

>New results on the estimation of the mass balance of the Antarctic
>Ice Sheet from the mass-budget method
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>As summarized by the most recent IPCC report, we do not know whether the
>Antarctic ice sheet is gaining or losing mass to the ocean at present,
>hence leaving a major uncertainty in the current sea-level rise budget.
>Radar altimetry results published in 1998 suggested a modest imbalance
>of the antarctic ice sheet, however based on a survey of 63 percent of
>the grounded ice, that excluded a 200-km wide band along the coast where
>radar altimetry measurements are challenging due to steep slopes. From
>the mass budget method, most researchers have embraced the study of
>Bentley and Giovinetto published in 1991 which concluded on a positive
>mass budget, however with considerable uncertainty. Their estimate was
>including largely positive budgets for Pine Island Glacier and Lambert
>glaciers. Even today, most researchers interested in post glacial rebound
>use those results as a plausible representation for present-day mass balance.
>New studies reveal that those sectors suspected to be gaining mass are
>in fact losing mass or being close to balance. These new studies employ
>interferometric SAR to measure ice velocity and grounding line position
>around the periphery of Antarctica, combined with a radar altimetry map
>of surface elevation to estimate ice thickness from
>hydrostatic equilibrium. While the results are still affected by
>uncertainties associated with the lack of quality direct measurements
>of ice thickness, they are clearly outlining major differences in behavior
>in different regions. Areas believed to be in a state of positive balance
>(Pine Island, Lambert) are in fact losing mass or in equilibrium; while
>sectors presumed to be losing mass (Ross ice streams) are in fact
>gaining mass. Overall, the West Antarctic Ice Sheet exhibits a bimodal
>behavior, thickening in the west and thinning in the north but overall
>thinning predominates. In East Antarctica, glacier survey is currently
>incomplete (only 56% of the ice sheet is covered), but the results
>suggests an ice sheet close to a state of mass balance. In summary, most
>significant change seem to be taking place in West Antarctica, especially
>the Amundsen sea sector where ice thinning is rapid and widespread, whereas
>most of East Antarctica should be considered as pretty close to balance.
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>Propulsion Laboratory under a contract with the Cryospheric Science Program
>of the National Aeronautics and Space Administration.
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