j19 Generalized concept of a craton < prolonged stability >

> ... the factual burden of a science varies inversely with its degree of maturity. As a science progresses particular facts become increasingly comprehensible within general statements of greater explanatory power and scope. In Sir Peter Medawar's words, we need no longer record the fall of every apple.
>
> —Anthony Hallam.[1]

Ocean basins and continents and are fundamentally different in their surface elevations. This has its explanation in the different origins of the two and in isostasy which invokes Archimedes principle.[2]

Oceanic crust is a layer-cake of seafloor sediments either on basalt overlying gabbro (the products of decompression melting of mantle peridotite that rises where plates diverge) or, more locally, on serpentinite (the product of seawater metasomatism of mantle peridotite). The oceanic crust, typically 4-8 km thick, can be 35 km or more thick where flooded by hot-spot (mantle plume) derived basalts. Because of subduction, existing oceanic crust dates 0-180 million years old (i.e is everywhere younger than near the beginning of the Middle Jurassic in age).

Continental crust is granitic. Because of isostasy, its thickness (see ***Table j19.1***) is expressed by the regional elevation of its landscape: 1) Emergence (or submergence) can be due to tectonic crustal thickening (or thinning) and epeiric lowering (or rising) of sealevel. 2) delamination of the lower part of the lithosphere and inflow of asthenosphere can raise a region. 3) Magmatic underplating at first raises a region and later lowers it as the magma crystallizes, and so becomes more dense.[3] 4) Riverine, flood plane, and lacustrine sediments, glacial drift, desert dune, loess, and volcanics can accumulate on a continent. 5) Erosion works to lower elevations above sealevel.

The average thickness of old, stable, continental crust is tied by isostasy to the depth of the ocean basins. (This depth is the *height* to which sial can stick out of sima without emerging above sealevel when erosion would return it to sealevel). Areas of continents that have not been involved in fold-deformation mountain building for great lengths of geologic time (half a billion years or more) are called *cratons*. (Oceanic crust is nowhere old enough to be a craton.) Cratons are called "shields" where continental basement rock (a complex of igneous and metamorphic rocks) is regionally exposed and are called "platforms" where this basement is extensively covered by unfolded strata). Fault rifting followed by seafloor spreading can fragment a craton of any age into several cratons. ❑

Table j19.1 **The presently existing continents and their measure** [4]

Continent	Volume, 10^3 km^3	Thickness (mean) km	Height (mean) m	Flooded area, %
Major Continents				
Eurasia	2.362	38	361	25.8
North America	1.393	35	96	30.6
Africa	0.857	24	244	14.5
South America	1.001	42	149	19.0
Antarctica	0.626	33	-344	78.4
Australia	0.510	36	-244	34.9
India	0.177	38	236	14.9
Arabia	0.106	23	470	10.6
New Zealand	0.084	21	-1568	90.3
Central America	0.024	18	-579	52.8
Submerged Microcontinents				
Rockall	0.015	33	-1702	
Seychelles	0.012	32	-1706	
Agulhas	0.002	12	-3222	
Jan Mayen	0.002	- - -	-1600	