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## Generation of Archean Granitoids by Subduction, not Sagduction, and an Early Onset of Plate Tectonics

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Many recent studies conclude that plate tectonics started about 3 billion years ago in the mid Archean. A transition from a "pre-subduction" regime to modern plate tectonics is said to be marked by trace element ratios or isotopic compositions that monitor the rate of growth of the continental crust, the appearance of eclogitic inclusions in diamonds, or an apparent change in the composition of the upper crust. Behind these arguments is the notion that, early in Earth history when the mantle was hotter, subduction was intermittent or impossible. If so, a mechanism other than subduction must have created the granitoid rocks that dominate Archean continental crust. One alternative, commonly referred to as "sagduction", proposes that the base of thick oceanic crust founders and partially melts to generate granitic magma. Here we evaluate the sagduction process, starting by discussing two crucial concepts: 1) to generate granitic magma requires that water and basalt is taken deep into the mantle, 2) thick oceanic crust is internally differentiated, with hydrated basalt being restricted to the uppermost layers. Our numerical modelling shows that any deformation within thick, differentiated crust is restricted to the lowermost layers of mafic-ultramafic cumulates which lack the ingredients essential for the generation of granitic magma. Hydrated basalts, the required source material for high-volume granitic magmas, have too-low densities and too-high viscosities to be dragged to depths where melting might take place. We find that the sagduction model is flawed, consider unpersuasive the arguments for an Archean "pre-subduction" regime, and conclude that plate tectonics operated from the beginning of the Archean.