Large aftershocks continue to occur in the ~1300 km-long rupture zone of the 2004 earthquake. In coupled subduction zones, compressional earthquakes occur before and tensional earthquakes follow 2004-like events. We note that the Nicobar segment did not generate any notable outer-rise compressional events; the few Mw>4.5, pre-2004 earthquakes within the subducting plate showed left-lateral strike-slip faulting. The pre-2004 deformation of the Andaman segment was mostly compressional, as evidenced by the shallow thrust faulting event at Diglipur (Mw 6.5 September 13, 2002) and uplifted microtasts at various locations on the outer ridge. Post-2004, the seismicity along the Andaman segment is dominated by extensional events, the largest of which occurred at Coco Island on August 10, 2009 (Mw 7.5). Shallow strike-slip and normal faulting events characterize the Andaman Spreading Ridge. Two deeper strike-slip faulting earthquakes sourced within the subducting slab (at depths of 113 and 130 km) possibly result from the release of the extensional slab bending resistance. In addition to increased right-lateral strike-slip faulting on the Sumatran Fault, the Nicobar segment is noted for pre and post-2004 left lateral outer-rise activity, especially the earthquake on June 12, 2010 (Mw 7.5). Left-lateral strike-slip faulting at depths 60-70 km is interpreted as the result of reactivation of near N-S oriented fossil fracture zones within the subducting plate. We surmise that in the Nicobar segment, the subducting oceanic plate is a chip of the Indo-Australian plate that responds in part to NW oriented compressive stress, which takes a northerly swing in the Andaman segment.