EarthScope New Madrid - Central U. S. Interpretive Workshop

Fogelman Executive Conference Center, Memphis, Tennessee
March 17-20, 2011

Welcome!

Bob Lillie
Oregon State University

Skip Nelson
Illinois State University

Chuck Langston
University of Memphis

www.earthscope.org

New Madrid – Central U. S. Interpretive Workshop

Supported by funds from the National Science Foundation to the EarthScope National Office

Special thanks to:

Fogelman Executive Conference Center

University of Memphis

EarthScope National Office

Oregon State University

Department of Geography/Geology

Illinois State University

Center for Earthquake Research and Information (CERI)

University of Memphis

University of Memphis

Beauty and the Beast

"The same geological processes that threaten our lives with earthquakes and other geological hazards also nourish our spirits by creating the inspiring landscapes of the United States."

Starved Rock State Park, Illinois

http://dnr.state.il.us/lands/landmgt/parks/i&m/east/starve/park.htm

Clearing the river after the New Madrid earthquakes

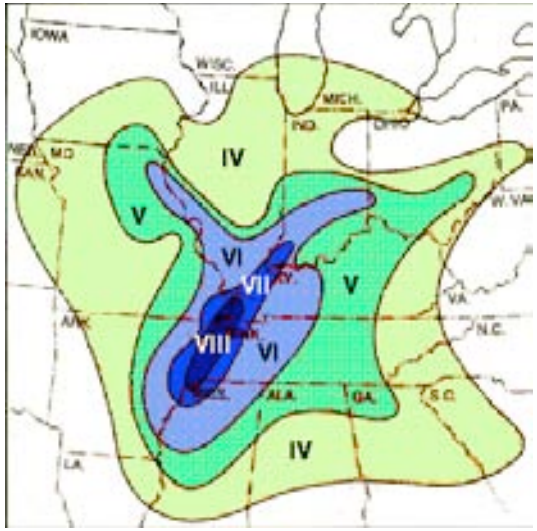
http://franceshunter.wordpress.com/2009/11/19/william-clark-and-the-new-madrid-earthquakes

EarthScope New Madrid–Central U.S. Interpretive Workshop

- **Science Content**
  - Basic geology: plate tectonics and the dynamic landscape
  - EarthScope and other geophysical monitoring of the landscape
  - Earthquake Hazards
- **Interpretive Methods**
  - "Beauty and the Beast"
    - Inspiring landscapes are formed by geological processes
    - Same processes result in earthquakes and other geological hazards
  - Participants participate:
    - Work in groups to prepare and present interpretive programs that incorporate EarthScope
    - Field trip to brainstorm about landscape and EarthScope observations

