

# Himalayan glacier melting doubled since 2000, spy satellites show

## Ice losses indicate ‘devastating’ future for region and 1 billion people who depend on it for water

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Research has shown 8bn tonnes of ice are being lost each year and not replaced by snow in the Himalayas. Photograph: Goncalo Diniz/Alamy

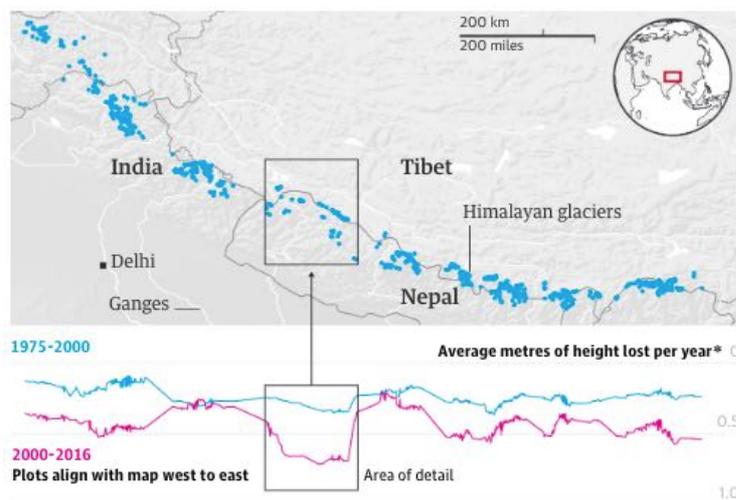
The melting of Himalayan glaciers has doubled since the turn of the century, with more than a quarter of all ice lost over the last four decades, scientists have revealed. The accelerating losses indicate a “devastating” future for the region, upon which a billion people depend for regular water.

The scientists combined declassified US spy satellite images from the mid-1970s with modern satellite data to create the first detailed, four-decade record of ice along the 2,000km (1,200-mile) mountain chain.

The analysis shows that 8bn tonnes of ice are being lost every year and not replaced by snow, with the lower level glaciers shrinking in height by 5 meters annually. The study shows that only global heating caused by human activities can explain the heavy melting. In previous work, local weather and the impact of air pollution had complicated the picture.

Joshua Maurer, from Columbia University’s Lamont-Doherty Earth observatory, who led the new research, said: “This is the clearest picture yet of how fast Himalayan glaciers are melting since 1975, and why.” The research is [published in the journal Science Advances](#).

### Glacier melting in the Himalayas has doubled since 2000



Guardian graphic. Source: Maurer et al, Science Advances. \*Rolling average of 30 glaciers

Prof Joerg Schaefer, also at Columbia and part of the team, said: “It is really the doubling of the speed of glacier melt that is most concerning.” The new understanding of past melting means forecasts can now be made with far more confidence but the outlook is dire, he said. “It looks devastating and there is no doubt in my mind, not a single grain of doubt, that [the impact of the climate crisis] is what we are seeing.”

A landmark report published in February found that at least a **third of the ice in the Hindu Kush-Himalaya ranges was already doomed to melt** by the end of the century, even if drastic action to cut emissions was taken immediately. Without action, two-thirds would go.

Either way, serious consequences will be felt by those who rely on the great rivers that flow from the peaks into India, Pakistan, China and other nations. “It’s the climate crisis you haven’t heard of,” said Philippus Wester, at the [International Centre for Integrated Mountain Development](#),

who led the February study and said the new work was very convincing. “Increasingly uncertain and irregular water supplies will impact the 1 billion people living downstream from the Himalaya mountains in south Asia.”

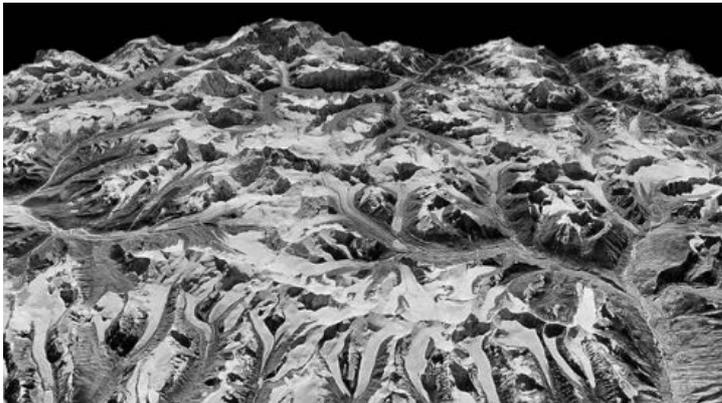


A third of Himalayan ice cap doomed, finds report

<https://www.theguardian.com/environment/2019/feb/04/a-third-of-himalayan-ice-cap-doomed-finds-shocking-report>

The spy satellite photographs used in the research had lain unused in archives for some years. But a computer tool developed by Maurer and colleagues enabled these 1970s photos to be turned into 3D maps.

The scientists used this data to track the changes in 650 Himalayan glaciers. On average, the glacier surfaces sank by 22cm (8.6 inches) a year from 1975 to 2000. But the melting has accelerated, with an average loss of 43cm a year from 2000 to 2016.



Oblique view of a Himalayan landscape captured by a KH-9 Hexagon satellite on 20 December 1975 on the border between eastern Nepal and Sikkim, India. Photograph: Josh Maurer/Science

The evidence points to human-caused climate change being the dominant cause of the melting. The glaciers are shrinking at similar rates all along the mountain chain, indicating a common cause. Weather changes and the settling of black air pollution, which absorbs heat from the sun and speeds up melting, have only local effects.

