

Ambient seismic noise at a Himalayan debris-covered glacier

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Seismic data was collected during autumn 2017 at a debris-covered glacier in the Himalayas to provide a wide-scale characterization of its cryo-seismic wavefield. Here, we analyze ambient noise at the glacier and find a strong diurnal variation of seismicity. We show that the air temperature is pacing the intensity of broadband noise (0.1-100 Hz) and that its polarity depends on an existence or a lack of a debris-mantle. Debris-covered area has the highest activity in the afternoon, while debris-free area at night. We consider debris-modulation of thermal stress, leading to near-surface tensile fracture, melt-related rock motion, and wind as the main mechanisms. Debris dampens the diurnal amplitude of the temperature and thus protects the ice from a cyclic mechanical damage, which cracks exposed ice most intensively early in the morning. Together with a well-known thermal insulation effect of debris, such property should protect weathering crust of glaciers from fast degradation.

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