http://www.tn.gov/environment/parks/ReelfootLake

Reelfoot Lake State Park, Tennessee

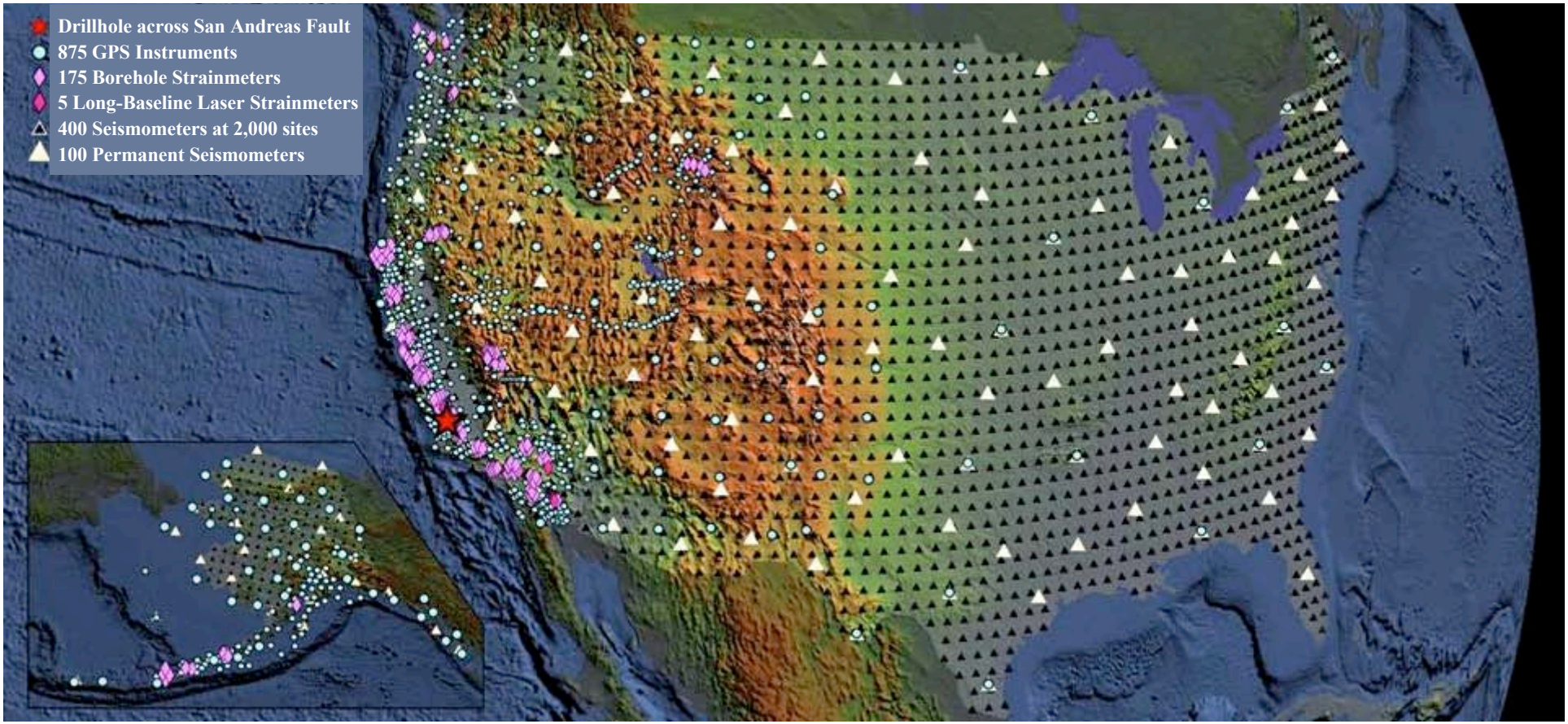


Roman numerals indicate estimated Modified Mercalli intensities for a 6.5 magnitude earthquake.

http://www.survivalprimer.com/Prophesy/The%20New%20Madrid%20Earthquake.htm

EarthScope

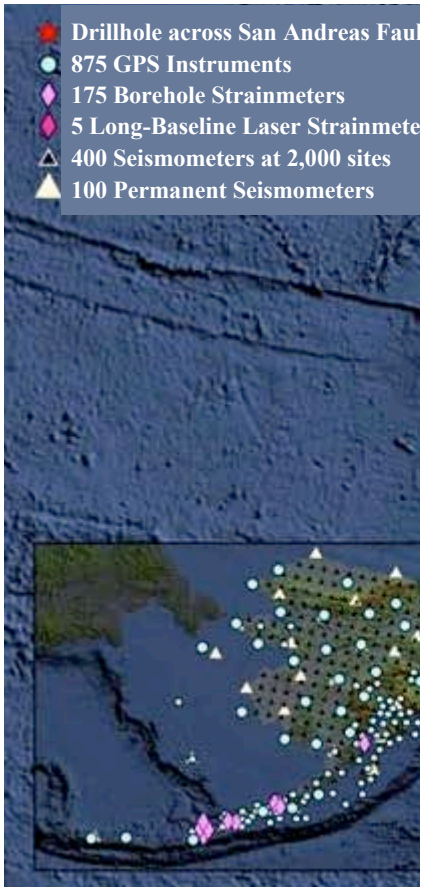
Like a "Hubble Telescope" aimed into the Earth

