

Unprecedented glacier melting in the Andes blamed on climate change

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Glaciers in the tropical Andes have been retreating at increasing rate since the 1970s, scientists write in the most comprehensive review to date of Andean glacier observations. The researchers blame the melting on rising temperatures as the region has warmed about 0.7°C over the past 50 years (1950-1994). This unprecedented retreat could affect water supply to Andean populations in the near future. These conclusions are published today in *The Cryosphere*, an Open Access journal of the European Geosciences Union (EGU).

The international team of scientists – uniting researchers from Europe, South America and the US – shows in the new paper that, since the 1970s, [glaciers](#) in tropical Andes have been melting at a rate unprecedented in the past 300 years. Globally, glaciers have been retreating at a moderate pace as the planet warmed after the peak of the [Little Ice Age](#), a cold period lasting from the 16th to the mid-[19th century](#). Over the past few decades, however, the rate of melting has increased steeply in the tropical Andes. Glaciers in the mountain range have shrunk by an average of 30-50% since the 1970s, according to Antoine Rabatel, researcher at the Laboratory for [Glaciology](#) and Environmental Geophysics in Grenoble, France, and lead author of the study.

Glaciers are retreating everywhere in the tropical Andes, but the melting is more pronounced for small glaciers at low altitudes, the authors report. Glaciers at altitudes below 5,400 metres have lost about 1.35 metres in ice thickness (an average of 1.2 metres of water equivalent [see note])

per year since the late 1970s, twice the rate of the larger, high-altitude glaciers.

"Because the maximum thickness of these small, low-altitude glaciers rarely exceeds 40 metres, with such an annual loss they will probably completely disappear within the coming decades," says Rabatel.

The researchers further report that the amount of rainfall in the region did not change much over the past few decades and, therefore, cannot account for changes in glacier retreat. Instead, climate change is to blame for the melting: regional temperatures increased an average of 0.15°C per decade over the 1950-1994 period.

"Our study is important in the run-up to the next IPCC report, coming out in 2013," says Rabatel. The Intergovernmental Panel on Climate Change (IPCC) has pointed out that tropical glaciers are key indicators of recent [climate change](#) as they are particularly sensitive to temperature changes. The tropical Andes host 99% of all tropical glaciers in the world, most of them in Peru.

The research is also important to anticipate the future behaviour of Andean glaciers and the impact of their accelerated melting on the region. "The ongoing recession of Andean glaciers will become increasingly problematic for regions depending on water resources supplied by glacierised mountain catchments, particularly in Peru," the scientists write. Without changes in precipitation, the region could face water shortages in the future.

The Santa River valley in Peru will be most affected, as its hundreds of thousands of inhabitants heavily rely on glacier water for agriculture, domestic consumption, and hydropower. Large cities, such as La Paz in Bolivia, could also face shortages. "Glaciers provide about 15% of the La Paz water supply throughout the year, increasing to about 27% during

the dry season," says Alvaro Soruco, a Bolivian researcher who took part in the study.

In their comprehensive review of Andean glaciers, the scientists synthesised data collected over several decades, some dating as far back as the 1940s. "The methods we used to monitor glacier changes in this region include field observations of glacier mass balance, and remote-sensing measurements based on aerial photographs and satellite images for glacier surface and volume changes," explains Rabatel.

The study takes into account data collected for glaciers in Colombia, Ecuador, Peru and Bolivia, covering a total of almost a thousand square kilometres. This corresponds to about 50% of the total area covered by glaciers in the tropical Andes in the early 2000s.

The research was conducted to provide the scientific community with a comprehensive overview of the status of glaciers in the tropical [Andes](#) and determine the rate of retreat and identify potential causes for the melting. But the authors hope the results can have a wider impact.

"This study has been conducted with scientific motivations, but if the insight it provides can motivate political decisions to mitigate anthropogenic impact on climate and glacier retreat, it will be an important step forward," Rabatel concludes.

More information: This research is presented in the paper 'Current state of glaciers in the tropical Andes: a multi-century perspective on glacier evolution and climate change' to appear in the EGU Open Access journal *The Cryosphere* on 22 January 2013. www.the-cryosphere.net/recent_papers.html

The discussion paper (before peer review) and reviewers comments is available at [www.the-cryosphere-discuss.net ... 2012-discussion.html](http://www.the-cryosphere-discuss.net...2012-discussion.html)

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