Abstract View

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Development of the Flow Field during the Onset of the Somali Current, 1979

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ABSTRACT

During the spring and summer of 1979 a multi-ship survey studied the changes in currents along the East African coast in response to the transition from the northeast to the southwest monsoon. The Somali Current in late April and early May flowed southwestward along the coast from northern Somalia to about the equator. Surface currents were 50–100 cm s^{-1} and the transport was 3×10^6 m^3 s^{-1}. South of the equator the East African Coast Current (EACC) flowed northward. The two currents met in the vicinity of the equator and turned offshore to the southeast. Surface velocities in the EACC were about 200 cm s^{-1}, and its transport in the top 100 m was 15×10^6 m^3 s^{-1}. With the initial onset of southerly winds in early May the Somali Current reversed. By mid-May at 3°N surface speeds of 200 cm s^{-1} were observed. The flow did not continue up the coast, but turned offshore by 4°N. The second onset of the monsoon took place in mid-June. Shortly after this, surface currents >350 cm s^{-1} were observed at the turn-off region. The transport at 3°N was 27×10^6 m^3 s^{-1} in the top 100 m. Farther to the north, northeasterly flow was observed as early as March. With the monsoon onset in June a strong anticyclonic circulation developed between 5 and 10°N. This continued to strengthen into July. The transport in the top 100 m in late June was 22×10^6 m^3 s^{-1}.

Energetic, organized flows were observed below the surface layer. North of the equator between 100 and 450 m, the flow was already to the northeast in mid-April. This coastal flow was fed by westward flow along the equator at this level. Little change was seen in this portion of the water column with the monsoon onsets. Around 700 m along the coast the flow was to the southwest with a speed of 50 cm s^{-1} in late April to mid-May. Flow at 700 m along the equator was to the west. Close to the coast this turned to the southwest. With the reversal in the surface current, the deep southwestward flow also reversed north of the equator. This deep northeastward flow increases the net

transport at 3°N to about 80×10^6 m^3 s^{-1}. A persistent, nearshore, southwestward undercurrent was seen in the northern gyre in May–July.

The current changes in the surface layer were primarily related to changes in the local winds and a northward intrusion of the EACC into the Northern Hemisphere. No direct evidence for strong remote forcing was seen. It is not clear what causes the changes in the deep water.

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