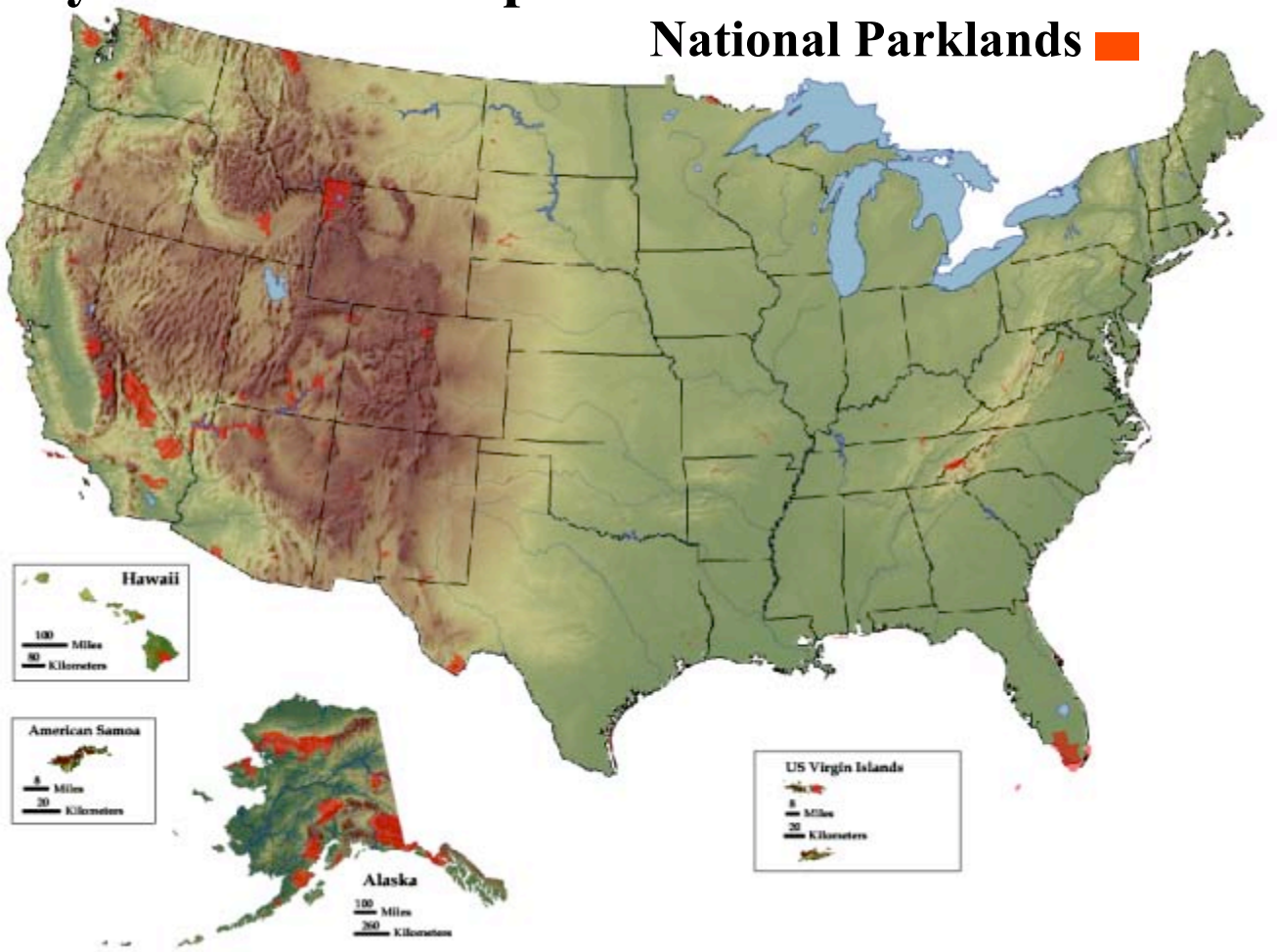


Informal Education Workshops

For Interpretive Professionals in Parks and Museums

Monitoring the Dynamic Landscape Enhances our "Sense of Place"





