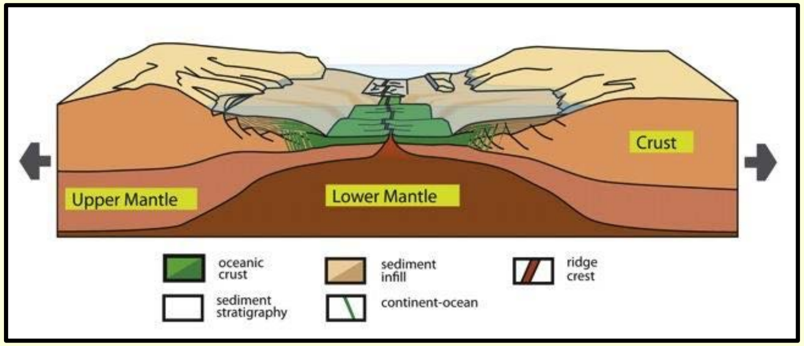
Science Highlights of the RCL Initiative

Rupturing
Continental
Lithosphere



Modified from a summary by
Rebecca Dorsey, University of Oregon

Original Goals:

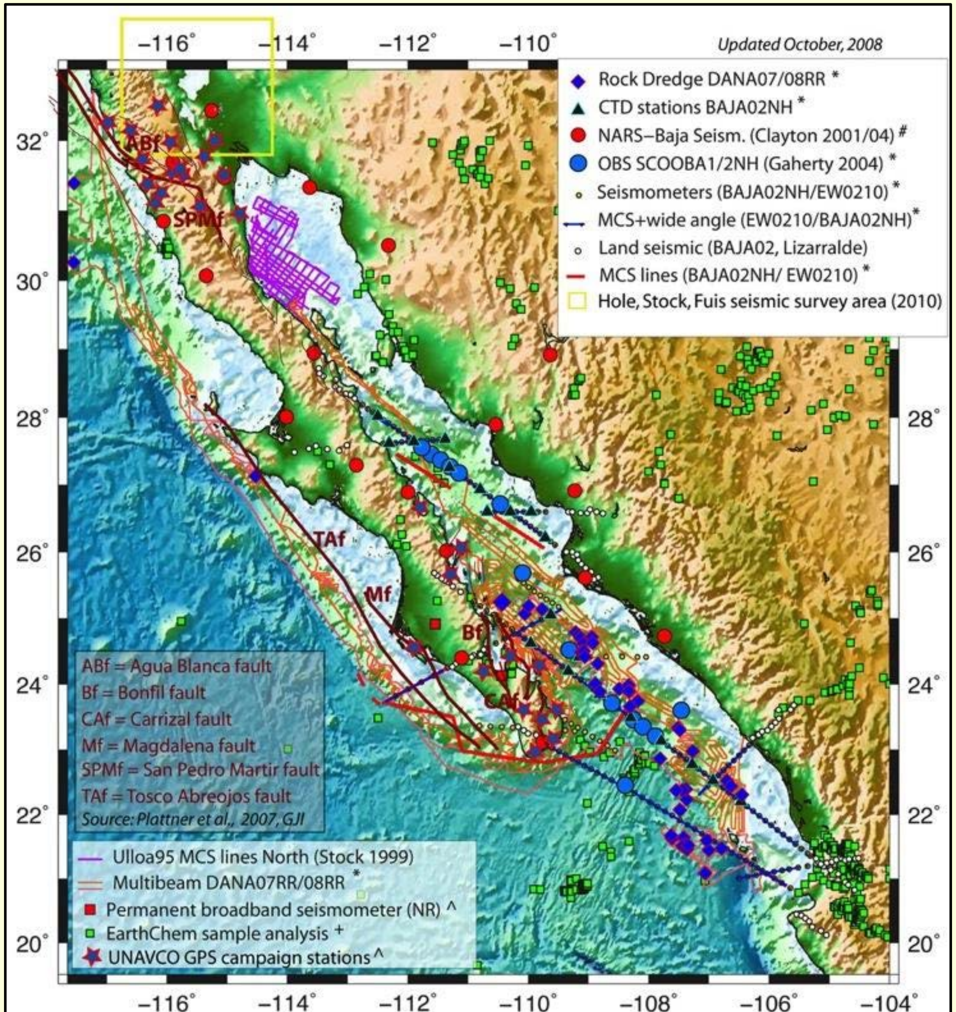
Understand spatial and temporal evolution of rifts.

