

# Earth's tectonic plates have doubled their speed

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Crust forming faster? (Image: Alex Mustard/naturepl.com)

SO MUCH for slowing down as you age. Earth's tectonic plates are moving faster now than at any point in the last 2 billion years, according to the latest study of plate movements. But the result is controversial, since previous work seemed to show the opposite.

If true, the result could be explained by another surprising recent discovery: the presence of more water within Earth's mantle than in all of the oceans combined<sup>[1]</sup>.

Plate tectonics is driven by the formation and destruction of oceanic crust. This crust forms where plates move apart, allowing hot, light magma to rise from the mantle below and solidify. Where plates are being pushed together, the crust can either rise up to form mountains or one plate is shoved under the other and is sucked back into the mantle.

The planet's inner heat powers plate tectonics. That heat is ebbing away as Earth ages, and this was expected to slow plate motion. A study last year by Martin Van<sup>[2]</sup> Kranendonk at the University of New South Wales in Sydney, Australia, and colleagues

measured elements concentrated by tectonic action in 3200 rocks from around the world, and concluded that plate motion has been slowing for 1.2 billion years<sup>[3]</sup>.

Now Kent Condie<sup>[4]</sup>, a geochemist at the New Mexico Institute of Mining and Technology in Socorro and his colleagues have used a different approach and concluded that tectonic activity is increasing. They looked at how often new mountain belts form when tectonic plates collide with one another. They then combined these measurements with magnetic data from volcanic rocks to work out at which latitude the rocks formed and how quickly the continents had moved.

Both techniques showed plate motion has accelerated. The average rate of continental collisions, and the average speed with which the continents change latitude, has doubled over the last 2 billion years (*Precambrian Research*, doi.org/vbv<sup>[5]</sup>).

"We expected to find that the average speed would be slowing down with time, but we didn't get that. Both speeds were going up," says Condie. "It was a surprise."

Condie thinks the mantle's huge store of water could explain the finding. When crust sinks back into the mantle, oceanic water gets sucked down too, and although most comes back to the surface in volcanic emissions, over the aeons the store of water in the mantle has grown vast.

Some of this water forms hydrous minerals that essentially make the mantle more runny, says Condie, speeding up the flow of rock. The effect is strong enough to overcome the stiffening of the mantle caused by the gradual cooling inside Earth, he says.

Peter Cawood<sup>[6]</sup> at the University of St Andrews in the UK thinks the work is interesting and provocative. "The overall increase in the rate of plate motion with time seems real and believable," he says, and could well be linked to changes in the mantle's water content – although convincing sceptics that plates move faster now will be difficult without more data, he adds.

Van Kranendonk is not ready to change his mind. "Our paper documents<sup>[7]</sup> a reduction in the rate and volume of crustal recycling for 1.2 billion years, supporting the idea that plate tectonics actually has been slowing down since that time," he says.

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