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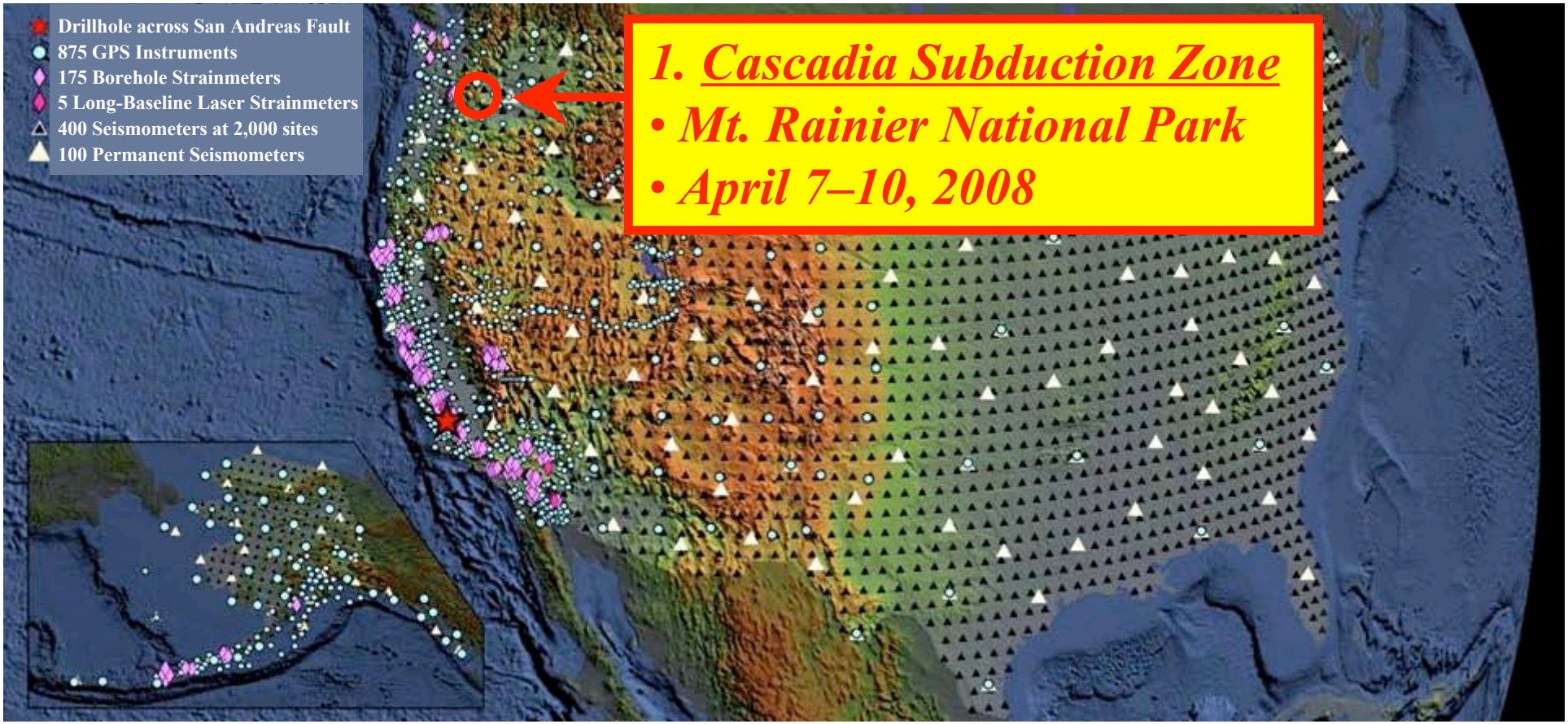

www.earthscope.org/eno/parks

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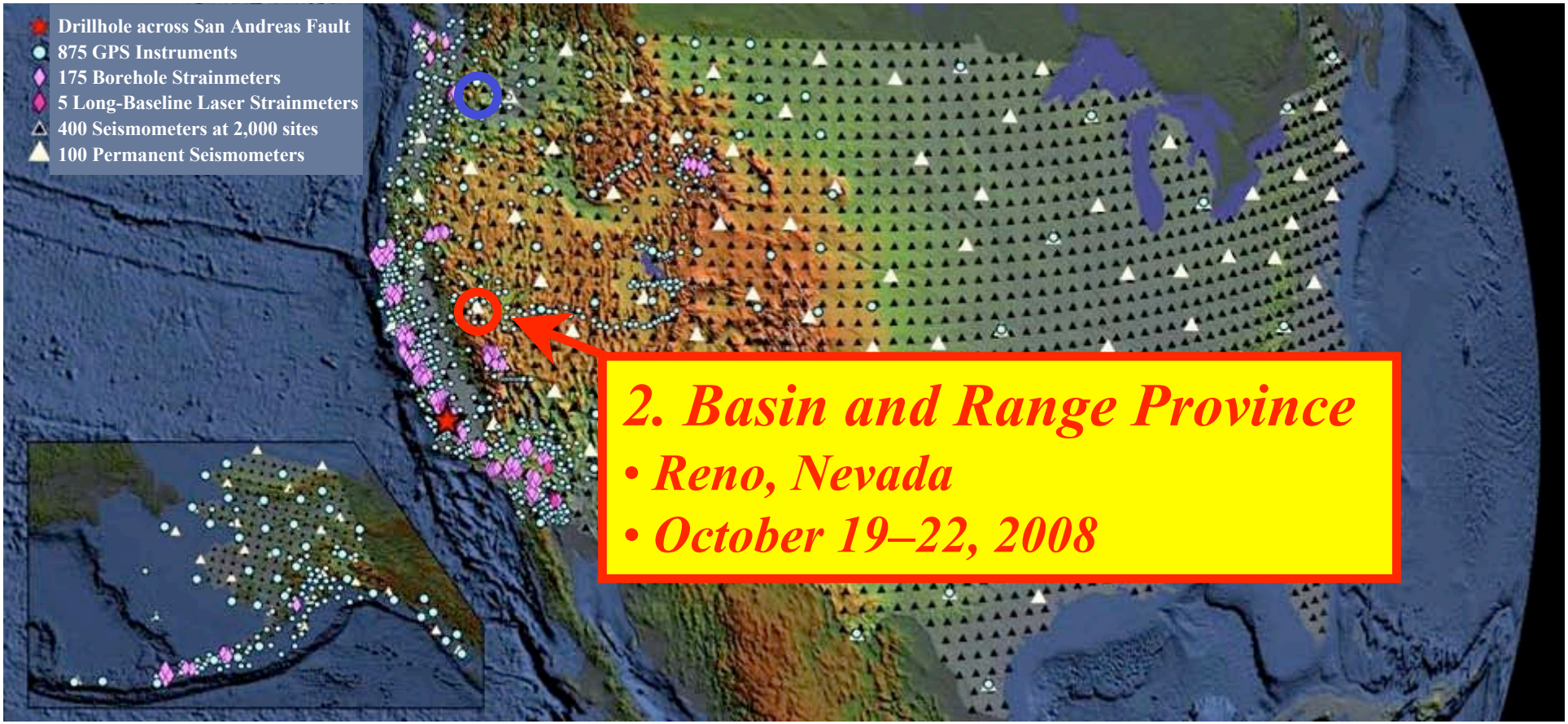

