



Improved estimates of the global glacier contribution to sea level rise

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Glaciers distinct from the Greenland and Antarctic ice sheets contain a relatively small volume of ice (0.4-0.5 m sea level equivalent) but contribute significantly to present rates of sea level rise and will continue to do so for the next century and beyond. A recent effort to better quantify mass changes of the world's glaciers found that glacier loss accounted for 30% of the total rise in sea level between 2003 and 2009. A comparison of multiple independent estimates of glacier mass change (ICESat, GRACE, and extrapolated in situ observations) revealed that in situ observations collected between 2003 and 2009 are biased towards glaciers that are thinning more rapidly than the regions' glaciers as a whole. This bias arises primarily from sparse sampling in large regions that experience sizeable spatial gradients in rates of mass change. The bias identified for the 2003-2009 period has implications for estimates of global glacier mass change prior to 2003 but, as of yet, no simple correction has been identified. Here we present the current state of knowledge of global glacier contributions to sea level rise and discuss sampling requirements necessary to resolve glacier mass change at regional scales.