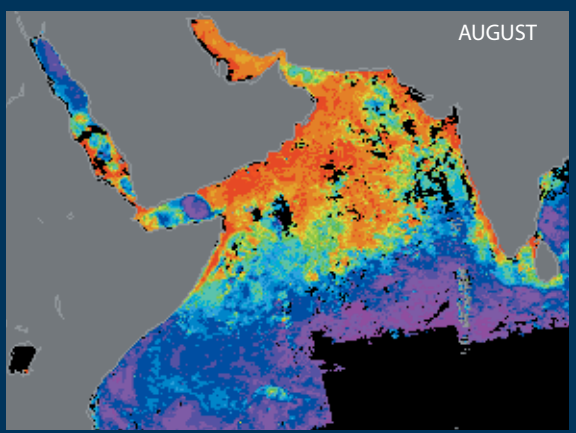
Indian Ocean

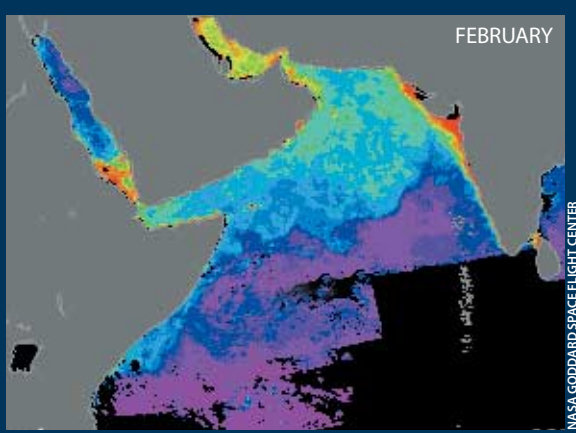
Unlike the Atlantic or Pacific, the Indian Ocean is completely enclosed on the northern side, a configuration that gives rise to drastic seasonal changes in the winds and currents. These monsoons, a variation on the Arabic word *mausim,* meaning "season," carry moisture northward from the southern Indian Ocean (causing torrential rains to lash India) during much of the summer there [see "The Oceans and Weather," by Peter J. Webster and Judith A. Curry, on page 38]. These winds induce a distinctive set of currents in summer (*right*).

The Indian Ocean basin is also involved in more long-term climatic shifts. When the northward-drifting Indian subcontinent collided with Asia tens of millions of years ago, it pushed the Tibetan Plateau upward about five kilometers. This mountainous barrier changed the pattern of atmospheric circulation, which many scientists believe cooled the earth's surface substantially.

Other reminders of India's ancient journey northward are visible in this view of the seafloor (*right*). Volcanic island chains and submarine rises mark the places where large amounts of lava erupted above hot spots, heat sources embedded deep within the earth's interior. The trace of the Réunion hot spot appears interrupted because tectonic spreading outward from the Central Indian Ridge has separated what was once a continuous structure. The parallel trace of the Kerguelen hot spot, known as the Ninetyeast Ridge, is unbroken for a greater stretch, making it the longest linear feature on the earth.

Area:	73,440,000 square kilometers
Average Depth:	3,890 meters
Maximum Depth:	7,450 meters





