Climate variability as a major forcing of recent Antarctic ice-mass change

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Antarctica has been losing ice mass for decades, but its link to large-scale modes of climate forcing is not clear. Shorter-period variability has been partly associated with El Niño Southern Oscillation (ENSO), but a clear connection with the dominant climate mode, the Southern Annular Mode (SAM), is yet to be found. We show that space gravimetric estimates of ice-mass variability over 2002-2021 may be substantially explained by a simple linear relation with detrended, time-integrated SAM and ENSO indices, from the whole ice sheet down to individual drainage basins. Approximately 40% of the ice-mass trend over the GRACE period can be ascribed to increasingly persistent positive SAM forcing which, since the 1940s, is likely due to anthropogenic activity. Similar attribution over 2002-2021 could connect recent ice-sheet change to human activity.