Australian discovery solves mystery of the Andes

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A research team led by an ANU scientist has solved the mystery behind the formation of the Andes by discovering how the jostling of tectonic plate boundaries affects geological formations.

It's been known for some time that the Andes mountain range in South America sits above a subduction zone, where one tectonic plate is sinking below its neighbouring plate. But until now, it hasn't been clear how such a movement could result in the upward thrust that created the Andes.

The researchers' findings were published in *Nature* today.

"It's commonly understood that large mountain ranges occur when one continent collides with another," explained team leader Dr Wouter Schellart from the Research School of Earth Sciences. "This kind of collision is responsible for the Himalayas, which have resulted from the Indian continent pushing up into Asia. But there's no continent butting up against South America, so we needed to find a different explanation for the Andes."

Using the modelling power of supercomputers, Dr Schellart and his colleagues Dr Justin Freeman at ANU and Dr Dave Stegman, Professor Louis Moresi and Mr David May at Monash University in Melbourne discovered that just as tectonic plates move, so too do the boundaries between them. As a subducting plate is drawn downward by gravity, it forces the boundary between the subducting plate and overriding plate to

move. This means the boundaries between tectonic plates are constantly changing shape.

The researchers found that the width of the tectonic boundary determines the speed and direction of its migration, which will effect whether a mountain range or an ocean basin forms above the activity. They also found that the width determines the shape of subduction zones, which thereby explains the curvature of deep ocean trenches that mark the surface expression of these subduction zones.

“So in the southwest Pacific, near New Zealand, the tectonic boundary is moving backwards very fast, in this case back towards the east. That causes the overriding plate to extend and form a deep basin,” Dr Schellart said. “But along the west coast of South America, the boundary is not moving backward very fast, and in the centre it’s actually moving forward very slowly. The overriding plate is moving toward the boundary itself. Hence you get compression, and the formation of the Andes.”

Dr Schellart said the tectonic boundary at the Andes can support such compressive behaviour because the zone is the widest of its kind on the planet, running for some 7,400 km. If the boundary fragmented, the upward thrust of the Andes would cease. But the team’s models predict that the world’s longest mountain range is likely to continue its upward thrust for thousands of years.

Source: Australian National University