# Geologic study suggests Earth's tectonic activity peaked 1.1 billion years ago

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(Phys.org) —A pair of Australian researchers studying rock samples has found evidence to suggest that the Earth's tectonic plate activity peaked approximately 1.1 billion years ago. In their paper published in the journal *Geology*, Martin Van Kranendonk and Christopher Kirkland describe the results of their analysis of a multitude of rock samples from various sites around the world.

Scientists agree that the Earth's tectonic plates have been shifting for at least 3 billion years, but no one really knows whether such shifting has been getting more or less active. In this new effort Kranendonk and Kirkland undertook an exhaustive study of rock samples to learn more.

The two first looked at 3200 samples of rocks collected by various researchers over the years, taken from various points around the world. Specifically, they were looking for the amount of zirconium and thorium in them—both have been found to be more common in rocks that were formed during tectonically active periods. Next they looked at an additional 1200 rock samples, this time looking for oxygen isotopes, which are also known to be more common in rocks created during times of high tectonic activity.

In analyzing the data obtained from studying the rocks, the researchers found evidence that suggests that tectonic activity increased from a time approximately 3 billion years ago. That activity continued to increase, they say, for 2 billion years, peaking around 1.1 billion years ago—a time during which all of the continents had merged into one supercontinent called Rodinia. Since that time, they note, it appears that tectonic activity has been slowing. This suggests that the planet has a lifespan.

The rocks can't offer any evidence to explain why there was an increase in activity or why it has been slowing after peaking, but the researchers have a theory—they believe that prior to the increase in tectonic activity, tectonic plates the world over became thicker, and likely larger. This meant collisions between plates would have been far more violent than before. As the Earth cooled off, the plates would have moved slower causing less activity overall. These new findings also suggest that at some point the Earth's plates will stop moving altogether—though how long that might take is still a mystery.

**More information:** Orogenic climax of Earth: The 1.2–1.1 Ga Grenvillian superevent, *Geology*, First published online April 29, 2013, doi: 10.1130/G34243.1

**Abstract**

The rate of growth of the continental crust is controversial. We present an evaluation of time-constrained analyses of oxygen isotopes in zircon grains and incompatible element (Zr, Th) concentrations in magmatic rocks to test for variations in the degree of crustal recycling through geological time. The data indicate a rise in these geochemical proxies from ca. 3.0 Ga to a statistically significant peak at 1.2–1.1 Ga during the amalgamation of supercontinent Rodinia, and a decrease thereafter. When combined with other geological and geophysical observations, the data are interpreted as a consequence of an unprecedented level of crustal recycling and sediment subduction during Rodinia assembly, arising from a "Goldilocks" (i.e., just right) combination of larger, thicker plates on a warmer Earth with more rapid continental drift relative to modern Earth. The subsequent decrease in δ18O, Zr, and Th measurements is interpreted to reflect decreasing drift rates on a cooling Earth.

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