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Recent glacier retreat and climate trends in Cordillera Huaytapallana, Peru

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Abstract

We analyzed 19 annual [Landsat Thematic Mapper](#) images from 1984 to 2011 to determine changes of the glaciated surface and snow line elevation in six mountain areas of the [Cordillera Huaytapallana](#) range in Peru. In contrast to other Peruvian mountains, [glacier retreat](#) in these mountains has been poorly documented, even though this is a heavily glaciated area. These glaciers are the main source of water for the surrounding lowlands, and melting of these glaciers has triggered several outburst floods. During the 28-year study period, there was a 55% decrease in the surface covered by glaciers and the snowline moved upward in different regions by 93 to 157 m. Moreover, several new lakes formed in the recently deglaciated areas. There was an increase in precipitation during the wet season (October–April) over the 28-year study period. The significant increase in maximum temperatures may be related to the significant glacier retreat in the study area. There were significant differences in the wet season temperatures during El Niño (warmer) and La Niña (colder) years. Although La Niña years were generally more humid than El Niño years, these differences were not statistically significant. Thus, glaciers tended to retreat at a high rate during El Niño years, but tended to be stable or increase during La Niña years, although there were some notable deviations from this general pattern. Climate simulations for 2021 to 2050, based on the most optimistic assumptions of greenhouse gas concentrations, forecast a continuation of climate warming at the same rate as documented here. Such changes in temperature might lead to a critical situation for the glaciers of the Cordillera Huaytapallana, and may significantly impact the water resources, ecology, and natural hazards of the surrounding areas.