



Ultra high-resolution topographic analysis for understanding bedrock erosion processes

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Fluvial bedrock erosion is relatively poorly understood, not least due to the dearth of field measurements. This presentation reports on an ongoing project that is opportunistically exploiting annually-recurring outburst floods at Russell Glacier, west Greenland and the technological advances in Structure-from-Motion (SfM) methods, to quantify the spatial distribution and intensity of bedrock erosion. Specifically, the workflow comprises (i) construction of high-resolution (sub-metre) 3D topographic models of bedrock gorge reaches (400 m x 100 m) and ultra high-resolution (sub-centimetre) 3D topographic models of multiple bedrock patches (each 5 m x 5 m), (ii) analysis of orthophotographs using image processing techniques to identify the position of recent erosion, (iii) analysis of the 3D models for topographic variables to discriminate bedrock structure and form, (iv) input of the gorge-scale topography to a hydrodynamic model to quantify hydraulics associated with bedrock erosion events. The presentation will discuss specific details of the workflow to emphasise the potential for developing process-based understanding of bedrock erosion, and with a look outwards and forwards to the applicability of the workflow to other sites and geophysical phenomena.