Intro to the Geology & Paleontology of Panama

Aaron R. Wood, PhD

Smithsonian Tropical Research Institute

Florida Museum of Natural History

Baru Volcano, Chiriqui Province

Gaillard Cut, Panama Canal

San Blas Mountains, San Blas Province
Panama Today
Million years ago

- 65.5 Million years ago
  - Cretaceous
  - Cooler / More ice

- 55.8 Million years ago
  - Paleogene
  - Warmer / Less ice

- 33.9 Million years ago
  - Tertiary
  - C3 → C4

- 23.0 Million years ago
  - Neogene
  - Uplift & exhumation of intrusive igneous bodies due to impact with South America

- 2.6 Million years ago
  - Quaternary
  - Volcanic arc development during plate subduction

Modifications from Walker and Geissman (2009)
Culebra Fm.
A Cosmopolitan Fauna

Rhinocerotidae

Equidae

Protoceratidae

Camelidae
New exposures along the canal

- Light-colored, layered lapilli tuff
- Purple and yellow ash tuff
- Green lapilli tuff
- Grey tuffaceous sandstone, layered

Seismic profile with scale bar indicating ~5 m.
Exposures in 10-20 years

?
Prospecting beneath the lava flows

The volcanic rocks above our most productive fossil localities provide clues about how the Panama Canal Basin was formed.
65 million years ago
Zircons and thermochronology

Zircons form in intrusive magmatic bodies and contain radioactive elements.

Above a certain temperature, emitted particles leave no tracks.

Below that temp, emitted particles leave distinguishable tracks that can be measured to determine time since cooling.
Hydrous melting at subduction zones

Magmas produced in this way have **high** concentrations of fluid mobile elements

Decompression melting

Magmas produced in this way have **low** concentrations of fluid mobile elements

Fission track thermochronology of Panama-Colombian intrusive rocks

Fission track results show intrusives were all uplifted and cooled between 20 -30 million years ago.
Geochemical evidence for switch from hydrous melting to decompression melting in Canal Basin

Farris et al (2011)
Reconstructed tectonic plate movements

A. 38 million years ago

B. 30 - 20 million years ago

C. 10 - 4 million years ago