



## Oceans :: Southern Ocean

### Introduction :: Southern Ocean

#### Background:

A large body of recent oceanographic research has shown that the Antarctic Circumpolar Current (ACC), an ocean current that flows from west to east around Antarctica, plays a crucial role in global ocean circulation. The region where the cold waters of the ACC meet and mingle with the warmer waters of the north defines a distinct border - the Antarctic Convergence - which fluctuates with the seasons, but which encompasses a discrete body of water and a unique ecologic region. The Convergence concentrates nutrients, which promotes marine plant life, and which, in turn, allows for a greater abundance of animal life. In the spring of 2000, the International Hydrographic Organization decided to delimit the waters within the Convergence as a fifth world ocean - the Southern Ocean - by combining the southern portions of the Atlantic Ocean, Indian Ocean, and Pacific Ocean. The Southern Ocean extends from the coast of Antarctica north to 60 degrees south latitude, which coincides with the Antarctic Treaty Limit and which approximates the

extent of the Antarctic Convergence. As such, the Southern Ocean is now the fourth largest of the world's five oceans (after the Pacific Ocean, Atlantic Ocean, and Indian Ocean, but larger than the Arctic Ocean). It should be noted that inclusion of the Southern Ocean does not imply recognition of this feature as one of the world's primary oceans by the US Government.

## Geography :: Southern Ocean

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### Location:

body of water between 60 degrees south latitude and Antarctica

### Geographic coordinates:

60 00 S, 90 00 E (nominally), but the Southern Ocean has the unique distinction of being a large circumpolar body of water totally encircling the continent of Antarctica; this ring of water lies between 60 degrees south latitude and the coast of Antarctica and encompasses 360 degrees of longitude

### Map references:

Antarctic Region

### Area:

**total:** 20.327 million sq km

*note:* includes Amundsen Sea, Bellingshausen Sea, part of the Drake Passage, Ross Sea, a small part of the Scotia Sea, Weddell Sea, and other tributary water bodies

### Area - comparative:

slightly more than twice the size of the US

### Coastline:

17,968 km

### Climate:

sea temperatures vary from about 10 degrees Celsius to -2 degrees Celsius; cyclonic storms travel eastward around the continent and frequently are intense because of the temperature contrast between ice and open ocean; the ocean area from about latitude 40 south to the Antarctic Circle has the strongest average winds found anywhere on Earth; in winter the ocean freezes outward to 65 degrees south latitude in the Pacific sector and 55 degrees south latitude in the Atlantic sector, lowering surface temperatures well below 0 degrees Celsius; at some coastal points intense persistent drainage winds from the interior keep the shoreline ice-free throughout the winter

### **Terrain:**

the Southern Ocean is deep, 4,000 to 5,000 m over most of its extent with only limited areas of shallow water; the Antarctic continental shelf is generally narrow and unusually deep, its edge lying at depths of 400 to 800 m (the global mean is 133 m); the Antarctic icepack grows from an average minimum of 2.6 million sq km in March to about 18.8 million sq km in September, better than a sixfold increase in area; the Antarctic Circumpolar Current (21,000 km in length) moves perpetually eastward; it is the world's largest ocean current, transporting 130 million cubic meters of water per second - 100 times the flow of all the world's rivers

### **Elevation extremes:**

**lowest point:** -7,235 m at the southern end of the South Sandwich Trench

**highest point:** sea level 0 m

### **Natural resources:**

probable large and possible giant oil and gas fields on the continental margin; manganese nodules, possible placer deposits, sand and gravel, fresh water as icebergs; squid, whales, and seals - none exploited; krill, fish

## **Natural hazards:**

huge icebergs with drafts up to several hundred meters; smaller bergs and iceberg fragments; sea ice (generally 0.5 to 1 m thick) with sometimes dynamic short-term variations and with large annual and interannual variations; deep continental shelf floored by glacial deposits varying widely over short distances; high winds and large waves much of the year; ship icing, especially May-October; most of region is remote from sources of search and rescue

