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## **The Consensus on Kilimanjaro is Wrong**

The recession of Kilimanjaro's ice field (not be confused with the "snows" of Kilimanjaro which still come and go with the weather) has become the poster child for the impacts of human-caused global warming. The story is easy to tell—especially with an accompanying series of photographs depicting the shrinkage of the mountain's ice cap. Anyone can see the dramatic changes. Comparisons of modern observations with historic photographs and literature accounts only seem to back the story up.

Melting ice seems a perfect metaphor for global warming; indeed, prominent scientists, major media outlets, and even members of the U.S. Senate have all equated melting ice with human-induced climate change.

The only problem with this simple story is that it is wrong. The real reasons behind Kilimanjaro's glacial loss are far more complex than the storytellers wish to admit to.

Ultimately, the glacier retreat is the result of changes to the mountain's climate that were put into motion more than a century ago—long before industrialized human activity could have played a part.

Yet the storytelling continues, misguided as ever. Here is a sampling of how that simplified story goes, as told by prominent scientists, politicians, and media outlets in their own words.

The tale begins with the words of world-renowned glaciologist Lonnie Thompson (recently named one of America's best scientists by CNN and *Time*):

In 1912, there was 12.1 square kilometers

of ice on the mountain. When we photographed the mountain in February of 2000, we were down to 2.2 square kilometers. If you look at the area of decrease, it's linear. And you just project that into the future, sometime around 2015, the ice will disappear off Kilimanjaro.

These glaciers are very much like the canaries once used in coal mines. They're an indicator of massive changes taking place and a response to the changes in climate in the tropics.

We have long predicted that the first signs of changes caused by global warming would appear at the few fragile, high-altitude icecaps and glaciers within the tropics. These findings confirm those predictions.

Former First Lady Hillary Clinton (D-N.Y.) continues the tale, also from the Senate floor during debate of Bill S.139:

"There are so many facts that support the evidence of climate change—whether we talk about the Larsen Ice Shelf on the Antarctic Peninsula breaking off and breaking up or whether we talk about the snow at Kilimanjaro.

"I want to show this one picture because it is so telling. It comes from the personal experience of one of my fellows who is working with me on my staff. He took a photo of himself on the summit of Kilimanjaro in 1970 next to a 20-foot-high glacier at Uhuru Point. And 29 years later, his daughter was at the same point and

there was only a trace of ice left. Maybe people climbed up there and carted the ice off. I don't know. Maybe that became some kind of economic activity that the folks in Tanzania decided to pursue.

“That is not what happened. I think what happened is we have evidence in the most dramatic way possible of the effects of 29 years of global warming. The scientific consensus is clear: That unless we act to reduce emissions, the planet will continue to warm over the next century, with widespread and potentially devastating effects. We have heard some of those mentioned already.”

The news media are quick to continue the story, as the *New York Times* demonstrates in a February 19, 2001, article entitled, “The Snows are Leaving Kilimanjaro: Fabled African peak offers clear sign of global warming”:

“The vanishing of the seemingly perpetual snows of Kilimanjaro that inspired Ernest Hemingway, echoed by similar trends on icecapped peaks from Peru to Tibet, is one of the clearest signs that a global warming in the last 50 years appears to have exceeded typical climate shifts and is at least partly caused by gases released by human activities, a variety of scientists say.”

The story continues with words from the *Washington Post's* “The End Is Near,” September 9, 2001:

“Spawned by just one degree of planetary warming in the 20th century, glaciers worldwide are retreating at breathtaking speed. Spots like Africa's fabled Mount Kilimanjaro will be ice free in just 15 years...”

Our dramatic, if misguided story concludes with words from a Greenpeace press release dated November 6, 2001:

“Mount Kilimanjaro, one of the few places in the world where ice and snow can be found on the equator, could lose its entire ice field by 2015 because of climate

change, Greenpeace said today. This loss symbolizes the fact that climate change may be felt first and hardest by the environment and people of Africa.

