Missing Radioactivity in Ice Cores Bodes Ill for Part of Asia

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Naimona'nyi's frozen ice cap lacks critical radioactive signal, based on the latest study by Ohio State University researchers. This could foretell drastic water shortages for people living in the Indian sub-continent. Photo courtesy ©Thomas Nash 2007

When Ohio State glaciologists failed to find the expected radioactive signals in the latest core they drilled from a Himalayan ice field, they knew it meant trouble for their research.

But those missing markers of radiation, remnants from atomic bomb tests a half-century ago, foretell much greater threat to the half-billion or more people living downstream of that vast mountain range.

It may mean that future water supplies could fall far short of what's needed to keep that population alive.

In a paper just published in *Geophysical Research Letters*, researchers from the Byrd Polar Research Center explain that levels of tritium, beta radioactivity emitters like strontium and cesium, and an isotope of chlorine are absent in all three cores taken from the Naimona'nyi glacier 19,849 feet (6,050 meters) high on the southern margin of the Tibetan Plateau.

"We've drilled 13 cores over the years from these high-mountain regions and found these signals in all but one – this one," explained Lonnie Thompson, University Distinguished Professor of Earth Sciences at Ohio State.

The absence of radioactive signals in the top portion of these cores is a critical problem for determining the age of the ice in the cores. The signals, remnants of the 1962-63 Soviet Arctic nuclear blasts and the 1952-58 nuclear tests in the South Pacific, provide well-dated benchmarks to calibrate the core time scales.

"We rely on these time markers to date the upper part of the ice cores and without them, extracting the climate history they preserve becomes more challenging," Thompson said.

"We drilled three cores through the ice to bedrock at Naimona'nyi in 2006," said Natalie Kehrwald, a doctoral student at Ohio State and lead author on the paper. "When we analyzed the top 50 feet (15 meters) of each core, we found that the beta radioactivity signal was barely above normal background levels."

Tritium, an isotope of hydrogen, and chlorine-36 were also both absent from the Naimona'nyi cores, she said. They were able, however, to find a small amount of a lead isotope, lead-210, which allowed them to date the top of the core.

"We were able to get a date of approximately 1944 A.D.," Kehrwald said, "and that, coupled with the other missing signals, means that no new ice has accumulated on the surface of the glacier since 1944," nearly a decade before the atomic tests.

While the loss of the radioactive horizons to calibrate the cores poses a challenge for Thompson's research, he worries more about the possibility that other high-altitude glaciers in the region, like Naimona'nyi, are no longer accumulating ice and the impact that could have on water resources for the people living in these regions.

"When you think about the millions of people over there who depend on the water locked in that ice, if they don't have it available in the future, that will be a serious problem," he said.

Seasonal runoff from glaciers like Naimona'nyi feeds the Indus, the Ganges and the Brahmaputra rivers in that part of the Asian subcontinent. In some places, for some months each year, those rivers are severely depleted now, the researchers said. The absence of new ice accumulating on the glaciers will only worsen that problem.

"The current models that predict river flow in the region have taken recent glacial 'retreat' into account," said Kehrwald, "but they haven't considered that some of these glaciers are actually thinning until now.

"If the thinning isn't included, then whatever strategies people adopt in their efforts to adapt to reductions in river flow simply won't work."

Thompson fears that what's happening to the Naimona'nyi glacier may be happening to many other high-altitude glaciers around the world. "I think that this has tremendous implications for future water supplies in the Andes, as well as the Himalayas, and for people living in those regions."

The absence of the radioactive signals in the 2006 Naimona'nyi core also suggests that Thompson and his colleagues have been lucky with their previous expeditions to other ice fields.

"We have to wonder -- if we were to go back to previous drill sites, some drilled in the 1980s, and retrieved new cores -- would these radioactive signals be present today?" he asked.

"My guess is that they would be missing." The researchers' recent work has shown similar thinning on glaciers in Africa, South America and in Asia in the past few years.

Source: Ohio State University