



A globally complete map of supraglacial debris cover and a new toolkit for debris cover research

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A growing canon of literature is focused on resolving the processes and implications of debris cover on glaciers. However, this work is often confined to a handful of glaciers that were likely selected based on criteria optimizing their suitability to test a specific hypothesis or logistical ease. The role of debris cover in a glacier system is likely to not go overlooked in forthcoming research, yet the magnitude of this role at a global scale has not yet been fully described. Here, we present a map of debris cover for all glacierized regions on Earth including the Greenland Ice Sheet using 30 m Landsat data. This dataset will begin to open a wider context to the high quality, localized findings from the debris-covered glacier research community and help inform large-scale modeling efforts. A global map of debris cover also facilitates analysis attempting to isolate first order geomorphological and climate controls of supraglacial debris production.

Furthering the objective of expanding the inclusion of debris cover in forthcoming research, we also present an under development suite of open-source, Python based tools. Requiring minimal and often freely available input data, we have automated the mapping of: i) debris cover, ii) ice cliffs, iii) debris cover evolution over the Landsat era and iv) glacier flow instabilities from altered debris structures. At the present time, debris extent is the only globally complete quantity but with the expanding repository of high quality global datasets and further tool development minimizing manual tasks and computational cost, we foresee all of these tools being applied globally in the near future.