

A NEW PARADIGM FOR NEW OCEANS

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The original simple theory of plate tectonics had to be refined to accommodate second-order geological features such as back-arc basins and continental deformation zones. We propose an additional refinement that is required by complexities that form and persist in new oceans when inhomogeneous continental lithosphere/tectosphere disintegrates. Such complexities include continual plate-boundary reorganizations and migrations, distributed continental material in the ocean, propagating and dying ridges, and sagging, flexing and tilting in the oceans and at continent-ocean boundary zones. Reorganizations of stress and motion persist, resulting in variable orientations over short distances, tectonic reactivations, complex plate boundary configurations including multiple triple junctions, and the formation and abandonment of oceanic microplates. Resulting local compressions and extensions are manifest as bathymetric anomalies, vertical motions, and distributed volcanism at various times and places as

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the new ocean grows. Examples of regions that exhibit some or all of these features include the North Atlantic, the Rio Grande Rise/Walvis Ridge region of the South Atlantic, and the Seychelles-Mauritius region in the Indian Ocean. We suggest that these complexities arise as a result of the formation of new spreading plate boundaries by rifts propagating through continental lithosphere/tectosphere that is anisotropic as a result of inherited structure/composition and/or a sub-lithospheric mantle destabilized by lithospheric-controlled processes. Such scenarios result in complicated disintegration of continents and local persistent dynamic instability in the new ocean.