



## **Spatially variable shrinkage of glaciers in the Annapurna region, Nepal, 2000 to 2016.**

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The specific controls modulating recent glacier changes in the Central Himalayas are still relatively poorly understood. This hinders our ability to predict future glacier changes in this region, which is vital for water resource management. In this study, we mapped changes in area, surface elevation and surface flow velocity of 162 glaciers in the Annapurna Conservation Area in Nepal since 2000 using satellite imagery. We examined the influence of glacier surface gradients, minimum and maximum elevations, hypsometry, disposition to be avalanche-fed and supraglacial debris on recent glacier changes. We found that total glacier area decreased by 8.5 % ( $n = 162$ ) between 2000 and 2014/15, and mean surface elevation change was  $-0.33$  m a<sup>-1</sup> and mean glacier mass balance was  $-0.28$  m w.e. a<sup>-1</sup> between 2000 and 2013/16 ( $n = 72$ ). Ice surface velocities decreased on seven glacier tongues between 2002 and 2016. We found orographically-driven south-to-north positive trends in glacier mass balance. However, within these trends, glacier changes were heterogeneous between glaciers and between sub-regions. In the Damodar Himal in the north of the Annapurna region, glaciers that had lower maximum elevations, bottom-heavy hypsometries and were more avalanche-prone, tended to lose the most mass. However, these trends were not clear in glaciers in Central Annapurna. This is attributed to differences in the glacier characteristics between the two sub-regions. This study presents new glacier change data in the previously little-studied Annapurna region and sheds light on the influence of different glacier-specific controls on individual glacier behaviour.