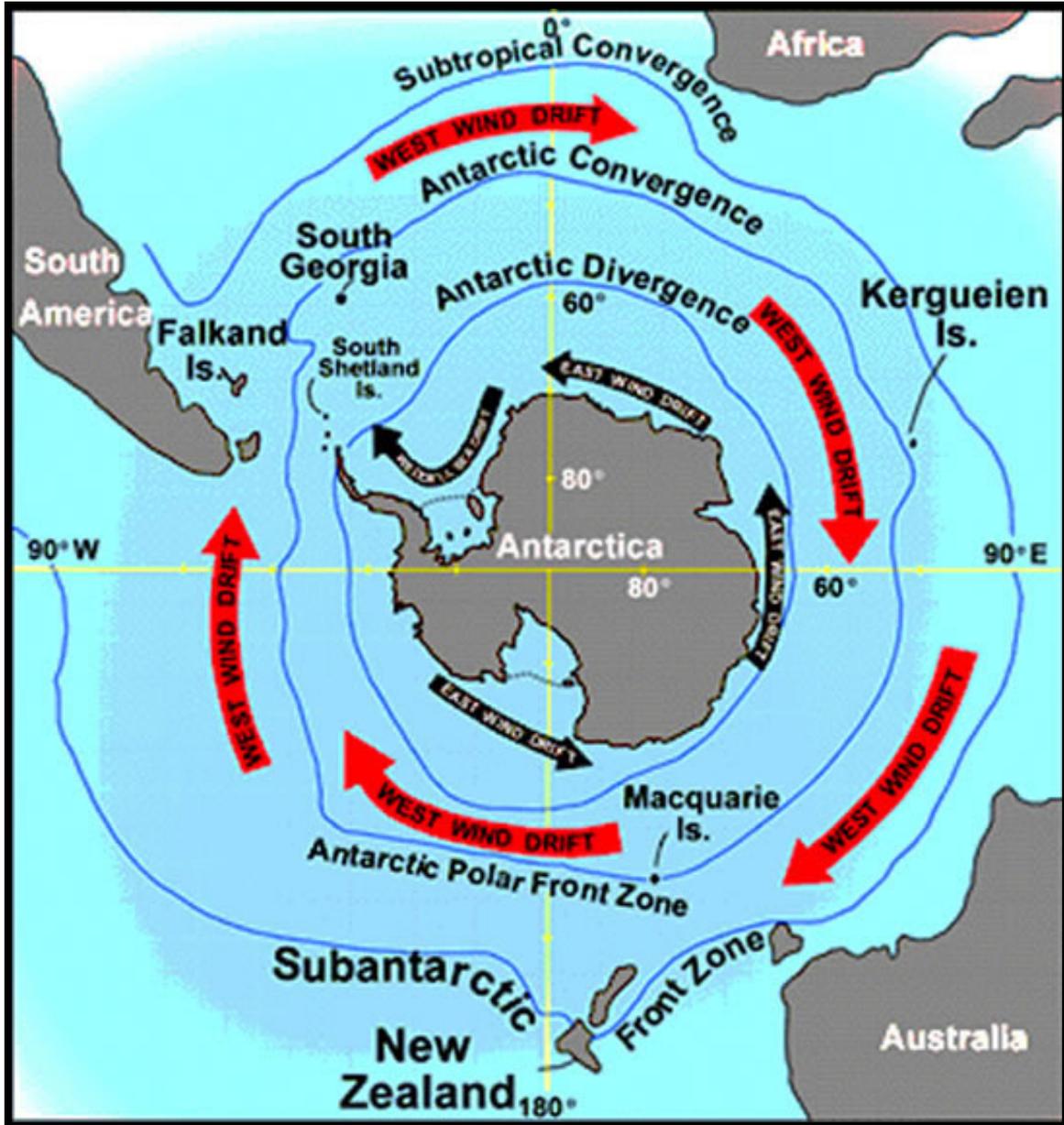


SOUTHERN OCEAN CURRENTS

Map from: <http://www.polar.org/antsun/oldissues2002-2003/Sun121502/current.html>



