Longevity of Archean oceanic environments – insights from the Ilomantsi greenstone belt

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There is continuing, vigorous and convective debate over the viability and nature of plate tectonic processes in the Archean time. Theoretical considerations of thermal and physical boundary conditions for the early earth have promoted the concepts of thick, buoyant oceanic lithosphere that is inherently difficult to subduct, combined with rapid recycling of abundant, small plates. The Kaapvaal and Pilbara cratons reveal that some stable cratonic environments existed from at leat 3.0 Ga but is there evidence to constrain the longevity of oceanic crust prior to recycling?

Recent dating of volcanic and sedimentary sequences and intruding orogenic pluton rocks in the Ilomantsi greenstone belt have confirmed a clustering of eruptive ages at about 2.89 Ga and 2.75-2.73 Ga. There is as yet no evidence to suggest deformation and metamorphism of the older, 2.89 Ga Kovero greenstones prior to eruption and deposition of the younger, 2.75 Ga Hattu assemblages, nor is there evidence to support the tectonic juxtaposition of two totally different terrains. The simplest scenario is one where Archean oceanic crust – or at least mafic to ultramafic volcanism on a submarine substrate at 2.89 Ga, remained submerged and undisturbed for about 150 Ma, until it was juxtaposed with a rapidly evolving volcanic and plutonic terrain heralding the onset of orogenic consolidation between 2.75-2.70 Ga. How does this differ from areas in the modern Pacific Ocean where ocean floor of Jurassic age is approaching active convergent margins?