# New insights on the origin of the Rocky Mountains

February 28 2011

Image: Wikipedia.

(PhysOrg.com) -- The formation of the Rocky Mountains in Colorado has always puzzled scientists. Some 600 miles inland and far removed from the nearest tectonic plate, the only comparable inland mountain range is the Himalaya, which scientists deduced were formed by the collision of the Indian plate with the Eurasian plate.

"But there really was no India slamming into North America," said Craig Jones, a research fellow of the Cooperative Institute for Research in Environmental Sciences (CIRES) and a professor of geological sciences at the University of Colorado at Boulder. "Just how the Rockies have formed is an enigma."

But now scientists have further insight into the solution of this mystery. Jones and his team of researchers have proposed a new model of the mountains' creation and published their results in the February edition of the journal Geosphere. Not only could their research explain the origin of the Rockies, it could also elucidate other geological phenomena: why a swath of gold, silver and other precious metal deposits stretches across Colorado, and why a marine basin deepened in the states of Colorado and Wyoming just before the Rockies rose. The sediments of this marine basin are the Pierre Shale, a layer of dark-gray shale lying along the Front Range of Colorado.

"Pierre Shale has this nasty tendency to bow up people's basements," Jones said. "Why more than a mile of this stuff was dumped into this area has been puzzling."

Previously scientists believed that the oceanic plate subducting - moving under - North America rose to rub against the continent's bottom all the way from the ocean to Colorado. The theory was this action pushed the landmass into mountains much like a rug piles up underfoot, said Jones. But the hypothesis just doesn't explain the facts, he said. "That model predicted removal of material that is still found to lie underneath California and Arizona," he said. "That in and of itself was unsatisfying."

The new model hinges on an unusually thick lithosphere – the stiff part of the Earth's surface that make up the tectonic plates – under Wyoming. The protrusion of this keel into more fluid mantle flowing below, created a suction that pulled down Southern Wyoming and Colorado and formed a basin, Jones said. This basin, or hole, in which Pierre Shale built up, amplified mountain-building forces far inland and forced the formation of the Rockies, he said. "A huge basin develops and all of a sudden these mountains come rocketing out of it," Jones said. "We end up with the counter-intuitive visage of mountains rising up out of a hole. "

The hypothesis, if confirmed, could not only unravel the geological origin of the Rockies, but could also illuminate the mechanisms that have led to mountain ranges worldwide. "We are adding a new collection of processes that can control how mountain belts develop that previously haven't really been appreciated," Jones said. "Considering these processes might explain other puzzling mountain belts."

Coauthors on the study include Lang Farmer of CIRES and the University of Colorado, Shijie Zhong of the University of Colorado, and Brad Sageman of the Department of Earth and Planetary Sciences, Northwestern University. The study was supported by the National Science Foundation and is published online in the journal *Geosphere*.

**More information:** Hydrodynamic mechanism for the Laramide orogeny, geosphere.gsapubs.org/content/7/1/183.abstract

Provided by University of Colorado at Boulder