Multi-method approach to inventorying rock glaciers and features of interest in Banff and Jasper National Parks, Alberta, Canada

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Rock glaciers are perennially frozen masses of ice and unconsolidated material that creep downslope resultant from internal, cyclic freeze-thaw mechanisms and weight due to gravity. These features are often tongue-shaped, lobate landforms, with lateral and frontal terminal margins, that often contain longitudinal or transverse flow topography within the surface that consists of poorly sorted, angular, rock debris. Although rock glaciers are abundant geomorphological features in the alpine periglacial environments of the Rocky Mountains, their spatial distribution and characteristics are largely unknown. As rock glaciers contain frozen fresh water and can be potential geohazards, inventories are crucial in the assessment of the activity status and distribution of these landforms. Over 800 intact (active/inactive) rock glaciers were successfully identified within the study areas, as well as over 204 features of interest requiring further validation of surface kinematics and morphometric quantification. Grid-based manual inventorying of these features was completed using high-resolution satellite imagery that is readily available through the ESRI World Imagery Base Layer, then subsequently verified manually with Google Earth Pro. This refined methodology proved crucial and supports the idea of both multi-temporal and multi-method approaches to the inventorying of rock glaciers and features of interest within the alpine terrains of Canada to ensure high accuracy in inventorying and for long-term monitoring feasibility. This multi-method approach to rock glacier inventorying and classification developed a proof of concept within the study area that verifies the applicability of this method at a regional scale. This work represents the first component of our rock glacier monitoring network within Canada, as there currently are none to date. The inventories completed with this initiative will be shared with the International Permafrost Associations Rock Glacier Inventorying Action Group.

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