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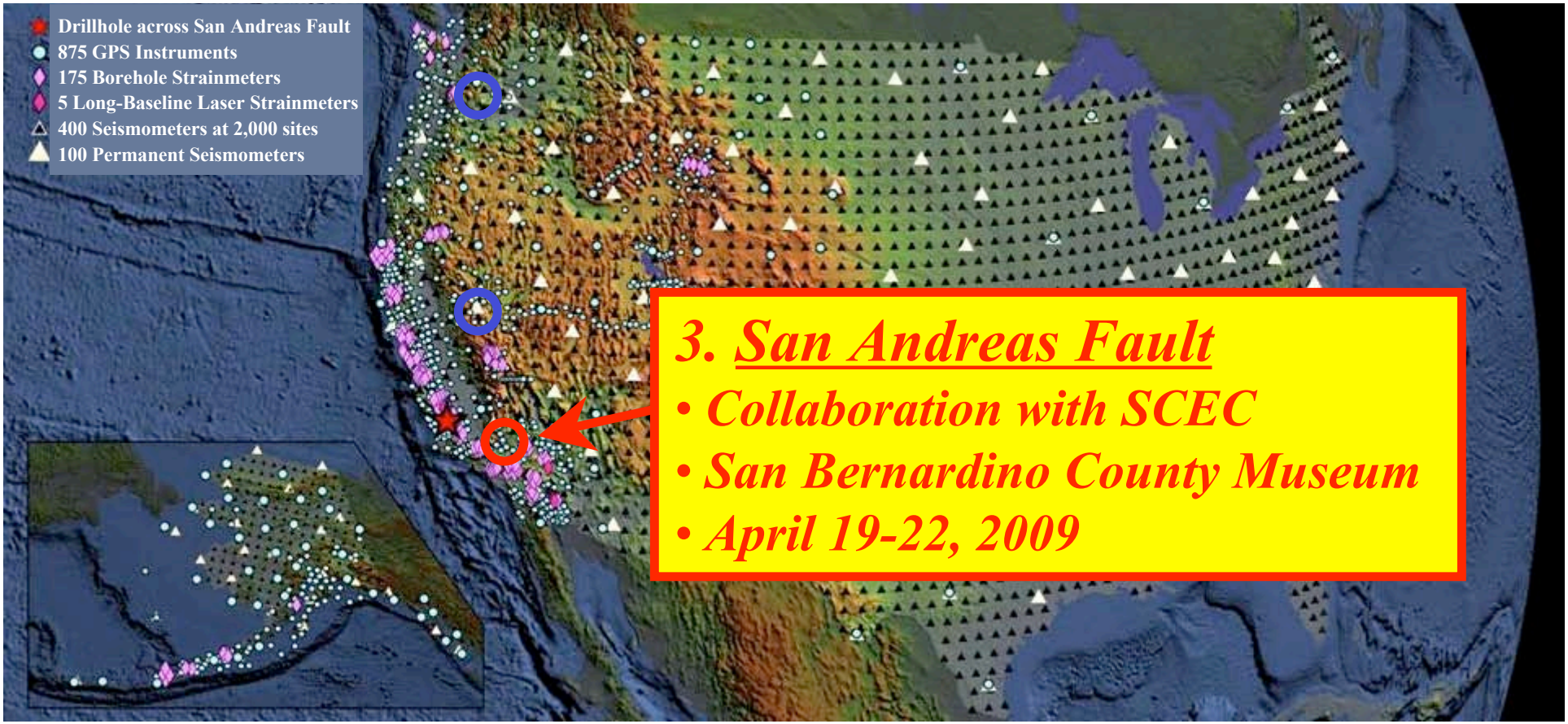