“As environment ministers from around the world gather in Marrakech to finalize the Kyoto Protocol, a Greenpeace team on Mount Kilimanjaro spoke with journalists covering the climate negotiations in Marrakech live via a video conference.

‘We are here to show government ministers coming to Marrakech that climate change is happening now and to remind them what is at risk if they fail to produce an environmentally sound protocol,’ said Greenpeace campaigner Joris Thijssen, on Kilimanjaro.”

Nearly all of these stories are told against a backdrop of *misinterpreted and misused* dramatic pictures depicting Kilimanjaro's white-capped peak with progressively less *snow* cover. (In addition to the *transient* snow that comes and goes near the crater summit of this old volcano, there is also a large ice field with glaciers reaching down the slopes. These glaciers have been receding during the 20th century.)

And though a photograph may be worth a thousand sound bytes, these words and photos do *not* go together.

Kilimanjaro is above most of the weather and is thus exposed to the equatorial sun, a sun which has been more active (hotter) during the 20th century than at any other time since the medieval period, hundreds of years ago. That would be a sufficient explanation in itself for the receding ice cap.

However, last year another explanation was published by *Nature's Science Update*,<sup>1</sup> pointing to de-forestation on the slopes of Kilimanjaro as being the main cause of recession. With forests present, the natural updraft from the slopes carried moist air to the summit and helped reinforce and sustain the ice cap. Without those forests, the updrafts are dry and fail to replenish the ravages of the sun on the summit ice cap, it was reasoned.

More recently, a newer explanation was

revealed in a research article published in the March 15, 2004, issue of the well-respected *International Journal of Climatology*. An international team of researchers led by Georg Kaser and comprising experts in tropical weather, mountain glaciers, and paleoclimate took a behind-the-scenes look at the Kilimanjaro ice melt and answered the question, “Is man-made global warming responsible for the loss of Kilimanjaro’s glaciers?”

Kaser’s team amassed a wide collection of data on Kilimanjaro that included direct field measurements made by the authors, 20th-century temperature and precipitation observations, and proxy data suggestive of past climate conditions back into the mid-1800s. The researchers then analyzed these data in conjunction with their understanding of tropical glacier-climate interactions and the peculiarities unique to Mt. Kilimanjaro to develop a scenario to describe the behavior of the ice cap since the late 1800s.

They summarize their findings as follows:

A synopsis of (i) proxy data indicating changes in East African climate since approximately 1850, (ii) 20th century instrumental data (air temperature and precipitation), and (iii) the observations and interpretations made during two periods of fieldwork (June 2001 and July 2002) strongly support the following scenario. *Retreat from a maximum extent of Kilimanjaro’s glaciers started shortly before Hans Meyer and Ludwig Purtscheller visited the summit for the first time in 1889 [emphasis added], caused by an abrupt climate change to markedly drier conditions around 1880. Intensified dry seasons accelerated ablation on the illuminated vertical walls left in the hole within Reusch Crater, probably a result of volcanic activity. The development of vertical features may also have started on the outer margins of the plateau glaciers before 1900, primarily as the formation of notches, as explicitly reported following field research in 1898 and 1912...Once started, the lateral retreat was unstoppable, maintained by solar*

*radiation [emphasis added] despite less negative mass balance conditions on horizontal glacier surfaces, and will come to an end only when the glaciers on the summit plateau have disappeared. This is most probable within the next few decades, if the trend continues. Positive air temperatures have not contributed to the recession process on the summit so far [emphasis added]. The rather independent slope glaciers have retreated above the elevation of their thermal readiness, responding to dry conditions. If the present precipitation regime persists, then these glaciers will most probably survive in positions and extents that are not much different than today. This is supported by the spatial patterns of glacier extent shown in the Thompson et al. (2002) map, which indicate that slopeglaciers retreated more from 1912 to 1953 than since then.*

