Indian Ocean Relief

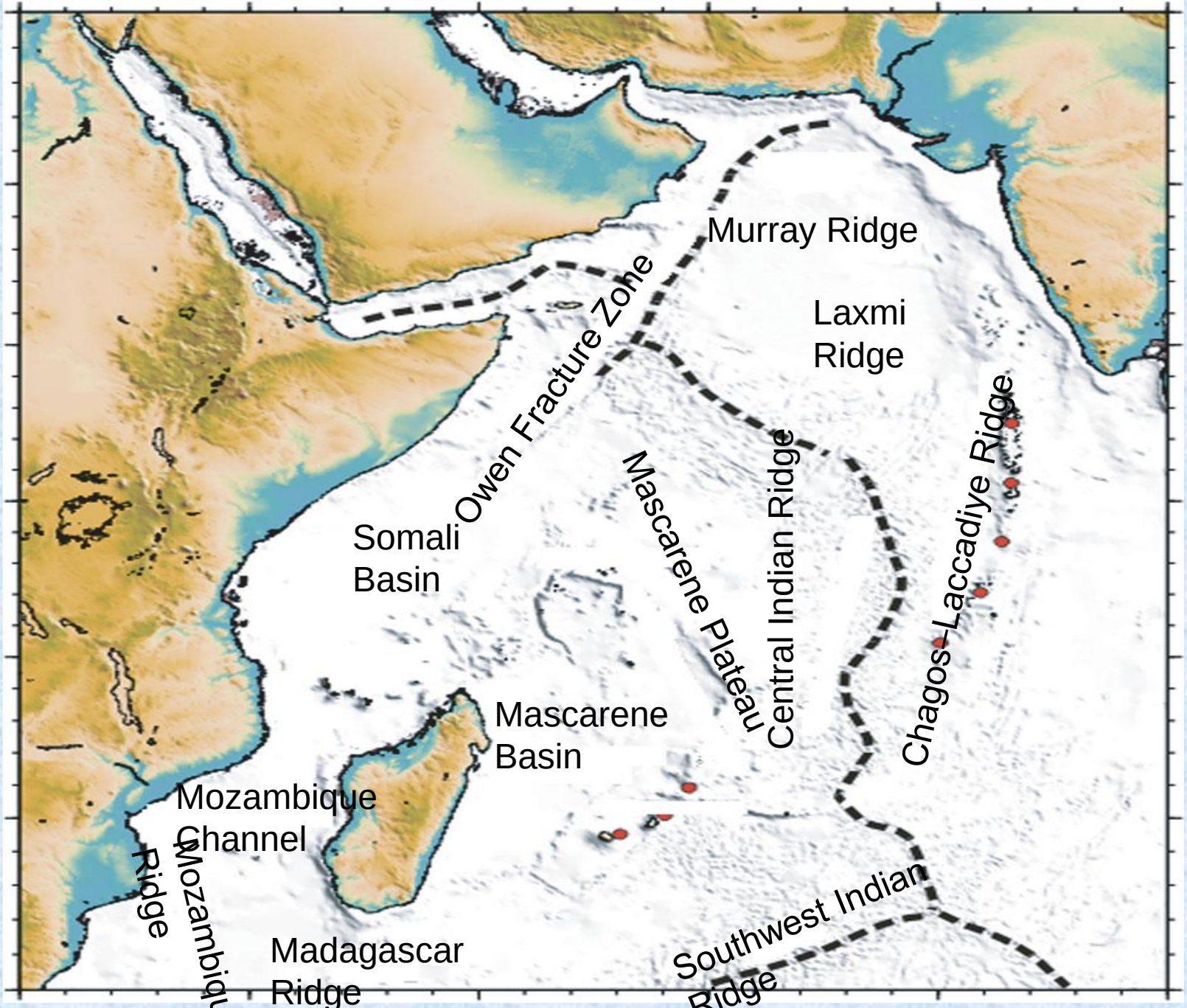
One of the first-order constraints on the oceanographic environment, on how the water masses move, and interact, is the form or topography of the seafloor. The basic elements of the Indian Ocean seafloor and its margins developed from the break-up of the supercontinent, Gondwanaland, which started to disintegrate over 160 million years ago. General Bathymetric Chart of the Ocean (GEBCO) organization, has produced bathymetric materials of the finest quality for over 100 years.

The development of the Indian Ocean Ridge system, comprising the Southeast Indian Ridge in the east, the Southwest Indian Ridge to the West and (later) the Central Indian Ridge to the northwest, generated new seafloor at a variety of spreading rates.

Large part of the ocean is floored by deep abyssal plains. These deep ocean basins are bounded predominantly by rifted margins, characterized by continental shelves of variable form, some several hundred kilometres wide. These margins are almost all *non-volcanic*, with passive rift geometries.

Deep-water basins have three major features

1. Chagos–Laccadive Ridge, stretching southwards more than 2000 km from the western margin of the Indian subcontinent.
2. The Indian Ocean mid-ocean-ridge system partitions the Indian Ocean floor into three parts, separating the tectonic plates of East Africa, Arabia, Antarctica and India/Australia along three actively spreading plate boundaries. The ridges meet at approximately the centre of the Indian Ocean at a triple junction
3. The Mascarene Plateau, the shallow bank comprising the arcuate collection of shoals, blocks and seamounts.



Diagrammatic cross-section of an ocean basin, showing the various geographic features

One of the most dominant features in the Western Indian Ocean is that of the Mascarene Plateau. This feature, extending from 4° S to 18° S, over 1500 km in length and covering more than 115 000 km^2.

The mid-ocean-ridge spreading system provides one of the most pervasive of bathymetric features in the whole of the world's oceans and in the Western Indian Ocean is represented by a shallow submarine ridge some 7000 km in length, rising some 3000 m above the ocean basins. At its shallowest point (66◦ 9 57 E, 17◦ 30 22 S), the ridge is only 1500 m below sea level, but at its deepest, the ridge axis is one of the deepest in the world (5600 m, on the Southwest Indian Ridge (Patriat *et al* .1997)).

The depth of the ridges varies dramatically along their length, on the scale of a few hundred metres over a distance of tens of kilometers.

There are four major bathymetric features which divide the Western Indian Ocean into several basin complexes. The Chagos–Laccadive Ridge, the Mascarene Plateau, the Madagascar Ridge and the Indian Ocean mid-oceanic ridge system. The deepest of these basins are the Central Indian Basin 5500 m deep and the Madagascar Basin a depth of 5500 m. Also following on in order of decreasing depth are the Somali Basin at 5100 m, Mozambique Basin at a depth of 5000 m, the Mascarene Basin at 4900 m, the northern region of the Arabian Sea at a depth of 4500 m and the northern end of the Crozet Basin at a depth of 4500 m.

The floor of the Western Indian Ocean is shaped by deep water and shallow bathymetric features of complex relief and diverse geological origin. These contribute to the restriction of the flow of water masses, and yet clearly direct and allow their passage in intricate pathways.