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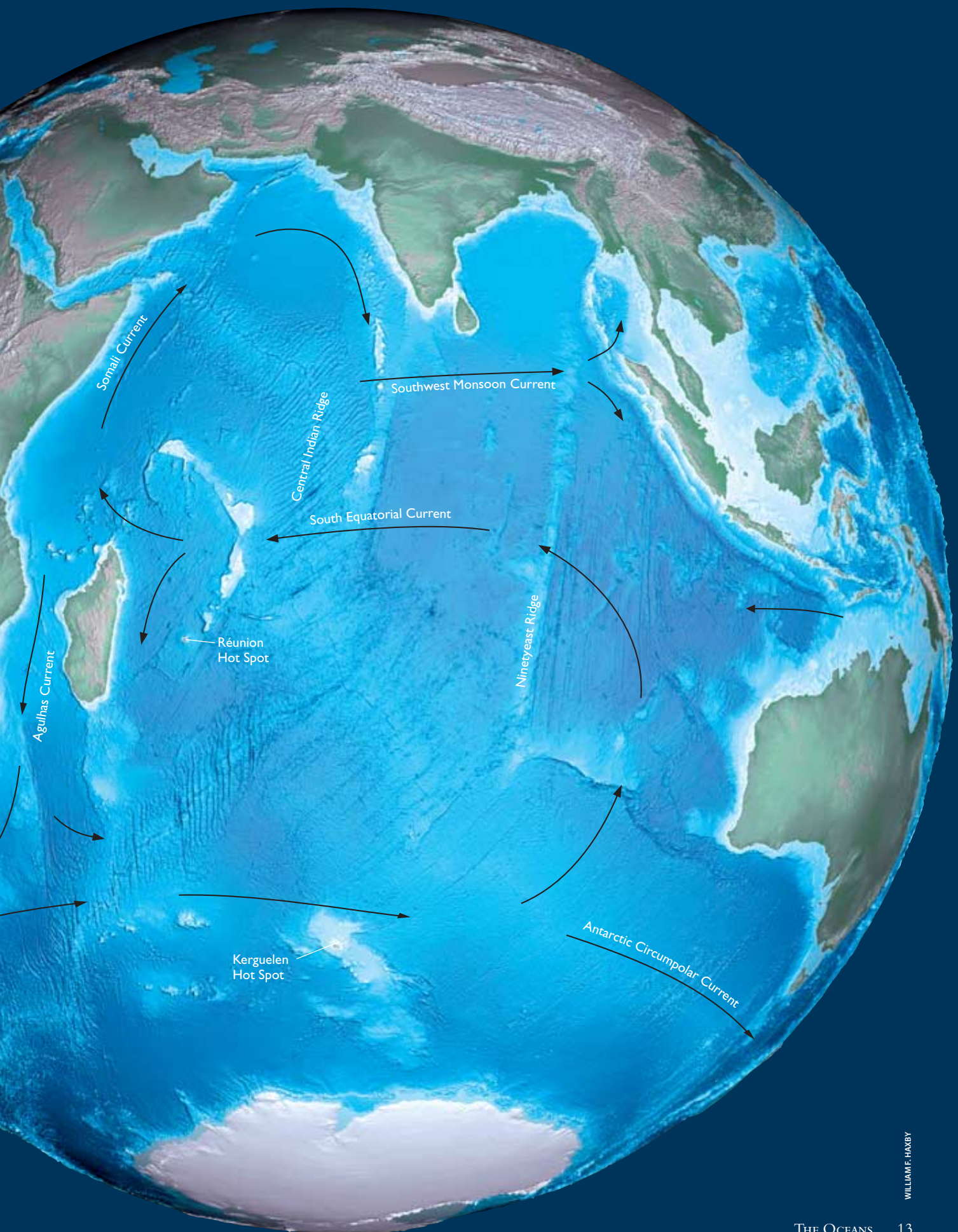
CHANGING MONSOON WINDS not only alter the weather, they also control the biological productivity of the ocean. These false-color images (*left*), made using satellite measurements from the Coastal Zone Color Scanner, reflect the density of phytoplankton at the sea surface. (Warm colors represent relatively high densities of phytoplankton.) From May through September, shallow currents driven by winds coming from the southwest veer away from the Arabian coast, causing nutrient-rich waters from greater depth to rise to the surface. Phytoplankton can then proliferate far offshore (*top*) and provide nourishment for creatures higher in the marine food chain. During the northeast monsoon, which runs from November to March, the surface currents travel in the opposite direction, preventing such upwelling of nutrient-rich water. Phytoplankton then grow well only close to the coasts, where nutrients constantly brought to the sea from rivers are still plentiful (*bottom*).



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