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Using near infrared photography to link spatial patterns in stratigraphy with stability

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Near infrared (nIR) digital photography produces high resolution snow profiles of specific surface area and effective grain diameter. By taking multiple measurements and tiling images, we can examine slopes at scales relevant for avalanche formation. We give an overview of our methodology and then use an independent technique, methane gas adsorption, to verify our measurements. We present nIR profiles from stable and unstable snowpits, based on stability scores. We also present tiled (3 to 19 images) profiles at two avalanche crown lines to study spatial patterns in starting zones. We find that near infrared photography is effective at mapping layer differences greater than 1mm—i.e. new snow and melt freeze crusts—but not at delineating boundaries on the sub-millimeter scale, such as grain size differences between in-storm layers. We suggest that nIR photography is effective for studying spatial patterns in stratigraphy for certain types of avalanches, such as those where the weak layer is marked by a large grain size difference. Further, nIR snowpits require calm winds, which prevents measuring avalanche terrain during storms. We end by proposing future research: near infrared profiles before and after explosive testing and the addition of micropenetrometer resistance measurements. With this work, we aim to establish relationships between spatial patterns in stratigraphy and stability.