
Two decades of glacier mass balance for the entire Andes Cordillera

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Abstract

The Andes cordillera glaciers and icefields are the biggest contributors to sea level rise per unit area. Past studies have calculated the mass balance of some of these glaciers to assess their contribution to rivers and sea level rise, but none of these methods has been able to obtain a comprehensive, homogeneous and multidecadal estimate for the entire Andes. Here, we present the mass balance of 99.6% of the glacierized area of the Andes using time series of digital elevation models derived from ASTER stereo images. We obtain a total mass change of -19.8 ± 6.3 Gt yr⁻¹ (-0.63 ± 0.2 m w.e. yr⁻¹) for the period 2000 to 2018. Glaciers lost mass in all Andes subregions with mass balance ranging from -0.09 ± 0.15 m w.e. yr⁻¹ in the Arid Andes to -0.77 ± 0.18 m w.e. yr⁻¹ in South Patagonia, this last region hosting alone 68% of the Andean glacier area. Our results show a strong latitudinal pattern of mass loss with high thinning rates in the Tropics and Patagonia and a central region (25-37°S) with reduced mass loss.

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