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The influence of disappearing ice faces and hanging glaciers on permafrost in steep rock

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Warming and thawing permafrost has been demonstrated to influence the stability of rock walls. In view of present and projected global change, permafrost thaw therefore constitutes a transient stability factor that can result in rock fall in areas that have previously been stable. Especially ice faces and hanging glaciers bear the potential to induce rapid changes to subsurface temperatures upon their decay and, as a consequence cause instabilities. Ice faces and hanging glaciers can react very sensitive to climate change and disappear quickly. Upon their decay the surface energy-balance is altered because of: a) changed surface albedo and b) no ice melt during summer resulting in positive surface temperatures. As a consequence, an active layer can develop quickly and expose considerable volumes of rock to fast thaw. The gradual equilibration of subsurface temperatures with new surface conditions can lead to thaw or decay of the permafrost body below the active layer. To study these effects, a computer model that simulates rock temperatures in complex topography is used together with simple assumptions on surface characteristics of ice faces and conditions below hanging glaciers. Results are interpreted in view of observed instabilities or disappearing steep ice.