FROM: The Antarctic Coastal Current

Joanna Gyory, John Cangialosi, Ieng Jo, Arthur J. Mariano, Edward H. Ryan

<http://oceancurrents.rsmas.miami.edu/southern/antarctic-coastal.html>

The Antarctic Coastal Current, also known as the East Wind Drift Current, is the southernmost current in the world. This current is the counter-current of the largest ocean current in the world, **Antarctic Circumpolar Current**. On the average, it flows westward and parallel to the Antarctic coastline. Although it is circumpolar, the Antarctic Peninsula partially impedes its flow (Tchernia, 1981; Grelowski and Pastuszak, 1984). The current is an important component of the very active air-sea exchange in this area that leads to deep convection and production of deep ocean water masses. The Antarctic Bottom Water and Antarctic Intermediate Water obtain their fundamental characteristics (Tchernia, 1981) in this region.

The Antarctic coastal zone shares some similarities with other coastal zones, but is dominated by relatively unusual aspects. First of all, location of the "coast" changes dramatically on an annual basis, because sea-ice extends hundreds of kilometers from the land in winter, before melting back to close to the shore in summer. Ice advances most rapidly in May and June, reaches maximum coverage in September, retreats most rapidly in November and December, and it reaches a minimum in February (Deacon, 1984). This annual expansion of sea-ice covers 22 million km² in winter but only 8 million km² in summer, and is such a dominant aspect of the waters surrounding Antarctica that any assessment of processes in the coastal zone must include the entire region annually covered in sea ice. Secondly, the coastal shelf surrounding Antarctica is relatively narrow and deep. This aspect, the dispersive nature of the Southern Ocean sea-ice circulation, and the lack of riverine inputs represent key differences from the conditions which prevail in the Arctic (Tchernia, 1980).

