

Crater Tectonics Evolution of the Australasian, African, North American and South American Deepwater Basins

By

D. B. Buthman, Unocal

The most obvious and simple geologic features on the terrestrial planets and moons are impact craters. Meteorite impacts form the majority of the basins on the moon, Mars, Mercury, and numerous other terrestrial bodies in our universe. In addition, impact events have the ability to fracture the host's lithosphere and initiate the extrusion of "mare" basalts into their basins. Because of their simplicity and abundance in the universe, might impact craters also be responsible for the formation and tectonic evolution of basins on Earth?

Convection cells in the soft plastic asthenosphere convey rigid lithospheric plates from their spreading centers, leaving rift basins in their wake. Presumably, the driving mechanism behind the theory of Plate Tectonics is mantle convection, initiated by a perturbation in the mantle. In the terrestrial universe, the most obvious lithospheric perturbations are caused by meteoritic impact. During exceptionally large impact events, the fractured crust extends into the mantle and evokes volcanism and igneous emplacements. The mantle is perturbed; the catastrophe introduces inhomogeneous thermal cells that may have initiated the movement of continent-scale plates.

On Earth, it is proposed that several Copernican-scale impact cataclysms have occurred during the last 70 million years, including the events that deposited the vast tektite fields and initiated the crater tectonics evolution of the Australasian, African (Ivory Coast), North American (Chicxulub) and South American plates. One meteorite rifted Pangea into South America, Africa and Antarctica, and initiated continental drift, another sculpted the Australasian plates, and still another initiated the crater tectonics evolution of North America.