SCIENCE NEWS of the week

Columbia Glacier's Last Stand

Columbia Glacier, the massive ice river poised by the sea near Valdez, Alaska, is beginning a drastic retreat. In the next 30 to 50 years, scientists say, the gleaming sheath that covers more than 400 square miles of frozen Alaskan terrain will recede 25 miles up the valley. By then, though still splendid, Columbia Glacier will be diminished to roughly half of its present size.

The glacier follows a seasonal pattern of advance and retreat. From July through mid-November, its seaward edge recedes as icebergs calve, or fall away. The leading edge creeps forward again from mid-winter through late spring, replenished as ice from the main body of the glacier flows down toward the sea.

When the ice supplied each year equals the amount sheared away, a tidewater glacier is stable. This year watchful scientists have waited for the seasonal advance of ice, but so far there is no sign that the tongue of ice is progressing seaward, says Mark Meier of the United States Geological Survey (USGS) in Tacoma, Wash. Even if some ice does move forward, it will no longer be enough, he says, to compensate for the overall 1,200 feet of ice lost in 1983. He and his colleagues estimate that in the next two to three years, the glacier's edge may move back rapidly, at a rate of two and a half to three miles per year. Their findings will be issued shortly in a USGS report.

Columbia is the last of Alaska's 52 tidewater glaciers to make its epic retreat from the sea. Its dramatic reversal gives scientists their first chance to study the event as it takes place. The most recent retreat of an Alaskan glacier began near the turn of the century. During the 10,000 years since the last ice age ended, each of the tidewater glaciers has followed the advance/retreat cycle. In turn, each has forsaken the furrow it carved in the Alaskan coast, leaving a narrow, water-filled fjord to mark its passage.

The retreat of Columbia Glacier will fulfill a prediction made by the USGS in 1980. Only a few years earlier, scientists believed that the glacier was near equilibrium, losing a total of only about 40 feet of ice from its seaward face each year. Then, Austin Post, now retired from USGS, surmised that the speed with which bergs break away from a tidewater glacier is directly proportional to the water depth at the glacier's front end, or terminus. The scientists knew that the glacier's tip was not advancing quickly enough to replace the ice that was breaking off. Seafloor radar soundings showed that if the front of the glacier moved back, it would end in even deeper water. If Post's hypothesis were correct, this would allow more ice to break off at a faster rate, pushing the end into ever deeper water.

R. Walters, USGS

Columbia, the last of the great tidewater glaciers, has started a rapid retreat.

"Once that instability is triggered, then the glacier follows this course of drastic retreat," Meier says. In the late 1970s, the water at the glacier's edge was 56 feet deep. Now, it is nearly 1,000 feet deep, and icebergs as tall are breaking off. The smaller icebergs leave the area immediately, making a heady exit past the shoal and out to sea. The larger ones, some weighing as much as a million tons, are trapped by the pile of rocks the glacier pushed ahead. They remain there until they break up into smaller bergs, and head out on their own.

In the mid-1970s, spurred by curiosity and the worrisome prospect of increasing numbers of icebergs on potential collision courses with oil tankers in the Valdez Arm, the scientists began to study the unique qualities of calving glaciers. In short order, they developed special radars that can measure the thickness of wet ice, and designed computer models for the dynamics of tidewater glaciers. In 1980, the scientists issued a prediction: The retreat of Columbia Glacier would begin within two or three years.

Now the prediction is coming true. Each day last summer, an average of 40 feet of ice gave way across the glacier's front, four miles wide and a thousand feet thick. Vast chunks of ice, buoyed up by the deep water along the glacier's face, splintered away from the glacier and crashed into the water. — *C. Simon*

Record-breaking microburst near Air Force 1

A harrowing near-miss by the presidential jet Air Force One and its passenger, President Reagan, has led University of Chicago meteorologist Tetsuya Theodore Fujita to "urgently recommend" installation of a Doppler radar to monitor all airports in the Washington, D.C., area. Fujita, who first postulated the phenomenon of microbursts, a strong downdraft that causes winds to spread out in a ring-like pattern as they reach the ground, has analyzed a storm episode that occurred last August 1. His study reveals the strongest microburst ever recorded happened only six minutes after Air Force One landed at Andrews Air Force Base near Washington. The winds measured near the end of the runway exceeded 130 knots, or about 149 miles per hour.

Eight aircraft accidents since 1964 have been linked to microbursts. A wide-ranging study has demonstrated that Doppler radar can be effective in detecting the violent downdrafts (SN: 9/3/83, p. 151; 8/21/82, p. 118). The Federal Aviation Administration (FAA) recently announced plans to install Doppler weather radars at more than 70 airports nationwide between 1990 and 1993. FAA's Donald Turnbull says that a Doppler radar will be placed in the Washington area, but says it is unclear whether the range of the radar will include Andrews Air Force Base, a military facility.

—*C. Simon*