Inside the tectonic wake of a migrating restraining bend: Mount Denali—the highest mountain peak in North America

December 3 2021, by Thamarasee Jeewandara

Photographs of Mount Denali and Muldrow Glacier. Mount Denali (6194 m; 20,310 feet; formerly known as Mount McKinley). Denali Bend key, Mount Denali (6194 m; 20,310 feet; formerly known as Mount McKinley) and the Mount McKinley restraining bend. Photo credit: Jeff A. Benowitz, Wiley Terra Nova, doi: 10.1111/ter.12571

In their recent publication, "Why is Denali (6,190 m) so big? Caught inside the tectonic wake of a migrating restraining bend," Jeff A. Benowitz and a research team from the University of Massachusetts

Amherst, Virginia Tech, and the South Dakota School of Mines and Technology in the U.S., documented the evolution of the Mount McKinley bend of the Denali Fault.

The researchers used scaled physical experiments, thermochronology, seismicity patterns and fault slip rate data to come up with a whole new geologic process to explain the geo-enigma of Mount Denali and Mount Foraker (5304 m), which had hitherto baffled researchers for generations. Primary author of the study Jeff A Benowitz describes Denali, previously also known as Mount McKinley, as an albino moose of the Alaska Range, taller by three thousand feet and broader than all other peaks of the Range.

Moreover, this is the highest peak in North America. Metrologists have often claimed that the mountain is big enough to create its own weather. According to Dr. Benowitz, "Famous artists, the like of Sydney Laurence, Ansel Adams and even Bob Ross, have been drawn to capture the light and shadows of Denali's glaciated slopes."

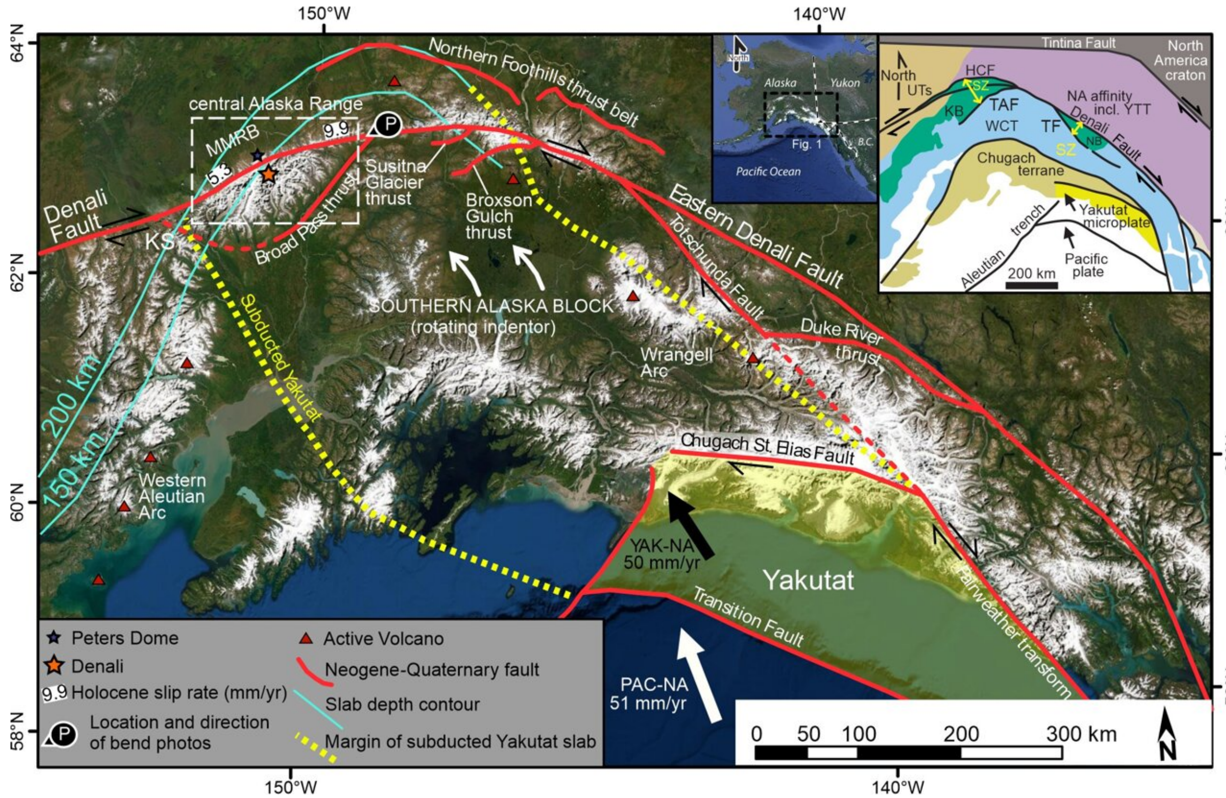
The heights of Denali have fascinated geologists for more than 100 years , and geologists have described and named the fissure running along the north base of the Mountain, as the Denali Fault, and linked the topographic development of the Alaska Range with the geological structure. The study is now published in *Wiley Terra Nova*.

The geo-enigma of Mount Denali

The broad Denali massif (20,310 feet) is a geo-enigma since its located along the Denali Fault, which is a strike-slip fault geologic structure with primary horizontal motion, much like the San Andreas. Kinks or restraining bends along strike-slip faults can lead to the creation of mountains as these geometric features lead to the transfer of a component of the horizontal motion into a vertical component and

Denali is located within the Mount McKinley restraining bend.

However, topography along strike-slip fault restraining bends is theoretically self-limited by erosion and translation of crustal blocks through regions of focused vertical tectonics. The unusual topographic high of the region is further highlighted by how such a mountain could form along a fault bend itself given the transient nature of these features and how they should not persist for millions of years as it has thus far. In this work, a team of interdisciplinary scientists discovered and documented a new geologic process, migrating low-angle restraining bends, and highlighted characteristics of these bends to provide tests to find out if other regions of extreme topographic elements along strike-slip faults were also products of migrating restraining bends. To accomplish this, Jeff A. Benowitz, a multiple-Denali summiteer himself, acquired funding from the National Science Foundation, and assembled a team of physical modelers, structure geologists, neotectonic researchers and a glaciologist to address this scientific "whatdunnit."



Satellite image of south-central Alaska showing the locations of Neogene-Quaternary fault systems discussed in the text, subducted and un-subducted portions of the Yakutat microplate, active volcanoes (

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