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Recent thinning of the Patagonian icefields and the contribution to sea level rise

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The Northern and Southern Patagonia icefields (NPI and SPI) have a total area of about 17,000 km2. These icefields exist due to high snow precipitation driven by the westerlies, which can be even larger than 10 m/y water equivalent (w.e.), with a strong west-east gradient. At low elevations ablation can exceed 10 m/y w.e., with a large number of freshwater and tidewater calving glaciers. Current knowledge shows large retreat and thinning rates in the ablation areas of most of the outlet glaciers (e.g. Rignot et al., 2003), up to 30 m/y w.e., which has been traditionally explained, at least partially by regional atmospheric warming. However, until now the mass balance of the upper accumulation areas has remained largely unknown. By comparing in situ GPS data Rivera et al. (2005) concluded that the glacier surface lowered in average 1.9 ± 0.14 m/y between 1320 and 1450 m a.s.l. at Chico Glacier (SPI, 49oS) within the period 1998-2001. Here we present new laser altimetry data of NPI (46°30'S-47°30'S) and the northernmost sector of SPI (48°15'S-48°45'S) collected by airborne missions performed by NASA/CECS/Armada de Chile in November/December 2002 and October 2008. The laser data show for the first time small but significant thinning in most of the upper accumulation areas of NPI and northernmost SPI. This agrees with the more local results of Rivera et al. for Chico Glacier. The laser altimetry results are used for reassessing the contribution of the Patagonian icefields to sea level rise.