CONTINENTAL GROWTH IN THE PROTEROZOIC: A GLOBAL PERSPECTIVE

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Throughout the Proterozoic mantle-driven plate tectonics and mantle-generated plume tectonics led to major juvenile additions and volumetric growth of continents. Subduction-generated arcs and plume-generated oceanic plateaus were the principal mechanisms. Most continental crust formed in three tectonic environments related to plate tectonic cycles:1. Formation of accretionary orogens by arc and oceanic plateau magmatism (komatiites) in: Birimian, W. Africa (2.1 Ga), SW. U.S.A, Yavapai (1.8-1.6 Ga), Arabian-Nubian Shield (ANS) (1.0-0.5 Ga), Cadomian, NW Europe (0.6-0.5 Ga), early (0.75-0.54 Ga) Altaids. 2. Formation of supercontinents at 2.5 Ga, 1.6-1.5 Ga, and 1.0 Ga (Rodinia). Incorporation of MORB-basalts, island arcs, oceanic plateaus and ocean island basalts within collisional orogens. e.g.1.9 Ga Amisk belt in Trans-Hudson orogen. 3. Break-up of supercontinents as a result of mantle upwellings at 2.4-2.1 Ga, 1.5-1.3 Ga and 1.0 Ga. Products were: plateau basalts (Circum-Superior Province, 1.96 Ga; Coppermine River, N. Canada 1.27 Ga; in Mid-Continent Rift, USA 1.1 Ga); giant mafic dyke swarms (worldwide at 2.4-2.0 Ga; Gardar, S. Greenland 1.2 Ga; Sudbury-Mackenzie dykes 1.2 Ga; Grenville dykes 590 Ma); anorogenic magmatism, USA on margin of Grenvillian ocean 1.5-1.3 Ga; carbonatites and alkaline complexes in continental rifts (Gardar, 1.3-1.0 Ga; Kola Peninsula, 0.6 Ga).Underplating of continental crust by mantle-derived melts may lead to crustal anatexis and growth. Proterozoic ophiolites were minor crustal additions, but diagnostic indicators of plate accretion (Portuniq, Canada, 2.0 Ga; Jormua, Finland, 1.95 Ga; Paysan, Arizona, 1.73 Ga; N. Zimbabwe; 1.4 Ga; ANS, 1.0 Ga; Bayanhongur and Tuva, Central Asia, 569 Ma).