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Antarctic snow accumulation over the past 200 years

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The Antarctic ice sheet (AIS) is the largest reservoir of fresh water on the planet, even small changes in its volume could have significant impacts on global mean sea level. There is growing evidence that the AIS has been losing mass in recent decades, while mass gains are predicted under future climate warming scenarios. However, there is little consensus on how surface mass balance (SMB) has changed in the past. Here we reconstruct Antarctic snow accumulation variability over the past 200 years based 79 ice core snow accumulation records to (i) produce regional SMB composites using a regional atmospheric climate model ($RACMO_2$.3p2) and (ii) produce an Antarctic-wide reconstruction derived from reanalysis precipitation-minus-evaporation. Both methods reveal a significant ($\sim$10%) increase in total Antarctic snow accumulation since 1800 AD. Our results show that SMB for the total Antarctic ice sheet (including ice shelves) has increased at a rate of 7 +/- 0.13 Gt dec-1 since 1800 AD, representing a net reduction in sea level of $\sim$ 0.02 mm dec-1 since 1800 and $\sim$0.04 mm dec-1 since 1900 AD. The largest contribution is from the Antarctic Peninsula, where the annual average SMB during the first decade of the 21st century (2001-2010) is 123 +/- 44 Gt yr-1 higher than the annual average during the first decade of the 19th century.