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Holocene glacial retreat at the Walgreen Coast, West Antarctica

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As a subarea of coastal West Antarctica, the Walgreen Coast is covered by parts of the two million km2 West Antarctic Ice Sheet (WAIS). With the fastest ice streams in the whole Antarctic, the WAIS is characterised by rapid thinning and grounding line retreat. Because the WAIS is mainly grounded below sea level, it is especially vulnerable to a complete collapse, when the buttressing ice shelves fade with the rising ocean temperatures.
Short-term observations, using radar (InSAR), show a doubling of the negative net mass balance within ten years (between 1996-2006; Rignot et al., 2008). On the other hand, due to remoteness and challenging accessibility, only little onshore data exists and close to nothing is known on the long-term evolution of the ice sheets in the study area.

To reconstruct the deglaciation history of the Walgreen Coast, we sampled erratic boulders as remnants of the glacial retreat in small altitudinal profiles. Using the terrestrial cosmogenic nuclide 10Be we could extract post-Last Glacial Maximum surface exposure ages of $\sim$8.7 k.y. and $\sim$12.9 k.y. alongside the Kohler and Simmons Glacier. In combination with the recent ice sheet elevation it is possible to extract average glacial thinning rates, yielding $\sim$3 cm/yr over the past 13 k.y for this area. This is in the same order of magnitude as previously published thinning rates for the adjacent Smith and Pope Glacier of 2.3 $\pm$0.3 cm/yr (Johnson et al., 2008) but one order of magnitude lower than recent rates obtained through satellite altimetry over the past decade. Therefore, our new data corroborate a general trend for significant acceleration of glacial retreat in West Antarctica. Furthermore, our data contribute to a better understanding of long-term glacial thinning along the West Antarctic coast, and thus provide new constraints for ice sheet models, helping to predict the future behaviour of the WAIS.

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