

Ross Ice Shelf

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The **Ross Ice Shelf** is the largest ice shelf of Antarctica (an area of roughly 487 000 km², and about 800 km across: about the size of France^[1]). It is several hundred meters thick. The nearly vertical ice front to the open sea is more than 600 km long, and between 15 and 50 meters high above the water surface. 90 percent of the floating ice, however, is below the water surface.

Most of Ross Ice Shelf is located within the Ross Dependency claimed by New Zealand.

The ice shelf was named after Captain James Clark Ross who discovered it on 28 January 1841. It was originally named the Ice Barrier as it prevented sailing further south. Ross mapped the ice front eastward to 160°W.

Coordinates: 81°30′S 175°00′W﻿ / ﻿81.5°S 175.0°W﻿ / -81.5; -175.0﻿ / -81.5; -175.0



Ross Ice Shelf in 1997.

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Exploration

On 5 January 1841, a British Admiralty team in the *Erebus* and the *Terror*, three-masted ships with specially strengthened wooden hulls, was going through the pack ice of the Pacific near Antarctica in an attempt to determine the position of the South Magnetic Pole. Four days later, they found their way into open water and were hoping that they would have a clear passage to their destination; but on 11 January, the men were faced with an enormous mass of ice.

Sir James Clark Ross, who was the expedition's leader, remarked: "Well, there's no more chance of sailing through that than through the cliffs of Dover". Ross, who in 1831 had located the North Magnetic Pole, spent the next two years vainly searching for a sea passage to the South Pole; later, his name was given to the ice shelf and the sea surrounding it. Two volcanoes in the region were named by Ross for his vessels.^[2]



Crevasse, Ross Ice Shelf in 2001.

For early Antarctic explorers seeking to reach the South Pole, the Ross Ice Shelf became a starting point. In a first exploration of the area, Robert Falcon Scott made a significant study of the shelf and its surroundings. These findings were presented at a lecture entitled "Universitas Antarctica!" given 7 June 1911, and were published in the account of Scott's expedition.^[3]

Both Roald Amundsen and Scott crossed the shelf to reach the Pole in 1911. Amundsen wrote that, "Along its outer edge the Barrier shows an even, flat surface; but here, inside the bay, the conditions were entirely different. Even from the deck of the *Fram* we were able to observe great disturbances of the surface in every direction; huge ridges with hollows between them extended on all sides. The greatest elevation lay to the south in the form of a lofty, arched ridge, which we took to be about 500 feet high on the horizon. But it might be assumed that this ridge continued to rise beyond the range of vision."

The following day, the party made its first steps on the Barrier. "After half an hour's march we were already at the first important point — the connection between the sea-ice and the Barrier. This connection had always haunted our brains. What would it be like? A high, perpendicular face of ice, up which we should have to haul our things laboriously with the help of tackles? Or a great and dangerous fissure, which we should not be able to cross without going a long way round? We naturally expected something of the sort. This mighty and terrible monster would, of course, offer resistance in some form or other," he wrote.

"The mystic Barrier! All accounts without exception, from the days of Ross to the present time, had spoken of this remarkable natural formation with apprehensive awe. It was as though one could always read between the lines the same sentence: 'Hush, be quiet! the mystic Barrier !'

"One, two, three, and a little jump, and the Barrier was surmounted!"^[4]

Composition and movement

Ice shelves are thick plates of ice, fed by glaciers, that float atop an ocean. The presence of the shelves acts as "brakes" for the glaciers. These shelves serve another important purpose -- "they moderate the amount of melting that occurs on the glaciers' surfaces. Once their ice shelves are removed, the glaciers increase in speed due to meltwater percolation and/or a reduction of braking forces, and they may begin to dump more ice into the ocean than they gather as snow in their catchments. Glacier ice speed increases are already observed in Peninsula areas where ice shelves disintegrated in prior years."^[5]

