Reconstruction of 78 years of continuous advance at Trinidad Glacier (Patagonia), causes and insights on the dynamics of Pio XI Glacier and glacier divides.

Oral

Glaciología de la Patagonia

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Trinidad Glacier is located in the Southern Patagonian Icefield, and it is the only land-terminating glacier in the Southern Hemisphere showing a significant and sustained advance. We have reconstructed its dynamics since 1945 and established that the most likely cause of its advance is a substantial increase in its accumulation area due to the migration of the ice divide between Pío XI and Trinidad basins. The divide migration results from the thickening of the Caupolicán Plateau, which encompasses most of the accumulation area of both glaciers. This migration process highlights the importance of 3D flow in delimitating glacier divides and the limitations of current methods for creating glacier outlines on icefields.

During the period 1945-2023, the Trinidad Glacier advanced 4.09 km (52 m/year) and thickened, with a surface elevation increase of 300 to 400 meters in its ablation zone. The sediments displaced have enlarged the proglacial plain, moving the shoreline between 165 and 330 meters seaward.

The advance in the 47 years between 1976 and 2023 fits a profile with a constant deceleration rate very well. A constant deceleration scenario would suggest the advance started in 1958 and generated a remarkably constant ice flow into the

Trinidad basin. The same scenario would suggest the advance might cease by 2041.

This work highlights the importance of considering ice divide migration and the significant uncertainties of glacier divides in plateaus, as both issues can dramatically affect mass balance estimations. For Trinidad Glacier, outline delimitations based on current methods result in AAR (Accumulation Area Ratios) ranging from 0.53 to 0.80, and mass balance estimations that vary by a factor of 2.4 for the 2000–2013 period.

We will also present new insights into reconstructing the history of Pío XI based on our observations of the Trinidad Glacier.

Palabras Clave

(1) glacier divides, (2) glacier dynamics, (3) Pio XI glacier, (4) advancing glacier.