GLACIOLOGY

'Third Pole' Glacier Research Gets A Boost From China

New research stations in Tibet and central Asian countries will monitor environmental changes around Himalayan glaciers

BEIJING—A low point for the study of glaciers in central Asia came on 21 August 1999 when armed supporters of the Islamic Movement of Uzbekistan—a militant group aiming to establish an Islamic state observing Sharia law—set a research station in Kyrgyzstan's Pamir Mountains on fire. For 22 years, scientists had taken measurements of nearby Abramov Glacier; all their records and instruments were consumed in the blaze. Scientists and staff were briefly held hostage, then released to trudge nearly 65 kilometers to the nearest road.

That field station isn't the only casualty of the fraught politics of central Asia. Since the collapse of the Soviet Union, which funded glaciology to gauge the region's water supply, other facilities have fallen into disuse or disrepair. Tajikistan, for instance, lost many of its stations—along with the scientists who staffed them—during its bloody 1992–97 civil war.

But the outlook is improving, thanks to a new commitment to regional glacier research led by the Beijing-based Institute of Tibetan Plateau Research, Chinese Academy of Sciences (ITPCAS). In collaboration with counterparts in neighboring central Asian countries, it is helping to fund new state-of-the-art research stations in Tajikistan, Nepal, and Pakistan and erecting its own high-elevation glacier stations in Tibet. The aim, Director Yao Tandong says, is to "record the full picture of environmental change around the glaciers."

Central Asia and the Tibetan Plateau contain over 1000 square kilometers of glaciers spanning parts of a dozen countries—some call it the third pole—the largest extent of ice outside the Arctic and Antarctic. The region is also among the world's most rapidly warming areas; monitoring it is critical to understanding the impact of climate change, because its glacier melt feeds the upper reaches of the Indus, Brahmaputra, Yangtze, and other major Asian rivers. Geographer Vladimir Aizen of the University of Idaho in Moscow, Idaho, calls it "the water tank for over 100 million people." Adds Yao: "The consequences of ice melting here are much more immediately felt than in the other two poles."

Frigid temperatures and whipping mountaintop winds make glacier studies in the region an extreme challenge, however. Data must be collected on site, Yao says, because remote sensing and climate modeling give a limited portrait of glacier activity. For instance, freshly fallen snow may be indistinguishable in a satellite image from glacial ice, leading a scientist to perhaps infer that a retreating glacier is advancing. "Satellite data needs to be verified with actual measurements," he says.

New heights. Data from a 7000-meter-altitude glacier-monitoring station on Mount Xixiabangma indicate rapid ice melt.

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Yao has been captivated by Tibet since he first visited the area in 1978 as a geography student. In 1989, after helping establish a glacier station near the icy headwaters of the Yangtze River, he began dreaming of building a research network. Today, his dream is materializing. In 2009, a glacier station cofunded by CAS and the Tajikistan Institute of Geology was erected in Tajikistan. Next year, a similar station will be built in Pakistan. Xu Baiqing, a CAS glaciologist sent to scout locations, says Pakistan will cover the construction costs, with CAS supplying instruments. CAS is looking at backing a site in Kyrgyzstan, Xu says.

China's glacier scientists hope to get a better understanding of climate variability at high altitudes. One mystery involves temperature readings. After comparing satellite data for the Tibetan Plateau spanning 6 years against Chinese Meteorological Administration readings for the same period, meteorologist Qin Jun noticed that the rate of warming is amplified at high elevations. For stations located at 1000 to 3000 meters, Qin calculated a rate of warming of about 1°C per decade. For stations at 3000 to 5000 meters, the rate of warming was double that. (Amplified rates of warming have also been observed in the Alps and the Andes.) Above 5000 meters, though, satellite temperature readings suggest that the rate of warming remains constant or even diminishes. Qin now hopes to pinpoint a cause for the discrepancy.

A network of 17 new high-altitude stations—located above 5000 meters—should help in that quest. Equipped with instruments to measure air and surface temperature, wind direction and speed, and humidity, the stations are intended to illuminate what Yao calls the glaciers' "complete dynamic processes." The new stations fill in a critical gap, says Raymond Bradley, a climatologist at the University of Massachusetts, Amherst. Most of the world's high-altitude areas are poorly monitored, he says. ITPCAS's work, he adds, is the "best example of activities which address questions of environmental change at high elevations."

One recent finding comes from a 7000-meter-altitude station on Mount Xixiabangma, near Mount Everest. Data logs on wind speed and direction show lower-than-expected summer wind speeds, a finding that correlates with rapid ice melt.

Even with the rash of new stations, obstacles remain. Retrieving data logs from the Mount Xixiabangma station entailed an arduous 3-day hike from base camp, says glaciologist Li Shenghai, who participated in an August research trip. After subsisting on instant noodles cooked with melted ice, Li's team had to shovel the station out from under 2 meters of snow. They later returned to replace some broken instruments. But Yao is confident the new efforts will help glaciologists working in central Asia and the Tibetan Plateau escape their tough past. "What we need now is ground-truth data," he says. "To understand the future, we need to understand the present." **–CHRISTINA LARSON**

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