



The spatial variation of supraglacial debris characteristics and their influence on glacier melt on Annapurna South Glacier, Nepal.

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Over the last 30 years, Himalayan glaciers have increasingly lost mass due to climate change, which has major impacts on regional water resources. Supraglacial debris, which develops on many Himalayan glaciers, influences sub-debris glacier melt rates by modulating the pathway of atmospheric radiation to the ice surface. However, this debris cover tends to be highly heterogeneous at the glacier scale and the spatial variation of properties such as debris thickness, surface roughness, grain size and thermal conductivity, and how they interrelate, are still poorly understood. This is due in part to the lack of field observations in these typically remote and high-altitude regions. This limits our ability to investigate the relationship between supraglacial debris and glacier melt rates and to model debris-covered glacier mass changes accurately at larger spatial scales. Here we present debris thickness, grain size, surface roughness, air and debris temperature, and annual sub-debris ablation rates obtained from the ablation zone of Annapurna South Glacier (ASG) a debris-covered glacier in the Nepalese Himalayas, between October 2016 and October 2017. The data give insight into the relationships between different debris properties on ASG, and the response of supraglacial debris to radiation during the year. They also provide some of the first measurements of sub-debris glacier melt rates in the Annapurna-Manaslu region of Nepal, which hosts ~300 debris-covered and debris-free glaciers but is largely unstudied.