



Back to the Future 2: Tidal modelling of four potential scenarios for the next Supercontinent gathering

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Deep time investigations have revealed that supercontinents formed periodically over Earth history. The dispersal and aggregation of supercontinents led to the opening and closing of oceanic basins, e.g., the Atlantic, which formed as the result of the breakup of the latest supercontinent, Pangea. Recently, we explored how the next supercontinent will form, and we showed that there is a link between the supercontinent cycle and the intensity of tides. A good example of this Super-tidal cycle is found in the Atlantic Ocean, which was microtidal after its inception, only to host the largest tidal ranges on Earth over the past 2 Ma. This is because the Atlantic is currently close to the right width to allow harmonic resonance of the dominating semi-diurnal tide. The continued opening of the Atlantic in the future will move the ocean out of resonance, leading to weakening of the tides regionally and globally. Consequently, there is a super-tidal cycle associated with the supercontinent cycle.

Here, we have used an established tidal model to simulate the evolution of the global tides for the next 250 Ma. Four different tectonic scenarios are proposed to answer the question above. All four scenarios confirm that the Atlantic will move out of resonance in the next 20 Ma, and the basins will take turns to become resonant. As the next supercontinent gathers the tides decrease globally in all scenarios, showing that Earth's tides are near the equilibrium tides during a supercontinent. This shows that there is a fundamental link between tectonics and Earth's tidal evolution with profound implications for the ocean's energy budget, which in turn will likely control the intensity of ocean circulation, extreme climate events, nutrient dispersal, the potential for the ocean to evolve and host life, and Lunar recession rates.

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