Focus on key processes, state parameters and physical properties that control them

- Link properties, processes, observations, and modeling
- Observations: one orogenic rift (Gulf of California) and one cratonic rift (Red Sea)
- Use experiments and data to address 4 thematic questions (below)

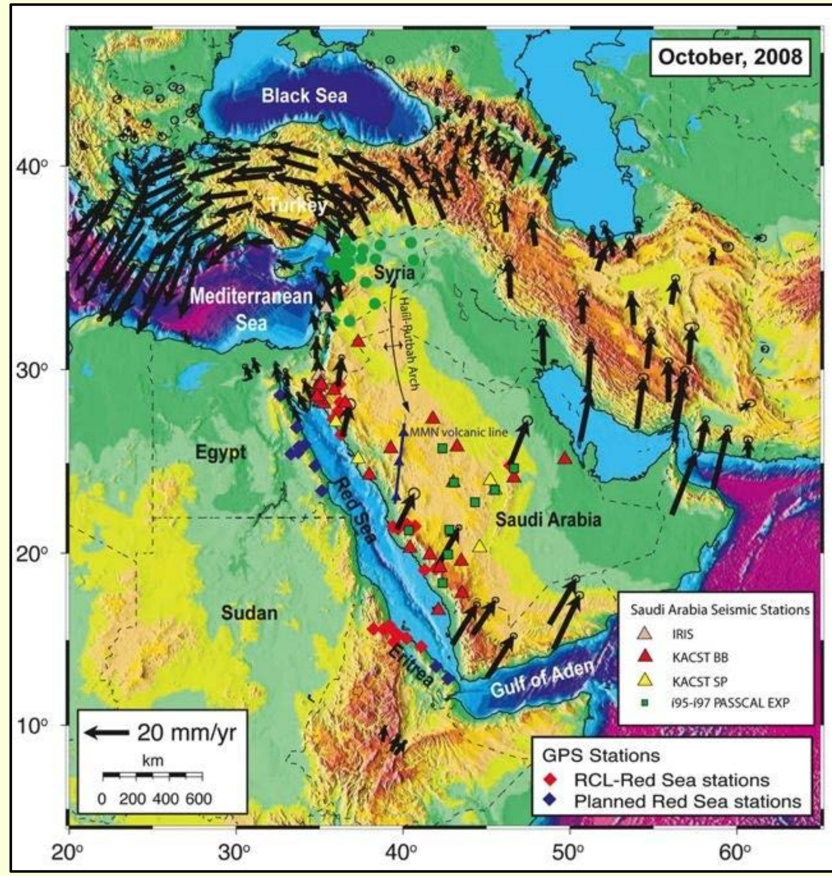
Two Focus Sites (and ancillary modeling studies)

Gulf of California / Salton Trough



* Source: MGDS MARGINS Data Server (www.marine-geo.org/portals/margins/)
\# NARS-Baja Project website: www.data.scec.org/NARS-Baja/
^ IRIS permanent Seismic Network/ UNAVCO sites through GeoMapApp WFS layer - (www.geomapapp.org)
\+ PETDB/GEOROC/NAVDAT databases from GeoMapApp - (www.geomapapp.org)

Red Sea Region



Source: MARGINS 2009 Review - RCL Summary
www.nsf-margins.org/Review2009/

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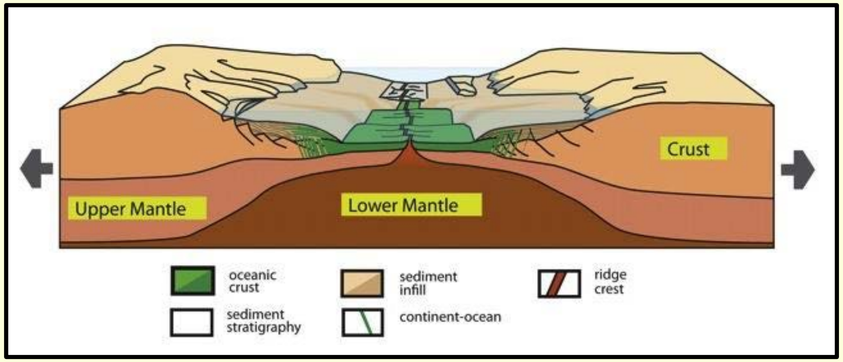


Summary by Rebecca Dorsey
University of Oregon

Original Scientific Questions

1. What forces drive rift initiation, localization, propagation and evolution ?
2. How does deformation vary in time and space, and why ?
3. How does crust evolve, physically and chemically, as rifting proceeds to spreading ?
4. What is the role of fluids and magmatism in continental extension ?

