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Insignificant change in Antarctic snowmelt volume since 1979: but what about the increase in ice-shelf breakup?

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Surface snowmelt is widespread in coastal Antarctica. Knowing its magnitude is relevant for assessing ice-shelf stability, and for quantifying the effects of firn densification on altimetrically derived mass changes. Satellite-based microwave sensors have been observing melt area and duration for over three decades. However, these observations do not reveal by how much the surface is melting. Here we present an Antarctic melt volume climatology for the period 1979–2010, obtained using the regional climate model $RACMO_2$, equipped with realistic snow physics. We find that mean continent-wide meltwater volume (1979–2010) amounts to 89 Gt y^{-1} with large interannual variability ($\sigma = 41$ Gt y^{-1}). Of this amount, 57 Gt y^{-1} (64%) is produced on the floating ice shelves extending from the grounded ice sheet, and 71 Gt y^{-1} in West-Antarctica, including the Antarctic Peninsula. $RACMO_2$ melt area and duration compare favourably with satellite microwave observations. We find no statistically significant trend in either continent-wide or regional meltwater volume for the 31-year period 1979–2010. Still, meltwater-induced fracturing of ice shelves has increased in this period. We will try to reconcile this observation with the insignificant change in meltwater volume.