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Landslides onto glaciers – absence of evidence is not evidence of absence

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Moraines are often used as geomorphic markers from which past climate and glacier dynamics are back calculated once dating analysis has been undertaken. This near standard methodology has recently been questioned as contemporary glaciers have been shown to respond to catastrophic inputs of sediment delivered supraglacially by landslides. The resultant moraines constructed as any landslide driven advance slows to a still-stand before retreating can be considered out of phase with climate. In addition, the debate over 'paraglacial' landscape which advocates dramatically increased rates of slope activity after ice-retreat exposes meta-stable sediments, also invokes 'debutressing' of rock slopes over long timescales to initiate catastrophic failure. The preservation potential of these rock-slope failure deposits in proglacial landscapes is far in excess of those emplaced onto ice which are rapidly reworked and dispersed censuring the record of their frequency. To prove that rock-slope failure rates increase in areas previously occupied by ice requires that we are correctly quantifying the magnitude frequency of rock-slope failures onto ice, or, we have suitable methods of identifying the resultant, reworked, and redeposited debris from them.

This work brings together the cutting edge research into what can be termed Landslide Glacier Interactions – LGI. Data from: base-line survey datasets using Terrestrial Laser Scanning to monitor glacial rock slopes, sedimentary analyses of moraines and known LGI's, and evidence preserved in the LGM-recent sedimentary record is brought together here. This highlights the disparity of what is preserved in the sedimentary and geomorphological records versus contemporary observations of rapid rates of rock-slope failure onto thinning/retreating ice rather than in front of it.