A new estimate of the contribution of ice sheets and glaciers to global sea level rise since 1992

Plain language summary

A new estimate of land ice mass trends during the satellite era (1992 to 2016) has been developed focusing on its contribution to sea level rise. The new estimate has been developed by scientists from the Universities of Bristol, Bremen and Utrecht, and shows a marked increase in the land ice contribution from 0.31±0.35 mm/yr of sea level equivalent for 1992-1996 to 1.85±0.13 mm/yr for 2012-2016. For the most recent 5-year period (2012-2016), Greenland contributed 37% and glaciers and ice caps contributed 34%. Antarctica contributed the remainder, with the vast majority from West Antarctica (26%).

The term 'land ice' describes permanent ice on the surface of the Earth, which comprises the two ice sheets that cover Antarctica and Greenland as well as numerous smaller glaciers and ice caps. Over the course of the 20th century, melting glaciers and ice caps dominated the overall contribution of land ice to global sea level rise. This has changed over the last few decades due to the accelerating contribution of the Greenland and Antarctic ice sheets. Ice sheets are the largest potential source of future sea level rise and represent the largest uncertainty in projections of future sea level.

Since 1992, there has been a revolution in our ability to measure the land ice contribution to sea level rise using satellite observations. However, different satellite sensors have provided unique and sometimes conflicting results, and as a result the many published estimates of land ice trends have provided a confusing and often inconsistent picture. The IPCC Fifth Assessment Report (AR5) attempted to collate and combine estimates published up to early 2013. Since then, considerable advances have been made in understanding the origin of the inconsistencies, reducing uncertainties in estimates and extending time series, yet this study is the first that has attempted to combine and update post-AR5 estimates in a rigorous and holistic way.

The new estimate draws on (i) the published literature, primarily since 2013, (ii) expert assessment of that literature, and (iii) a new analysis of Arctic glacier and ice cap trends combined with statistical modelling. The estimate is lower than many studies that have attempted to derive ocean mass gain directly using data from the GRACE satellite mission.

Full paper (open access): Bamber, J.L., Westaway, R.M., Marzeion, B. and Wouters, B. (2018) The land ice contribution to sea level during the satellite era. Environmental Research Letters (DOI: 10.1088/1748-9326/aac2f0)

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