

How to make continents from oceanic arcs

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Where the crust is thin, melting occurs at relatively low pressures in the mantle wedge producing andesitic magmas. Where the crust is thick, melting pressures are higher and only basaltic magmas tend to be produced (Tamura et al., 2016, Scientific Reports). Many different models of continental growth rate have been proposed. The implication of this hypothesis is that the rate of continental crust accumulation, which is andesitic in composition, would have been greatest soon after subduction initiated on Earth, when most crust was thin.

In a hotter early Earth, however, the extents of melting were higher in mantle plumes, beneath spreading ridges, and in arcs. If so, the crust in such settings was generally thicker, rather than thinner, compared to the present day. Another implication of this hypothesis is that the production of continental crust might have been impossible in the early Earth if the oceanic crust had been thick. Why are the oldest rocks 4 Ga? Where had the rocks of Hadean gone? We haven't had continental crust before 4 billion years because of the thick crust, thus the older rocks had returned to mantle by plate tectonics.

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