effect on geomorphic processes, permafrost degradation also results in increased CO_2 and CH_4 emissions [4]. This causes a positive feedback mechanism on climate change processes [5]. For both the intensity of geomorphic processes and rate of greenhouse gas (GHG) emissions, little information exists for mountain areas in the permafrost belt worldwide [3]. The Russian Altai Mountains are marginally glaciated and house sporadic and discontinuous permafrost [6, 7, 8]. Due to global warming, temperature and precipitation are changing rapidly in the area, at rates higher than the global average [9, 10, 11]. This result in highly dynamic environmental processes, making the Altai Mountains a potential area to understand the interrelations between geomorphology and permafrost, as influenced by climate change. Due to its marginal nature, permafrost degradation is rapid in the Russian Altai Mountains, and related geomorphological processes (e.g. landslides) are therefore accelerating [8, 12]. To study this, the general objective of this research is to understand the interrelationships between climate, permafrost and geomorphology in the climate sensitive Altai Mountains. This will be done by (i) conducting a detailed geomorphological mapping and linking the occurrence and typology of permafrost to geomorphic processes, (ii) understand and model permafrost dynamics (1960s-2100) in relation to climate trends and (iii) quantifying the magnitude of greenhouse gas emissions from thawing permafrost. By doing so, this study expects to contribute to the understanding of the geomorphological sensitivity of cold climate mountains to climate-driven permafrost degradation, and to assess the potential of such mountains to greenhouse gas emissions (Fig. 1).

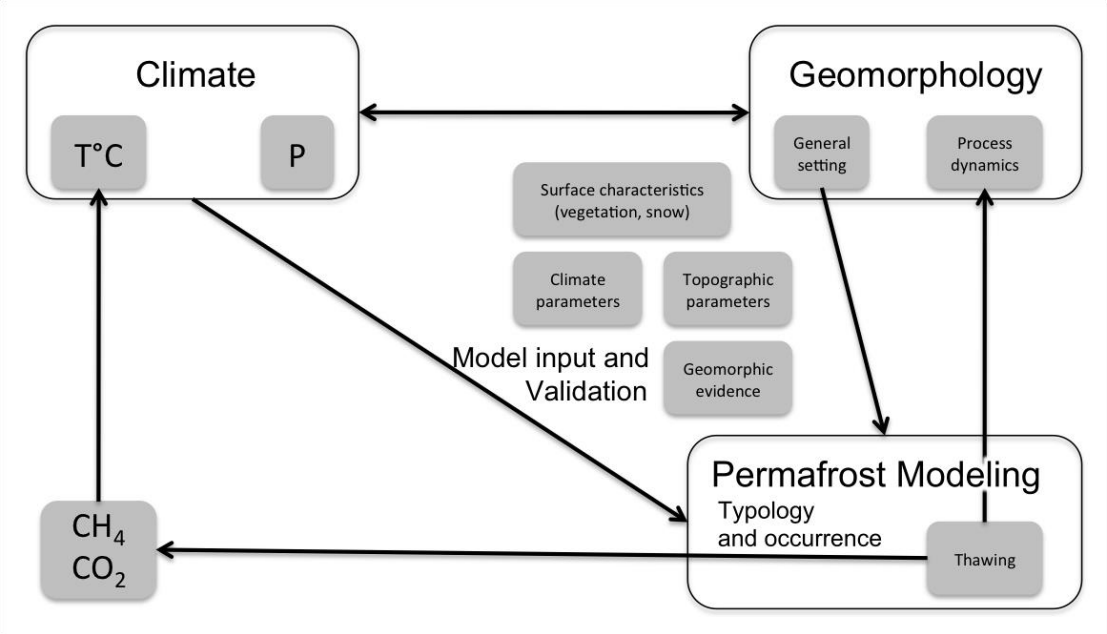

Fig. 1: Conceptual model of this study

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