## **Environment - current issues:**

increased solar ultraviolet radiation resulting from the Antarctic ozone hole in recent years, reducing marine primary productivity (phytoplankton) by as much as 15% and damaging the DNA of some fish; illegal, unreported, and unregulated fishing in recent years, especially the landing of an estimated five to six times more Patagonian toothfish than the regulated fishery, which is likely to affect the sustainability of the stock; large amount of incidental mortality of seabirds resulting from long-line fishing for toothfish

*note:* the now-protected fur seal population is making a strong comeback after severe overexploitation in the 18th and 19th centuries

## **Environment - international agreements:**

the Southern Ocean is subject to all international agreements regarding the world's oceans; in addition, it is subject to these agreements specific to the Antarctic region: International Whaling Commission (prohibits commercial whaling south of 40 degrees south [south of 60 degrees south between 50 degrees and 130 degrees west]); Convention on the Conservation of Antarctic Seals (limits sealing); Convention on the Conservation of Antarctic Marine Living Resources (regulates fishing)

*note:* many nations (including the US) prohibit mineral resource exploration and exploitation south of the fluctuating Polar Front (Antarctic Convergence), which is in

the middle of the Antarctic Circumpolar Current and serves as the dividing line between the cold polar surface waters to the south and the warmer waters to the north

### **Geography - note:**

the major chokepoint is the Drake Passage between South America and Antarctica; the Polar Front (Antarctic Convergence) is the best natural definition of the northern extent of the Southern Ocean; it is a distinct region at the middle of the Antarctic Circumpolar Current that separates the cold polar surface waters to the south from the warmer waters to the north; the Front and the Current extend entirely around Antarctica, reaching south of 60 degrees south near New Zealand and near 48 degrees south in the far South Atlantic coinciding with the path of the maximum westerly winds

## **Economy :: Southern Ocean**

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### **Economy - overview:**

Fisheries in 2006-07 landed 126,976 metric tons, of which 82% (104,586 tons) was krill (*Euphausia superba*) and 9.5% (12,027 tons) Patagonian toothfish (*Dissostichus eleginoides* - also known as Chilean sea bass), compared to 127,910 tons in 2005-06 of which 83% (106,591 tons) was krill and 9.7% (12,396 tons) Patagonian toothfish (estimated fishing from the area covered by the Convention of the Conservation of Antarctic Marine Living Resources (CCAMLR), which extends slightly beyond the Southern Ocean area). International agreements were adopted in late 1999 to reduce illegal, unreported, and unregulated fishing, which in the 2000-01 season landed, by one estimate, 8,376 metric tons of Patagonian and Antarctic toothfish. In the 2007-08 Antarctic summer, 45,213 tourists visited the Southern Ocean, compared to 35,552 in 2006-07, and 29,799 in 2005-06 (estimates provided to the Antarctic Treaty by the International Association of Antarctica Tour Operators (IAATO), and does not include passengers on overflights and those

flying directly in and out of Antarctica).

## **Transportation :: Southern Ocean**

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### **Ports and terminals:**

McMurdo, Palmer, and offshore anchorages in Antarctica

*note:* few ports or harbors exist on the southern side of the Southern Ocean; ice conditions limit use of most to short periods in midsummer; even then some cannot be entered without icebreaker escort; most Antarctic ports are operated by government research stations and, except in an emergency, are not open to commercial or private vessels

### **Transportation - note:**

Drake Passage offers alternative to transit through the Panama Canal

## **Transnational Issues :: Southern Ocean**

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### **Disputes - international:**

Antarctic Treaty defers claims (see Antarctica entry), but Argentina, Australia, Chile, France, NZ, Norway, and UK assert claims (some overlapping), including the continental shelf in the Southern Ocean; several states have expressed an interest in extending those continental shelf claims under the United Nations Convention on the Law of the Sea to include undersea ridges; the US and most other states do not recognize the land or maritime claims of other states and have made no claims themselves (the US and Russia have reserved the right to do so); no formal claims exist in the waters in the sector between 90 degrees west and 150 degrees west