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# Plate tectonic–like cycles since day one: Possible interpretations of Hadean geodynamics

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Interpretation of Earth's oldest preserved crustal archive, the Jack Hills zircon of Western Australia, has been controversial in terms of the onset of plate tectonics. 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-tectonic subduction. At face value, such cycles may suggest early Earth conditions similar to those of today—the uniformitarian hypothesis that plate tectonics was essentially operational since "day one". 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 mantle convective harmonics already facilitated by an early phase of stagnant-lid delamination—the "lid-to- plates" hypothesis. Either way, any model for the nature of plate tectonics must incorporate conditions operating during Hadean time, either by initiation of plate tectonics then or by later inheritance of preexisting cycles of mantle convection.