South Indian Ocean

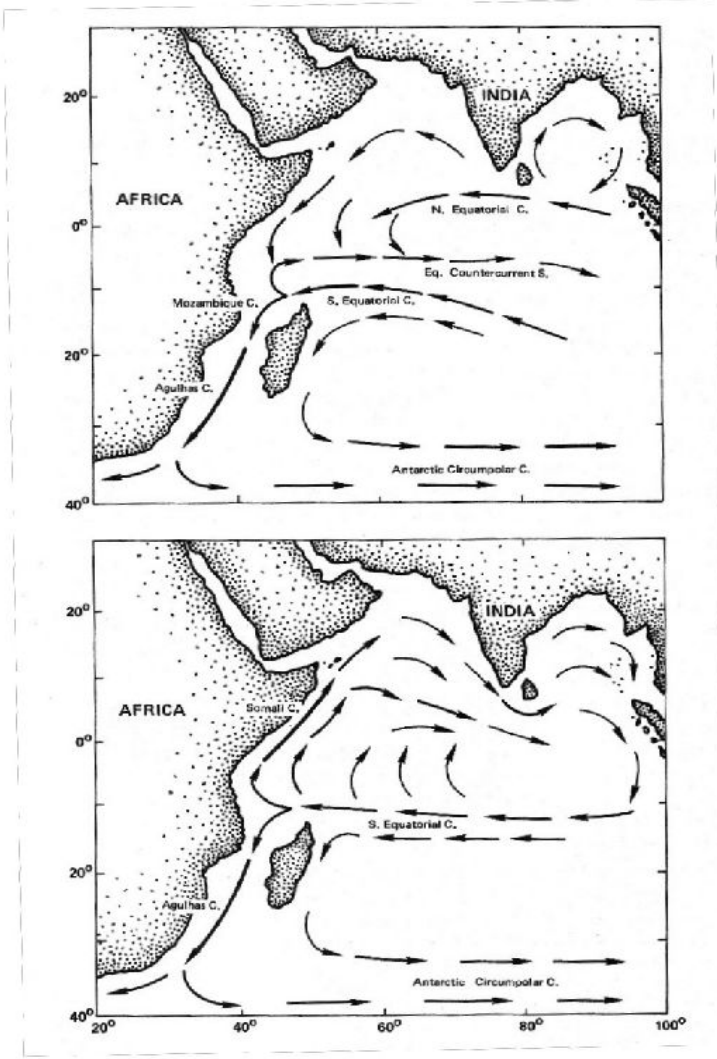
General remarks

6.28

The main surface circulation of the South Indian Ocean is counter-clockwise. The W-going flow of the **South Equatorial Current** of the Indian Ocean lies well S of the equator, thus differing from the South Equatorial Currents of the Atlantic and Pacific Oceans, which extend in latitude a few degrees N of the equator. Its N boundary is about 6°S to 8°S, varying according to longitude and season. To the N of that, in the north-east monsoon the E-going **Equatorial Counter-current** can be seen, at least in the W part of the Indian Ocean, originating at the convergence of the N-going **East African Coast Current** and the SW-going Somali Current.

At the beginning and end of the north-east monsoon, the Equatorial Counter-current merges into the equatorial jet, also E-going, and it is difficult to distinguish between them. However, the Counter-current is relatively broad, weak (typically ½ to 1 kn) and variable, whereas the equatorial jet is narrow (within 2° of the equator), of greater rate (typically 1 to 2 kn) and relatively steady.

In the south-west monsoon there is little evidence of any E-going flow S of the equator, currents between 2°S and 7°S being mostly weak and variable.



4 The W-going South Equatorial Current splits on reaching the E coast of Madagascar, at 16°S. The N-going branch turns W round the N extremity of Madagascar and continues W to split again off the African coast near Cabo Delgado. Some goes N into the East African Coast Current, the rest goes S into the Moçambique Channel. South of 16°S, the current near the E coast of Madagascar runs SSW. In the open ocean, average rates in the South Equatorial Current are ½ to ¾ kn, but much larger values are found inshore. Within a few miles of the E coast of Madagascar, average rates are 1 to 2 kn and 3 kn or more is sometimes reported.

5 Off the SE coast of South Africa the S-setting **Moçambique Current** is supplemented by the South Equatorial flow setting W to the S of Madagascar. This combined strong SW flow continues along the coast as the **Agulhas Current** reaching average rates of 2 to 3 kn and a maximum of about 5 kn, between 30°S and 34°S. Average rates seem slightly higher during the summer and autumn months than in winter and spring. During the latter two seasons the sparse data available suggests a greater extension of the **Southern Ocean Current** to the N. This in turn restricts the extension of the Agulhas Current to the S in 20°E to 22°E. The low constancy of predominant currents off Cape Town (33°53′S, 18°26′E) in winter also suggests that, at times, the surface flow nearer the coast and into the South Atlantic Ocean may be markedly restricted. In open waters E and SE of the coast between Durban (29°51′S, 31°06′E) and Cape of Good Hope and to the S of Madagascar continuous interaction between the warm waters of the recurving South Equatorial Current and the ENE-going sets of the Southern Ocean Current lead to many eddies and much variability of direction and rate. These ENE-going sets continue across the South Indian Ocean but constancies and rates decrease to the N. Any weak predominance of E-going sets changes to W-going N of about 25°S in summer and near 30°S in winter, at a longitude of 80°E. Approaching the W coast of Australia the circulation is not well defined. During autumn and winter sets off the coast are moderately constant, S-going, turning SE to E off Cape Leeuwin (34°23′S, 115°08′E). In spring and summer coastal eddy and counter-current activity N of 33°S show little marked predominance but W of 113°E there is a tendency for NW or N-going sets to extend in a widening band merging into the South Equatorial Current between 16°S to 20°S and 95°E to 105°E. The more constant part of this current is often referred to as the **West Australian Current** and is evident for much of the year, particularly N of 25°S. South of this latitude during autumn and winter the South Indian Ocean Current extends farther N and E before merging into the S-going coastal flow, with increased rates and constancies off Cape Leeuwin, and entering the Great Australian Bight.

Off the NW Australian coast and in the Timor and Arafura Seas historical data is sparse. The general indications are a weak predominance of W-going sets ESE of Timor turning SW for much of the year. During the late summer period a reversal to E-going sets occur in the E part of the Arafura Sea.

Text: Admiralty Ocean Passages for the World, NP 136, 5th Ed. 2004, UK Hydrographic Office;
Diagr.: Van Dorn, Oceanography and Seamanship, 2nd Ed. 1993, Cornell Maritime Press, USA