Temperature data from the region also shows an average rise of 1C from 2000-16 compared with 1975-2000. Calculations show this rise is consistent with the amount of ice being lost. “Even glaciers in the highest mountains of the world are responding to global air temperature increases driven by the combustion of fossil fuels,” said Joseph Shea, at the University of Northern British Columbia in Canada, who was not involved in the study.

Schaefer said: “For the wellbeing of the people there, our results are of course the worst possible. But it is what it is, and now we have to prepare for that scenario. We have to worry a lot, because so many people are affected.

“To stop the temperature rises, we have to cool the planet,” he said. “We have to not only slow down greenhouse gas emissions, we have to reverse them. That is the challenge for the next 20 years.”

## Spy satellites reveal extent of Himalayan glacier loss

By Rebecca Morelle  
Science Correspondent, BBC News  
2 hours ago

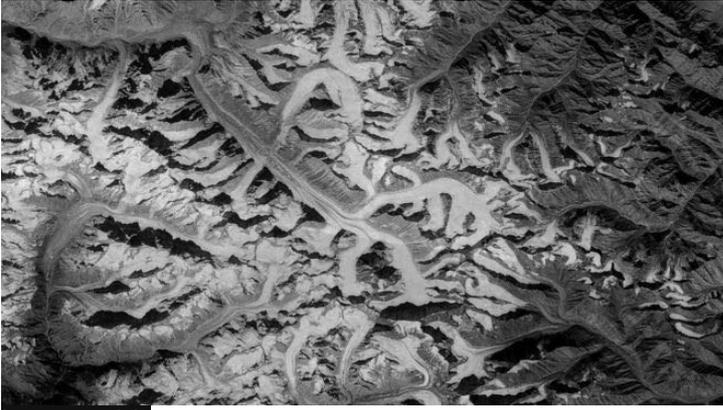


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NRO/USGS

Image caption

The Hexagon images were declassified in 2011 and digitised for scientific study

**Images from Cold War spy satellites have revealed the dramatic extent of ice loss in the Himalayan glaciers.**

Scientists compared photographs taken by a US reconnaissance programme with recent spacecraft observations and found that melting in the region has doubled over the last 40 years.

The study shows that since 2000, glaciers heights have been shrinking by an average of 0.5m per year.

The researchers say that climate change is the main cause.

"From this study, we really see the clearest picture yet of how Himalayan glaciers have changed," Joshua Maurer, from Columbia University's Lamont-Doherty Earth Observatory in New York, told BBC News.

The research is published in the journal **Science Advances**.

**Asia's glaciers put the brakes on  
Warming threatens Himalayan glaciers  
Melting glaciers reveal Everest bodies**



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Image caption

The Hexagon satellites were a top secret American reconnaissance programme

During the 1970s and 1980s, a US spy programme - codenamed Hexagon - launched 20 satellites into orbit to secretly photograph the Earth.

The covert images were taken on rolls of film that were then dropped by the satellites into the atmosphere to be collected mid-air by passing military planes.

The material was declassified in 2011, and has been digitised by the US Geological Survey for scientists to use.

Among the spy photos are the Himalayas - an area for which historical data is scarce.

By comparing these pictures with more recent satellite data from Nasa and the Japanese space agency (Jaxa), the researchers have been able to see how the region has changed.

The Columbia University team looked at 650 glaciers in the Himalayas spanning 2,000km.

The group found that between 1975 and 2000, an average of 4bn tonnes of ice was being lost each year.

But between 2000 and 2016, the glaciers melted approximately twice as fast - losing about 8bn tonnes of ice each year on average.



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NASA

image caption

We now have a satellite record approaching nearly 50 years in length.

Mr Maurer said: "For a sense of scale, 8bn tonnes of ice is enough to fill 3.2 million Olympic-sized swimming pools per year."

And the ice loss was not uniform, he added.

"Glaciers lose most of their ice in the lower elevation portions of the glacier, and it's there where most of the thinning is concentrated.

"Some of those zones have been thinning by as much as 5m per year."

Among the scientific community, there has been some debate over the cause. Changes in rainfall in the region and soot deposited from industrial pollutants are thought to have hastened the melt.

However the Columbia team said that while these factors were contributing, rising temperatures in the Himalayas were the main cause.

"The fact we see such a similar spatial pattern of ice loss across so many glaciers across such a large and climatically complex region suggests there needs to be some kind of overall forcing affecting all of the glaciers similarly."



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image caption

The Hexagon photographs would come down in a capsule from the satellites

Scientists say continued losses will have a huge impact.

In the short-term, the huge increase in meltwater could cause flooding.

In the longer term, millions of people in the region who depend on glacier meltwater during drought years could experience very real difficulties.

Commenting on the research, Dr Hamish Pritchard from the British Antarctic Survey, said: "What's new here is being able to see how the melting of glaciers across the whole Himalayan range has increased due to climate change.

"Over one generation, the melt has doubled and these glaciers are now shrinking fast.

"Why does this matter? Because when the ice runs out, some of Asia's most important rivers will lose a water supply that keeps them flowing through drought summers, just when water is at its most valuable.

"Without mountain glaciers, droughts will be worse for millions of water-stressed people living downstream."



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Image caption

The view of the Himalayas for the International Space station

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