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First geodetic mass balance estimate of the bulk of the South Shetland Islands ice caps

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The Antarctic Peninsula ice sheet is an important contributor to sea-level rise and the glaciers in its peripheral islands have a large potential to increase their contribution under a warming climate. This region has undergone a complex history of climate change during recent decades, which justifies a close monitoring of their glaciers. The South Shetland Islands (SSI) is one of the northernmost archipelagos in this region, but it is lacking a geodetic mass balance (GMB) calculation for the entire archipelago. We have estimated the GMB of the SSI over a 3-4 years period within 2013-2017 (depending on the data availability for each island). Our estimation is based on remotely-sensed multispectral and interferometric SAR data covering 96% of the glacierized areas of the islands considered in our study, and 73% of the total glacierized area of the SSI archipelago (Elephant, Clarence and Smith Islands were excluded due to overly large slopes for SAR or limited input data). Our Results show a close-to-balance overall status during the analyzed period, with specific mass balances ranging from -0.680±0.071 to 0.209±0.025 m w.e. a^{-1} on Low and Livingston islands, respectively. The average specific mass balance for the whole area is -0.064±0.015 m w.e. a^{-1}, representing an ice mass loss of 0.144±0.035 Gt a^{-1}. This result is consistent with the cooling trend observed in the region between 1998 and 2017, and with the mass balance estimates by the glaciological method performed in various glaciers in the AP region (and the SSI in particular).