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Effect of Improved Bedrock Geometry on Antarctic Vulnerability to Regional Ice Shelf Collapse

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The Antarctic Ice Sheet (AIS) is vulnerable to the thinning or even the collapse of its floating ice shelves, which tend to buttress ice streams. Any reduction in buttressing results in acceleration and thinning upstream and potentially the onset of Marine Ice Sheet Instability. Recent work demonstrates that West Antarctica is vulnerable to sustained disintegration in any of its major marine outlets, resulting in 2-3 m sea level rise over 1000 years. At the same time regions in East Antarctica are vulnerable only to the loss of local ice shelves. However, most of this work has used the Bedmap2 dataset as a starting point. Since the release of Bedmap2 in 2012, there has been a sustained campaign of observations, along with improved interpolation techniques based on mass conservation. The resulting datasets, including the recently released BedMachine dataset, incorporate much-improved bedrock and thickness data compared to what was available in Bedmap2.

We reproduce our previous examination of the millennial-scale vulnerability of the AIS to the loss of its shelves to examine the effect of this improvement on projected Antarctic vulnerability, paying special attention to regions like the Aurora Basin which were under-constrained in Bedmap2.