*...The scenario presented offers a concept that implies climatological processes other than increased air temperature govern glacier retreat on Kilimanjaro in a direct manner [emphasis added]. However, it does not rule out that these processes may be linked to temperature variations in other tropical regions, e.g. in the Indian Ocean, where a large-scale connection between sea-surface temperature and East African rainfall amounts has been found in several studies (e.g. Latif et al., 1999; Black et al., 2003). Long-term changes in this specific large-scale mechanism are also likely to govern the long-term deficit of accumulation on Kilimanjaro glaciers and, thus, have to be considered particularly in future studies.<sup>2</sup>*

Succinctly put, Kaser et al. conclude that the ice fields on Mt. Kilimanjaro started melting in response to a climate shift that occurred near the end of the 19th century (well before any reputed anthropogenic alteration to the earth’s greenhouse effect) that reduced the amount of moisture in the air in the vicinity of the mountain. *Man-made global warming has nothing to do with it.*

This represents a perfect example of why

*scientific “consensus” does not equal scientific truth.* And why we should not act in haste, basing our actions on scientific conclusions that have not been thoroughly examined and tested despite being widely quoted. It is interesting to note that the report by Kaser et al. did not come out of the blue. Rather, it represents another citation in a growing mass of evidence indicating that the patterns of glacial recession do not match the patterns of historical temperature changes in the region around the Kilimanjaro. Yet *this widely available information continues to be overlooked (or ignored)* by the people interested in using Kilimanjaro to promote their cause.

NASA satellites have measured the temperature history for the region around Kilimanjaro. The satellite doesn't measure surface temperature, but instead the temperature of the atmosphere above the surface—primarily near the altitude of Kilimanjaro's peak. The satellite temperature observations for that region indicate that there has been a slow *decline* in temperatures since records began in 1979. That's right, atmospheric temperatures have been *cooling* there during the past 25 years. Twenty-five years of cooling would not lead to enhanced glacial melting.

Further satellite data shows that the cooling since 1979 has not just been confined locally to Mt. Kilimanjaro, but extends to the atmosphere over most of central Africa.

And if we take even a larger-scale view, we realize that while the glaciers of Kilimanjaro have been steadily melting since the late 1800s, average *global* temperatures have taken more of a roller-coaster course during the same period. Global temperatures rose from the late 1800s to the mid-1940s, they cooled from the mid-1940s to the mid-1970s, and they have been rising again from the

1970s to the present day.

A pronounced series of ups and downs does not fit the simple picture of a relatively steady loss of glacial mass that appears in the photographs. Comparing temperature observations with photos of the receding snow should have provided a clue that something other than global warming was causing Kilimanjaro's glacier loss. In fact, the observational evidence shows that the glaciers of Kilimanjaro continued to decline during the middle portion of the 20th century—a time when global temperatures were cooling!

At the time, it would have been completely logical (if ultimately false) to predict the following: “If this global *cooling* trend continues, Kilimanjaro's glaciers will completely disappear by 2015.”<sup>3</sup>

Taken together, these facts, many of which have been available for several years, should have tempered any attempts to conflate warming and the decline in Kilimanjaro's glaciers. But thus far they have not. The “consensus” is not so willing to change.

Willing or not, however, the “consensus” must change, for *no longer is the scientific evidence tipped in favor of fingering human industrial activities for Kilimanjaro's glacier loss.*

We are not culprits, but simply witnesses to the glacier's decline, observers of the ebb and flow of the endless cycle of nature.

With more down-to-earth causes identified for Kilimanjaro, other “human-made-global-warming-did-it” phenomena should be carefully re-examined for natural, local causes.

*A full copy of this report, with figures, can be found at <http://ff.org/centers/csspp>.*

<sup>1</sup> <http://www.nature.com/nsu/031117/031117-8.html>

<sup>2</sup> Kaser, G., et al., 2004. Modern glacial retreat on Kilimanjaro as evidence of climate change: observations and facts. *International Journal of Climatology*, 24, 329-339.

<sup>3</sup> Thompson, L.G., et al., 2002. Kilimanjaro ice core records: evidence of Holocene climate change in tropical Africa. *Science*, 298, 589-593.