



Recent high-resolution surface velocity and elevation change at a high-altitude, debris-covered glacier: Chacaraju, Peru

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Surface elevation change and ice velocities have been measured over the debris-covered tongue of Chacaraju, Peru. Elevation change was measured by reflectorless survey at a 1 m horizontal resolution over three separate areas of the glacier between 2004 and 2005. Area-averaged change revealed general lowering, with two of the surveyed areas experiencing surface lowering of 0.58 m and 0.77 m, and the third a rise of 0.07 m. Combining all three areas (43,216 m²) resulted in a mean net lowering of 0.43 m a⁻¹, which is at the higher end of the range of long-term studies in the region.

Velocity was measured over seven days by the repeated optical survey of 12 prisms attached to stakes inserted directly into the glacier's surface. Results indicate an increase in velocity from some mm d⁻¹ near the terminus to approaching 100 mm d⁻¹ at the base of the glacier's icefall, located ~1.7 km up-glacier. Velocity vectors also changed systematically along the glacier, from a consistent down-glacier orientation near the icefall to more variable orientations within ~300 m of the terminus. No up-glacier motion component was measured. The best-fit curve to the velocity data plotted against distance upglacier was a power function, indicating that surface velocity at Chacaraju increases with distance squared from the glacier's terminus.