Graduate Student Pop-ups

1 Minute Poster Previews
The Role of Obliquity in Rift Localization: Example of the Northern Gulf of California

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ROLE OF RIFT OBLIQUITY

COASTAL SONORA FAULT ZONE & NE ISLA TIBURON

Initiated ca. 7 Ma, waning by 6 Ma
15.7 km of shear @ 294°
Rocks don't match (10 - >100 km slip)

LA CRUZ FLAT, SW TIBURON

Marine rocks deposited - 4.1 Ma
<6.7 Ma rocks match (>20 km slip)
Strike-Slip faults:

Pre-Rupture Obliquity? Myr
1 km of shear per 1 Myr
(0.1-0.3 km)

Results support that rift obliquity, strike-slip faults may localize strain

Older (pre-7 Ma) shear zones east??

PRE-RUPTURE DEXTRAL SHEAR
When? How Much? Where?

Westward Migration of Extensional Basins
Aragón-Arreola & Martín-Barajas (2007)
Investigations into early rift development and geothermal resources in the Pyramid Lake fault zone, Western Nevada
Geochemistry and Geochronology of Miocene to Recent Volcanoes of the Northern Tanzanian Divergence Zone, East African Rift System

S. Mana, G.F. Moliel, M.J. Carr, T. Furman and C.C. Swisher III

Rifting at 1.2 Ma (Macintyre et al., 1974)

Higher degree of melting immediately precedes the rifting

Extremely Undersaturated magma series derives from a low degree of melting

Undersaturated magma series represents more intense degree of melting

Isotopes of Extremely Undersaturated and Undersaturated magma series are overlapped indicating similar sources
Seismic Reflection Study of the Salton Sea

Danny Brothers et al., 2009
Methods
+ Geologic Mapping
+ Stratigraphy
+ Tephrochronology
+ Tephrostratigraphy
Objectives

• Understanding the onset of rifting.
• Determining erosion Rates through time

Methods

Cosmogenic Nuclides: \(^{10}\text{Be}\) in river sediment
Thermochronology: (U-Th)/He on apatite from basement rocks
Breaching: a slope failure process that generates sustained turbidity currents

1. Breaching can occur in any dilative material, like silty sand on the head of submarine canyons.
2. The erosion rate of breaching is proportional to the coefficient of consolidation of the deposit.
Melt generation and extraction from the upper mantle as a magma source for rifting

Chris Havlin*, Marc Parmentier*, Greg Hirth* in collaboration with Nick Kusznir**
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An assessment of the ability of porous flow melt migration to supply magma for dike emplacement in the lithosphere at early and intermediate stages of continental rifting

For reasonable material parameters, reasonable extension rates (1 km/Myr)
Thermochronological evidence for diffuse rupture of continental lithosphere within the central Arabian margin of the Red Sea rift system

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RESEARCH OBJECTIVES

- central and northern Arabian rift flank unexplored in terms of low-T (U-Th)/He thermochronology research

- CARF geologic terrane occupies a critical position along the length of the RSR system that allows us to investigate the nature of the change in rift dynamics

KEY RESULTS

- Onset of lithosphere rupture phase ~23 Ma
  - began concomitantly along the near-full length of the Red Sea – Gulf of Suez system

- strain diffusion: AHe data shows the CARF subdivided into two primary structural domains (HFC and inboard)

- CARF terranes exhumed along numerous rift-parallel footwalls from pre-rift flank depths of ~1.5 – 3.9 km

- Continental Lithosphere Rupture Phase ~23 Ma
- ~200 km-wide zone delineates “deformed wedge” of diffuse extension in the CARF
- Strain Focusing Phase ~14 Ma
- deformational mechanics of SARF and CARF/ NARF fundamentally different