



## **Ice Shelf behaviour and the velocity of Cook Glacier, East Antarctica 1989-2016**

Bertie Miles, Chris Stokes, and Stewart Jamieson

Department of Geography, Durham University, Durham, United Kingdom (a.w.j.miles@durham.ac.uk)

Cook Glacier, East Antarctica, discharges around 40 km<sup>3</sup> of ice per year, which is one of the highest rates of all outlet glaciers in both East and West Antarctica. It is also significant because a large proportion of the Wilkes Subglacial Basin drains through Cook Glacier, which is thought to have been destabilized during the Pliocene, resulting in a significant sea level contribution of several meters. Modelling studies have also suggested that the removal of a relatively small section of its coastal ice could lead to self-sustaining retreat of a large proportion of the Wilkes Subglacial Basin. These studies, combined with observed thinning of its ice shelf since 1998, suggests that Cook Glacier may be particularly vulnerable to near-future changes in climate. However, despite its large ice discharge and potential vulnerability there very few observations of the velocity of Cook Glacier and how changes in the ice shelf might be impacting on inland ice.

Here, we use feature tracking on Landsat and ASTER imagery to create the first time series of velocity changes on Cook Glacier from 1989 to 2016. This reveals a ~20% increase in its velocity since 1989, which we link to the long-term thinning trend of its buttressing ice shelf. We also observe strong annual variability in glacier velocity throughout the 2000s which are consistent with annual variations in the rate of thickness change of its ice shelf. Our results highlight sensitivity of glacier velocity to ice shelf behavior and the need to improve our understanding of the processes driving changes in ice shelf thickness.