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Coastal retreat doubles previous estimates of Antarctic ice shelf loss

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Ice shelves tend to grow through a steady influx of glacial ice and retreat in discrete calving events that occur on subannual to multidecadal timescales. The impacts of ice shelf calving and retreat are far-reaching, but the evolution of Antarctica's coastline has not been well characterized, owing to the difficulty of delineating ice fronts in limited satellite data. To create an annual coastline dataset that spans the past quarter century, we combine data from multiple satellite sensors, and we use the known physics of ice flow to constrain ice front positions and fill gaps in the data record. We find that since 1997, Antarctica's coastlines have retreated by 37,000 km^2, led by major calving events from the Ross and Ronne ice shelves in the early 2000s, and sustained by countless loss events from smaller ice shelves ever since. Calving losses total nearly 6000 Gt, which is roughly equivalent to the total mass that has been lost to ice shelf thinning over the same period. Using an ice sheet model, we examine the impacts of observed coastal changes on the buttressing strength of Antarctica's ice shelves.