



'Unlocking the archive': Using digital photogrammetry of modern and historic aerial photography to reconstruct 60 years of volumetric change on the Moider Glacier, Antarctic Peninsula

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The Antarctic Peninsula is a mountain glacier system comprised of over 400 glaciers, and is an important contributor to historical and future sea level rise. Assessment and monitoring of AP glaciers is crucial for understanding sensitivity to climate change. Changes to glacier fronts and ice shelves and glacier acceleration are well documented, but there are almost no data on mass changes on the Antarctic Peninsula. Satellite data have been used to calculate change over the last 3 decades, but methods to quantify this over longer timescales have eluded researchers. However there is an archive of aerial photography dating back to the 1940s, this has been largely ignored due to the range of technical problems associated with deriving quantitative data from historic imagery and the lack of ground control data. This presentation demonstrates how advances in photogrammetric processing and capture of modern aerial photography has allowed this archive to be 'unlocked'.

Accurate photogrammetric reconstruction from aerial photographs traditionally requires known ground control points acquired in the field; in remote and inaccessible areas, such as the Antarctic Peninsula, this is often impossible. A method for providing control for historic photos without fieldwork, by linking them to a newly acquired, highly accurate photogrammetric model adjusted through direct kinematic GPS positioning of the camera has been applied to a number of glaciers across the Antarctic Peninsula.

This presentation will outline the photogrammetric workflow with focus on the Moider Glacier in the Marguerite Bay region of the western Antarctic Peninsula to investigate the quality of data that can be obtained. Volumetric changes on the glaciers from the 1950s to present day (2015) have been reconstructed and can be used to explore the spatial and temporal changes that have occurred on this glacier. In particular, there is near-annual data over the last 5 years recording a period when there has been considerable change to the frontal position of the glacier has broken off, enabling glacial response of this system change to be evaluated in detail.