The Ross Ice Shelf is one of many such shelves. It is about the size of France,^[1] and reaches into Antarctica from the south. The ice mass is about 800 km (500 miles) wide and 970km (600 miles) long. In some places, namely its southern areas, the ice shelf can be almost 750 m (2,450 ft) thick. The Ross Ice Shelf pushes out into the sea at the rate of between 1.5 m (5ft) and 3 m (10 ft) a day. There are other glaciers that gradually add bulk to it. At the same time, the freezing of seawater below the ice mass increases the thickness of the ice from 40 cm (16 in) to 50 cm (20 in). Sometimes, fissures and cracks may cause the shelf to break off; the largest known is about 31,000 km² (12,000 square miles), that is slightly larger than the size of Belgium. Iceberg B-15, the world's largest recorded iceberg, was calved from the Ross Ice Shelf in March 2000.

Scientists have long been intrigued by the shelf and its composition. In fact, most of the scientific teams have made camps on or adjacent to the Ross Ice

Shelf. This includes McMurdo Station.^[6] One major effort were a series of studies conducted in 1957 and 1958, which were continued during the 1960-61 season. The efforts involved an international team of scientists. Some parties explored the glaciers and others the valleys on the ice shelf.^[7]

From 1967 to 1972 the Scott Polar Research Institute reported extensive observations using radio echo sounding. The technique allowed measurements to be taken from the air; allowing a criss cross track of 35,000 km to be covered; compared with a 3,000 km track from previous seismic sounding on the ground.^[8] More detailed surveys were executed between 1973 and 1978.

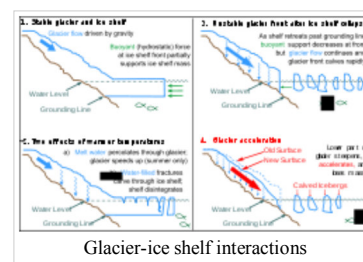
A significant scientific endeavor called the Ross Ice Shelf Project was launched with a plan of drilling into the shelf to sample the biomass in the area and make other determinations about the shelf and its relationship to the sea floor. The project was to have begun in 1974, but the actual drilling was delayed until 1976. Finally, in 1977, the scientists were able to successfully drill through the ice, making a hole that could be sampled every few days for three weeks. The team was able to map the sea floor, study the tides, and assess the fish and various other forms of life in the eaters. The team also examined the oceanographic and geological conditions as well as the temperature of the ice. They estimated that the base of the shelf was negative 2.16 degrees Celsius. They also made other calculations about the fluctuations of the temperatures.^[6]

The results of these various projects appear in a series of reports in *Science* magazine, published 2 February 1979.^[9]

In the 1980s, a network of weather stations were installed to record temperatures on the shelf as well as throughout the more remote reaches of the continent.^[10]

University of Colorado's National Snow and Ice Data Center has been studying ice shelves and, in 2002, announced that, based on several break ups of ice shelves, including Larsen B, has begun to reassess their stability. Their scientists stated that the temperature of the warmest portion of the shelf is "only a few degrees too cool in summer presently to undergo the same kind of retreat process. The Ross Ice Shelf is the main outlet for several major glaciers draining the West Antarctic Ice Sheet, which contains the equivalent of 5 m of sea level rise in its above-sea-level ice." The report added that observations of "iceberg calving" on the Ross Ice Shelf are, in their opinion, unrelated to its stability.^[5]

Continuing scientific exploration continues to uncover interesting information and the analyses have resulted in some interesting theories being posited and publicized. One such opinion, given in 2006 based on a geological survey, suggested that the ice shelf had previously collapsed, perhaps suddenly, which could well happen again.^[11]



References

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- ^a Ross Ice Shelf could 'collapse quickly' | The Australian (<http://www.theaustralian.news.com.au/story/0,20867,20840754-23109,00.html>)

See also

- List of Antarctic ice shelves

External links

- Polar Discovery: Ross Sea Penguins and Lava Flows (<http://polardiscovery.who.edu/expedition3/index.html>)
- <http://www.vims.edu/bio/microbial/NBPishelf.html> - some pictures of the Ross.
- http://www.nzherald.co.nz/section/story.cfm?c_id=5&ObjectID=10412954 Massive ice shelf 'may collapse without warning'

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