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# Coincident optical and thermal airborne imagery for three dimensional characterisation of forest canopies during snowmelt

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Remotely sensed data describing 3D forest structures are commonly retrieved using airborne or terrestrial light detection and ranging (LiDAR) methods. More recently, improvements in the affordability and accessibility of lightweight unmanned aerial system (UAS) technology has facilitated lower cost methods to obtain 2D images for input into structure from motion (SfM) models of forest canopies. Furthermore, thermal imaging technology has advanced to the stage where survey grade, portable, and easy to use cameras are readily available. The processing of 2D thermal imagery to produce complete 3D models containing thermal information has yet to be fully explored in the context of vegetation structure. We present a workflow combining airborne optical and infrared thermal imagery for generating 3D structural thermal data. Coincident optical and thermal imagery from a low-altitude UAS platform were used within SfM methods to produce 3D optical and thermal models of a standalone tree and a discontinuous forest stand. Optical and thermal point cloud densities were 35,254 and 776 points/m, compared to 78 points/m for a LiDAR dataset of the same area. Despite comparatively low resolution of thermal imagery, forest structural elements in the upper canopy can be accurately resolved.