

Study Shows Motion of Earth's Plates Consistent for 40 Million Years

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A recent study at the University of Missouri-Columbia may impact the way scientists look at history. The study, which examined the relationship between plate tectonics (movement of the broken pieces of Earth's rigid outer shell) and hotspots (areas of sustained volcanism) provided evidence that the motion of Earth's plates has remained the same for the past 40 million years. Previously, scientists had proof from only the past 3 million years.

"This means that now we have enough confidence to say that 40 million years ago, the plates were moving in approximately the same way they are today," said Mian Liu, MU professor of geological sciences in the College of Arts and Science. "Direct evidence for constructing a plate motion model is available only for the past 3 million years. Our study allows us to extend the history of plate motions with greater certainty."

Liu and Shimin Wang, MU postdoctoral fellow in geological sciences, tested a hypothesis developed by geophysicist William Jason Morgan in the early 1970s. Morgan theorized that there had been no major reorganization of plates in the past 40 million years and that hotspots remained fixed relative to each other. Morgan's propositions have become two main pillars for modern research of plate tectonics. Wang and Liu's findings support Morgan's assumption about plate reorganization, but reject his proposition that hotspots are fixed.

"Our findings give us a better idea of what happened in the past," Liu said. "This information is useful to geologists as well as researchers in

many other fields, from climate change to animal migration, because all of these things are affected by how the configuration of Earth's surface has changed in the past due to continued plate motion."

For the past 30 years, hotspots were assumed to be fixed, which allowed scientists to use them as reference points for measuring absolute plate motion, the motion of plates relative to Earth's deep interior. However, this convenient reference framework has been shaken by increasing recent evidence pointing to the possibility that hotspots are moving. Liu and Wang's findings confirm that hotspots are not fixed, but also show that hotspots can continue to serve as a useful framework for absolute plate motion because they move in a consistent and predictable way.

"Statistical compatibility tests show that hotspots have moved, but their movement has not been arbitrary. They move in a special way: opposite to plate motion. That means that scientists can continue to use hotspots as reference points, although we must now think of them in a different way," Wang said. "The surface of our earth moves in a simple and beautiful way. Our research answers some confusing questions and clarifies the relationship between plate tectonics and hotspots. This sets up the main framework for plate tectonics and enables us to better reconstruct the Earth's changing surface."

Wang and Liu's study was published in the June issue of the journal *Geology*.

Source: University of Missouri-Columbia

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