

Response of glacier mass on recent temperature cooling in northeastern Antarctic Peninsula

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The Antarctic Peninsula (AP) region has been often recognized as one of the most rapidly warming parts of our planet during the second half of the 20th century (Turner and others, 2014). However, recent study of Oliva and others (2016) has documented that significant warming trend was shifted to a prominent cooling trend during 2006–2015. The recent cooling is particularly pronounced in the northeastern part of the AP, with the largest temperature drops of 0.7–0.9 °C between 1996–2005 and 2006–2015. Therefore, we aim to study response of small glaciers on James Ross Island, north-eastern part of the AP, that are considered to be sensitive to recent temperature fluctuations.

We have studied annual changes of mass balance and equilibrium line altitude of Whisky Glacier, a cold-bases land-terminating valley glacier ($\sim 2.4 \text{ km}^2$), in the northern part of James Ross Island. The surface mass balance changes were estimated based on ablation stake measurements, carried out in late summer over the five years period (2009/10–2013/14). In addition, glacier surface velocity and area changes were determined for this period from aerial and satellite imageries based digital elevation models.

Automatic weather stations in the northern part of James Ross Island reflect the recent cold period and indicate a prominent cooling by 1.2 °C over the period 2006–2015. A response of glaciers on colder conditions can be observed throughout the area where negative mass changes turned to predominantly positive values after 2009. The total mass of Whisky Glacier has increased by 0.8 m w.e. in 2009/10–2013/14 and the annual mass changes were positive except for 2011 (-0.1 m w.e.). A comparison of annual mass balance changes with the data reported from glaciers on nearby Vega Island (Marinsek and Ermolin, 2015) indicates similar values of glacier mass changes in northeastern AP.

Acknowledgments: This research was supported by the Czech Science Foundation (project GC 16-14122J) and Czech Ministry of Education (LM2015078).