Geophysical Research Abstracts, Vol. 9, 02918, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-02918

The Mesozoic–Tertiary Caribbean plate boundary in Guatemala–Honduras: first-order temperature-deformation-time history

Lothar Ratschbacher (1), Uwe Martens (2), Raik Bachmann (1,3), Leander Franz (1,4), Myo Min (1), Michael O. McWilliams (2), Bodo Weber (5), Bruce K. Nelson (6), **Konstanze Stübner** (1)

(1) TU Bergakademie Freiberg, Germany, (2) Stanford University, California, USA, (3) GeoForschungsZentrum Potsdam, Germany, (4) Universität Basel, Switzerland, (5) CICESE, Ensenada, Mexico, (6) University of Washington, Seattle, USA

(konstanze.stuebner@geo.tu-freiberg.de)

Scope

Transform fault zones are little studied in their long-term horizontal and vertical displacement history mostly due to their submerged nature. Spectacular exceptions are the few continental transforms, i.e. the San Andreas Fault Zone of California and the Alpine Fault of New Zealand. Similarly spectacular, but little studied, is the Polochic-Motagua Fault Zone, comprising the northern boundary of the Caribbean Plate in Guatemala and Honduras. Our ongoing research focuses on the long term partitioning of horizontal and vertical displacements along mega-strands that comprise these fault zones.

Polochic-Motagua Fault Zone

Extending from the Pacific Ocean to the Caribbean Sea for about 400 km E-W and 80 km N-S, the exposure of the Polochic-Motagua Fault Zone within continental crust of southern North America and northern Central America allows quantitative structural, petrologic, and thermochronologic studies. The fault zone represents a complex Late Mesozoic-Tertiary transpressional-transtensional system that exhibits spectacular topographic differences ($>$2.5 km).

Results

SHRIMP and TIMS U/Pb zircon geochronology demonstrates Grenvillian orthogneisses ($\sim$1 Ga) in the Sierra de Chuacús (Chuacús complex of the "Maya Block") between the Polochic and Motagua Fault Zones. Silurian–Devonian (420–407 Ma) ages are likely magmatic and correlate the Chuacús complex with peraluminous intrusions in the Maya Mountains of Belize and Mexico. Migmatitic Chuacús paragneisses yield Triassic metamorphic ages (240–210 Ma) that are coeval with anatexis in the basement of Chiapas, southeastern Mexico. Connecting the Chiapas and the Chuacús Blocks yields $>$200 km of post-Triassic sinistral offset along the Polochic Fault Zone.

New U/Pb crystallization, and Rb/Sr and Ar/Ar cooling ages and apatite fission-track data highlight a regionally consistent syn-kinematic intrusion cooling/exhumation history of the crustal blocks along the Polochic-Motagua Fault Zone. The Chuacús Block, rimmed by the Polochic and the Motagua Fault Zones, cooled through $\sim$800–250°C in the Late Cretaceous, $\sim$40 Ma earlier than the Chortis Block (Las Ovejas unit) south of the Motagua Fault Zone. Similarly, cooling through $\sim$100°C is $\sim$15 Ma earlier in the Chuacús complex than the Las Ovejas unit. Apparently, vertical and horizontal displacements were spectacularly partitioned along the Polochic-Motagua Fault Zone: the Chuacús complex was heated to high amphibolite-grade metamorphism and cooled rapidly to upper crustal temperatures during the Cretaceous; we speculate that this occurred during and after sinistral transpressive emplacement of the Caribbean ophiolite sheet. The Chortis Block apparently lacks a significant Cretaceous thermal-tectonic history; its cooling seemed to have been steady-state at $\sim$30°C/Ma. The Oligocene-Recent evolution of the Las Ovejas unit seems to track the major eastward displacement of the Caribbean Plate contemporaneous with the formation of the Cayman Trough.