L6 Early Archean plate tectonics < terrains >

In layman's terms? I'm afraid I don't know any layman's terms. —Nick Downes.[1]

Accretion has included the addition of allochthonous (arrived from some remove) island arc *terranes*, beginning before the Late Archean. However, any Archean shield rocks will have formed by mechanisms and processes different for a then steeper (increase of temperature with depth) geothermal gradient.

The gneiss belts and the greenstone belts in Early Archean shield remnants could be autochthonous (formed in place) and should be referred to by the neutral term *terrains* (to avoid the inference that they are allochthonous). What is lacking is clear evidence that granite-gneiss domes in Archean greenstone belts were related to subduction. Craton stabilization is preceded by both widespread within-crustal melting attendant upon subcrust delamination that produces late anorogenic intrusions[2] and the diapiric rise of gneiss belts between, and of granite-gneiss domes in, greenstone belts. Concomitant regional-load induced sagduction (subsidence) of the greenstone formations at low metamorphic grade made of them structural synclinoria.

The great thickness of basaltic pillow lavas in the Archean tells us that the oceans were early deep. Compared to the volume of volcanics, Early Archean sediments are of small abundance. They are typically immature and clastic quartz is not common. Evidently (as quartz and carbonate platform-sediments are absent), the Early Archean was an island-festooned ocean world without cratoned continents. Maarten J. de Wit in 1992 reasoned that the granitoid-greenstone terrains that formed during the Early Archean could be the end product of intra-oceanic obduction of hydrated oceanic crust. The vast amounts of rising tonalite-trondhjemites (***Footnote L6.1***) and associated calc-alkaline extrusives are in any model magmatic differentiates. In their generation, the more mafic component of the rock that differentiated would have been left behind at depth (***Figure L6.1***). De Wit hypothesized that the earliest Archean continent terrains originated as imbricated (piled-up, obducted) thrust sheets of hydrated (where formed at the mid-ocean ridge), thin, oceanic lithosphere (***Figure L6.2***). Sheeted dikes (which form by sea-floor spreading and accretion during horizontal movement at divergent plate boundaries) are part of 3.8 Gy ophiolites within the Paleoarchean Isua supracrustal belt.[3] ❑

Footnote L6.1 *Trondhjemite* (also spelled: *trondjemite*, *trondheimite*), name derived from Trondhjem, Norway, is a light-colored plutonic igneous rock primarily composed of sodic plagioclase (especially oligoclase), quartz, sparse biotite, and little or no alkali feldspar; or is a *leuco-quartz diorite* when oligoclase is its sole feldspar.[4]

Figure L6.1 [5] An Archean terrain is the culminating product of differentiation in which continental-like crust rises buoyantly leaving at depth a lithospheric keel of peridotite-eclogite.