



Decoding Earth's rhythms: modulation of supercontinent cycles by longer superocean cycles

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The supercontinent cycle of episodic assembly and breakup of almost all continents on Earth is commonly considered the longest period variation to affect mantle convection. However, global zircon Hf isotopic signatures and seawater Sr isotope ratios suggest the existence of a longer-term variation trend twice the duration of the supercontinent cycle. Here we propose that since ~ 2 Ga the superocean surrounding a supercontinent, as well as the circum-supercontinent subduction girdle, survive every second supercontinent cycle. This interpretation is in agreement with global palaeogeography and is supported by variations in passive margin, orogen, and mineral deposit records that each exhibits both ~ 500 – 700 Myr periodic signal and a 1000 – 1500 Myr variation trend. We suggest that the ca. 600 Myr supercontinent cycle is modulated by a ca. 1.2 Ga superocean/subduction girdle cycle, featuring a supercontinent assembly that alternates between dominantly extroversion after a more complete breakup, and dominantly introversion after an incomplete breakup of the previous supercontinent.