



## **Future Earth: Testing different scenarios for the next supercontinental gathering and implications for supertidal cycles.**

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One of the conundrums in plate tectonics is what the next supercontinent will look like. The idea of the existence of the past supercontinent Pangaea was a key element in the concept of continental drift proposed by Alfred Wegener. This implied that the Atlantic Ocean formed as a consequence of the breakup of Pangaea. During the advent of the plate tectonic theory, Tuzo Wilson proposed that the “Atlantic” had in fact closed and re-opened. This led to the concept of the Wilson Cycle, which states that oceans have a lifetime: they open, spread and close. Eventually, scientists came to realise that Pangaea was not the first supercontinent on Earth but that other supercontinents have existed in the past (e.g., Rodinia). They also recognized that their aggregation was somewhat cyclical, which led to the concept of the Supercontinental Cycle.

Having this in mind, we can envisage that a new supercontinent will form in the future. Several proposals have been made regarding the different ways that this could happen. In this work, we have revisited four of these future scenarios: Pangaea Proxima (by closing the Atlantic), Novopangea (closing of the Pacific), Aurica (closing of both Atlantic and Pacific), and Amasia (closing neither the Atlantic nor the Pacific). We have done this by reproducing these different scenarios using the same software (GPlates) and the same initial and boundary conditions. This allowed a new comparative analysis between the different models testing their tectonic plausibility.

We have used these tectonic models as boundary conditions in OTIS, a well-established dedicated tidal model, to test the idea that the ocean is currently in a tidal maximum due to resonance in the Atlantic. This work further showed that the tidal amplitude (and dissipation) in the Atlantic, has remained relatively weak since the breakup of Pangaea, and will progressively become weaker once the Atlantic passes this resonant phase. This supports the existence of a Super-tidal Cycle associated with the Wilson Cycle and the Supercontinental Cycle.