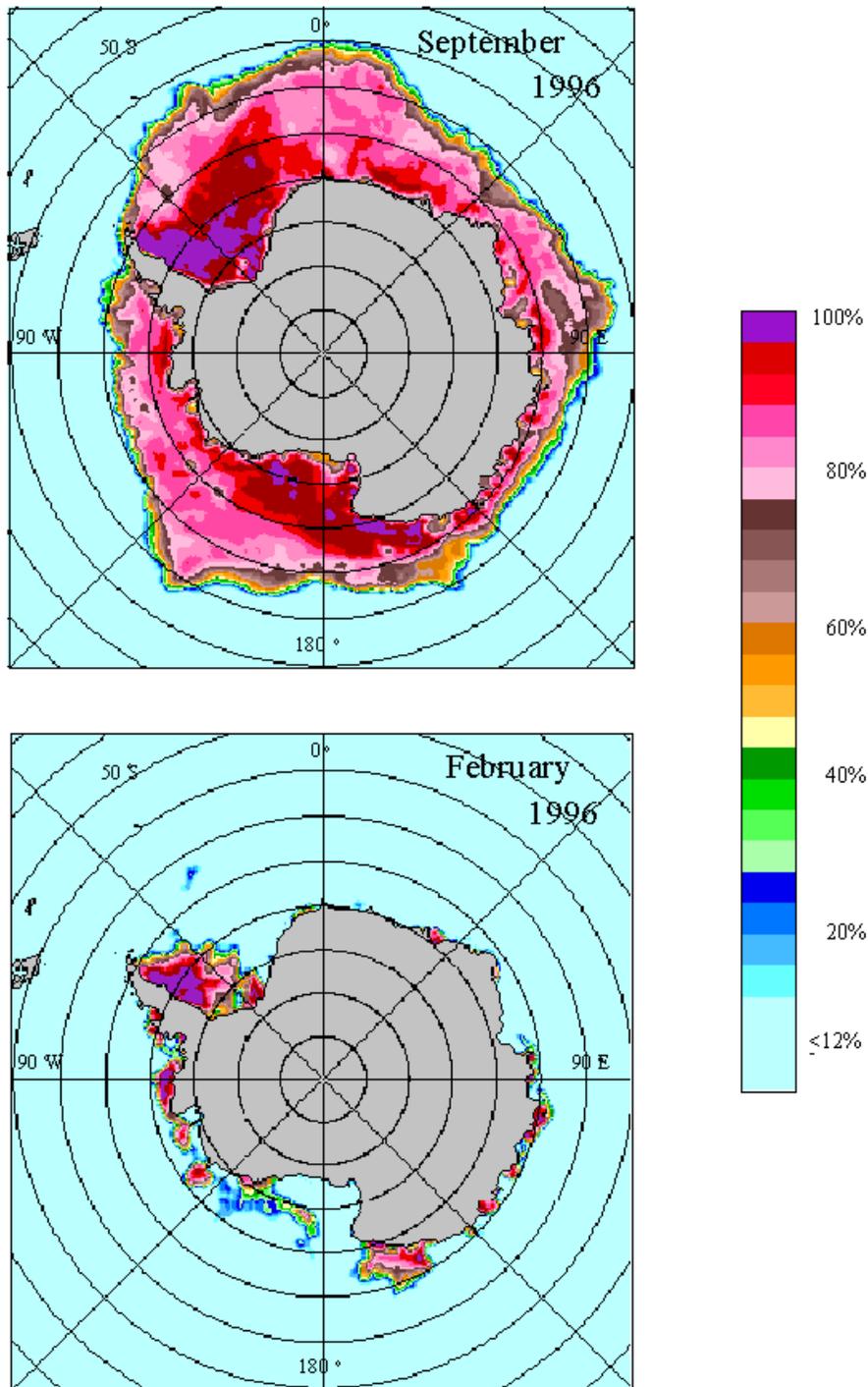
FROM: The Antarctic Circumpolar Current

Ryan Smith, Melicie Desflots, Sean White, Arthur J. Mariano, Edward H. Ryan

<http://oceancurrents.rsmas.miami.edu/southern/antarctic-cp.html>

The Antarctic Circumpolar Current (ACC) is the most important current in the Southern Ocean, and the only current that flows completely around the globe. The ACC, as it encircles the Antarctic continent, flows eastward through the southern portions of the Atlantic, Indian, and Pacific Oceans. Edmond Halley, the British astronomer, discovered the ACC while surveying the region during the 1699-1700 HMS Paramore expedition. Later, the famous mariners James Cook in 1772-1775, Thaddeus Bellingshausen (Estonia) in 1819-1821, and James Clark Ross in 1839-1843 described the Atlantic Circumpolar Current in their journals. Cook was the first person to use the term, Southern Ocean, to describe this area. Other notable expeditions were made by Sir Drake, who reached the tip of South America in 1578, Abel Tasman, who sailed south from Australia into the Southern Ocean in 1642, James Weddell in 1823, and by the HMS Challenger in 1873-74 (Deacon, 1984).

The ACC is arguably the "mightiest current in the oceans" (Pickard and Emery, 1990). Despite its relatively slow eastward flow of less than 20 cm s^{-1} in regions between the fronts, the ACC transports more water than any other current (Klinck and Nowlin, 2001). The ACC extends from the sea surface to depths of 2000-4000 m and can be as wide as 2000 km. This tremendous cross-sectional area allows for the current's large volume transport. The Antarctic Circumpolar Current's eastward flow is driven by strong westerly winds. The average wind speed between 40°S and 60°S is 15 to 24 knots with strongest winds typically between 45°S and 55°S . Historically, the ACC has been referred to as the 'West Wind Drift' because the prevailing westerly wind and current are both eastward.



Fraction of southern ocean covered by ice in September (top) and February (bottom) of 1996. The ice concentration was estimated by means of Special Sensor Microwave Imager (SSM/I) data collected by the DMSP (Defense Meteorological Satellite Program) polar orbiting satellite. At 19 GHz the SSM/I has a resolution of about 70 x 45 km, and the 19 GHz brightness temperature of a clear ocean pixel is a measure of what fraction of a 70 x 45 km area is covered by sea ice. (image courtesy of Claire Parkinson at NASA Goddard)

ARCTIC OCEAN CURRENTS

