



## **Understanding how Alpine Valley-Glacier Overdeepenings affect Seasonal Glacial Dynamics**

Will Higson

United Kingdom (wjhigson1@shef.ac.uk)

Recent advances within the fields of photogrammetry and UAV technology has opened up the potential for use in glaciological fields due to high resolution imagery (1-20 cm), low costs, increased portability and improved ortho-mosaic software. Glaciers tend to move slowly and from lower resolution satellite data, smaller scale changes can be harder to infer, particularly over shorter, seasonal time periods.

High resolution imagery from 5 sets of flights using a 'DJI Phantom 4' unmanned aerial vehicle (UAV) were recorded over the lower 2 km of Findelen Glacier, Switzerland between 22 August and 6 September. 3-dimensional ortho-mosaics were created using Agisoft PhotoScan software of each flight. Photogrammetry was rectified by nine ground control points (GCP) positioned at the margins of the glacier in static locations and georeferenced to ~1-20 cm error using Magellan ProMark 3 DGPS equipment. Pixel sizing was suitable for feature tracking software (5 +/- 2 cm) but varied based on relative altitude and velocity at time of capture which was set to 2.5 m/s. vertical and horizontal overlap were high (89% & 70% respectively).

Feature tracking of the glacier over 17 days combined with DEM change comparison shows a flattening slope angle and slowing of velocity before an assumed reigel and an increased velocity post-reigel. Glacier surface flow velocities over this period were found to be in the region of ~1.5 m. However, this does not account for error levels of ~40 cm throw doubt on findings, considered due to a lack of GCPs on the glacier itself. A repeat survey is scheduled to reduce error and seek to compare annual changes in glacial dynamics. Importantly, this method (which enables feature tracking at these high resolutions) is suitable for measuring smaller seasonal changes within glacier dynamics.

Keywords: UAV, Feature Tracking, Glacier Dynamics, Overdeepening, Photogrammetry.