Modern plate tectonic cycles are inherited from Hadean mantle convection

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Earth’s oldest preserved crustal archive, the Jack Hills zircon of Western Australia, has been controversial to interpret in terms of the onset of plate tectonics. Here we conduct time series analysis on hafnium isotopes of the Jack Hills zircon and reveal an array of statistically significant cycles that are reminiscent of plate tectonics, i.e., subduction. At face value, such cycles may suggest early Earth conditions similar to today—the uniformitarian “day one” hypothesis. On the other hand, in the context of expected secular changes due to planetary evolution and geological observations, the cycles could instead imply that modern plate tectonic subduction inherited convective harmonics already facilitated by an early phase of stagnant-lid delamination—the “lid-to-plates” hypothesis. Either way, any model for the initiation of plate tectonics must begin in Hadean time.