Science Highlights of the RCL Initiative

GAME CHANGERS: New results that change the way we think about continental rifting, rupture, and underlying controls

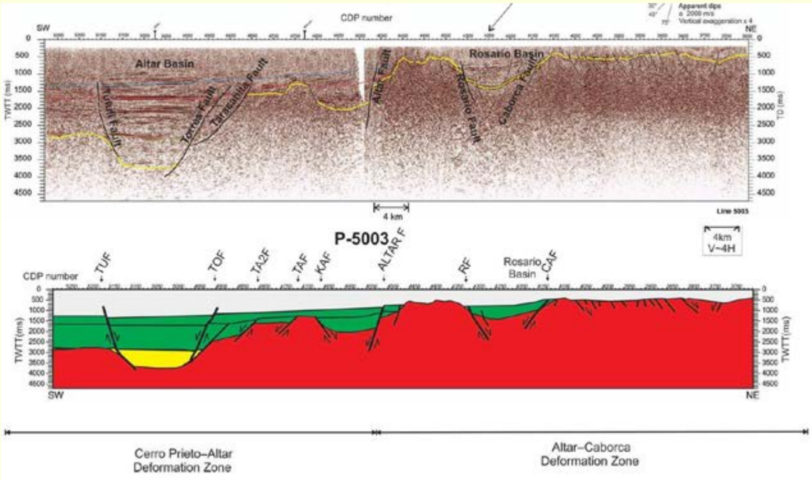
1. Styles of Extension Important factors:

(a) Different styles of extending the lithosphere

(b) Structural evolution of normal faults in rifts

(c) Pre-rift tectonic histories (subduction, collision)

(d) Faulting style controls shape of sedimentary basins



Science Highlights of the RCL Initiative

GAME CHANGERS: New results that change the way we think about continental rifting, rupture, and underlying controls

2. Role of Sedimentation

Sediments not just a passive record of earth history. Exert a direct control on rift process, magmatism, crustal composition, formation of ocean basins.

Includes critical link to interior fluvial system (Colorado River) – “source to sink”. Can create new type of hybrid crust at Ocean – Continent Transition.

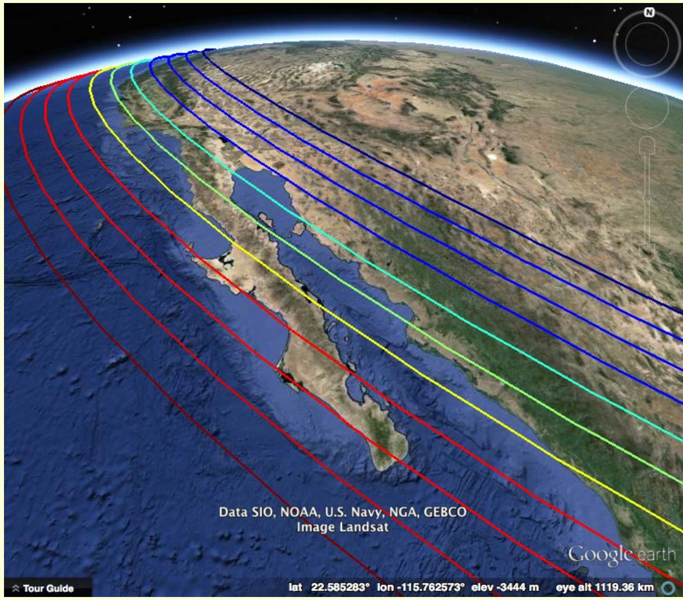
Science Highlights of the RCL Initiative

GAME CHANGERS: New results that change the way we think about continental rifting, rupture, and underlying controls

3. Role of Rift Obliquity Important factors:

(a) Oblique extension and strike-slip faults

(b) Relationship between the orientation of the rift and relative motion direction (° of obliquity)



(c) Rift obliquity affects resulting morphology of the rift zone (Gulf of CA vs. Red Sea)

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GAME CHANGERS: New results that change the way we think about continental rifting, rupture, and underlying controls

4. Role of Magmatism

Pre-rift volcanism depletes the upper mantle

- leads to less syn-rift magmatism

Less magma makes lithosphere effectively stronger, so deformation migrates (not localized).

This produces a WIDE RIFT zone and longer time to rupture.

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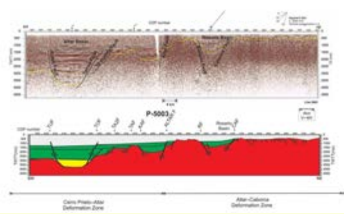
GAME CHANGERS: New results that change the way we think about continental rifting, rupture, and underlying controls



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