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## Scientists investigate Ecuador's receding glaciers

By James Painter  
BBC News, Quito



CATHARINE ROSSI

Studies suggest Ecuador's glaciers are rapidly shrinking

**Ever since the German explorer Alexander Von Humboldt visited Ecuador in 1802, foreign visitors have been drawn to its majestic volcanoes with delightful-sounding names like Cotopaxi, Chimborazo and Cayambe.**

Scientists studying them are reluctant to predict how many more decades visitors have left to see the glaciers which crown the volcanoes.

There are too many uncertainties involved, the experts fear, and they are worried that many are losing their glacial cover at an alarming rate.

A study to be published this year by Ecuadorean glaciologist Bolivar Caceres suggests that the country's glaciers lost more than 40% of their surface area between 1956 and 2006.

For example, the Cotopaxi mountain with its famous volcanic cone has lost 40% of its glacial cap since 1976.

### 'Abnormally high temperatures'

And one of the glaciers on the nearby mountain called Antisana has also retreated by nearly the same amount in the last 50 years.

"There's been a definite acceleration since the 1980s, which is consistent with what's happening to tropical glaciers in other parts of South America and the world," says Mr Caceres.

At more than 5,000m (16,400ft) high, tropical glaciers are particularly sensitive to a changing climate. During El Nino, which tends to bring hotter temperatures, the glaciers melt.

On the other hand, during La Nina, which is associated with colder weather and more precipitation, some of the glaciers can advance or stabilise.

"The last few months have been particularly unusual," says Bernard Francou, a glaciologist from the French Development Research Institute (IRD), who has been studying Ecuador's glaciers since 1994.

"We have had the lowest precipitation for more than 40 years," Mr Francou told the BBC.



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"And temperatures have been abnormally high."

He says that as a result the snowline on Antisana is currently 300-400m higher than normal at 5,300m.

There is a link between a weak El Nino weather event in recent months and the higher snowline, he believes.

Mathias Vuille, a climatologist from New York State University at Albany, says "yearly variations can be best explained by the El Nino/La Nina cycle, but the long-term trend of retreating glaciers is best explained by anthropogenic climate change".

### Crucial role

Mr Vuille and others working in the Andes have tracked temperature changes in the last 70 years to show that there has been an average warming of near-surface air temperatures of around 0.10C per decade and an overall increase of 0.68C since 1939.

The gradual disappearance of the glaciers is not just a matter of aesthetic regret. Several Andean cities are thought to be dependent on the melting glaciers for part of their drinking supply, particularly in the dry season.

However, recent studies suggest that at least in the case of Quito, the Ecuadorean capital, which has a population of 2.4 million people, the contribution of glacial melt from Antisana and Cotopaxi to its water supply may not be as high as previously thought.

Marcos Villacis from Quito's National Polytechnic School leads a team of researchers who have been studying the water supplies to the capital.

"Preliminary estimates suggest that between 2% and 4% of Quito's annual water provision comes from the glaciers," Mr Villacis told the BBC. Precipitation provides by far the most amount of water.

Some studies had previously suggested that the figure was at least 10%, and possibly as high as 35%.

However, Mr Villacis is at pains to stress that the melt water from the glaciers plays a crucial role in supplying water to the high Andean grasslands known as paramos, which act like an enormous sponge in absorbing and releasing water.

"On Antisana, at the altitude of 4,000m, the contribution to the paramos from glacial melt could be between 20% and 35%, and is particularly important in the period November to February when there is not much precipitation," he says.

### Water demand

Ecuador's glaciers have a much smaller total surface area than, for example, those in neighbouring Peru and nearby Bolivia.

Both countries are also losing their glacial cover at a similar rate to Ecuador.

Recent studies by a young Bolivian researcher, Alvaro Soruco, suggest that since 1975 glaciers in Bolivia's Cordillera Real have lost half their volume.

Mr Soruco calculates that melt water from the glaciers contribute an average 15% of the water supply to the cities of La Paz and El Alto, and up to 27% in the dry season.

In Peru, it is still not known how much water is provided by melting glaciers to the capital, Lima, which is one of the most "water-stressed" cities in the world as it is built on a desert.

But scientists do know that the melting ice from the huge Cordillera Blanca range in Peru provides significant amounts of water via the Rio Santa valley to hydroelectric dams, export agriculture in the lowlands and the coastal city of Chimbote.

Studies suggest that glacial melt can provide 10% to 20% of the

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Glaciologist Bernard Francou warns of unusual weather in the region

total annual water run-off into the Rio Santa valley. This figure can rise to 40% in the dry season, when water is most in demand.

Back in Quito, Mr Villacis is convinced that scientists need to study the Andean grasslands as much as the melting glaciers.

"We should be just as worried about the effect of higher temperatures on the paramos," he says.

"We know there is going to be more demand for water as the population increases. But we don't know how climate change and less water from glaciers will affect the capacity of the paramos to absorb and supply water."

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