



The challenge of non-stationary feedbacks within the response of debris-covered glaciers to climate forcing

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Debris-covered glaciers are a feature of many mountain ranges around the world and their proportion is expected to increase under continued climate warming.

The impact of debris cover on glacier behavior, via its profound modification of the glacier ablation regime, causes debris-covered glaciers to respond to the same climate forcing in a markedly different way to clean ice glaciers. In order to better understand how debris cover impacts the glacier's response to climate forcing, we revisit the concept of steady state and examine it for a debris-covered glacier system. We present simple modeling results to explore how the development and evolution of debris cover affects the potential for steady-state and how feedbacks instigated by supraglacial debris cover complicate the glacier's response to a prescribed steady climate. These investigations highlight the non-stationarity induced by the presence of debris and as a result, that debris cannot be considered as a static component, as it is a highly dynamic component which affects the glacier system in different ways.