www.earthscope.org/eno/parks

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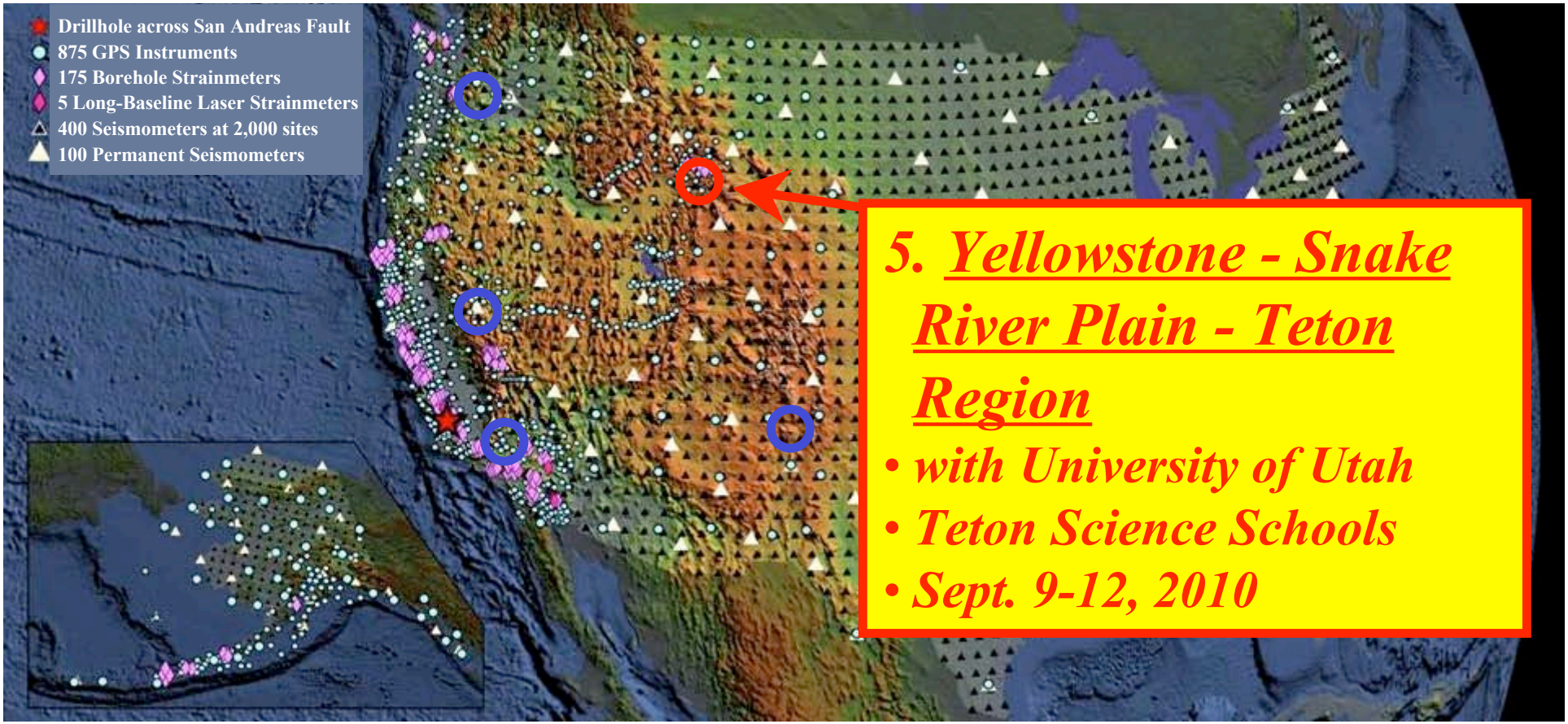

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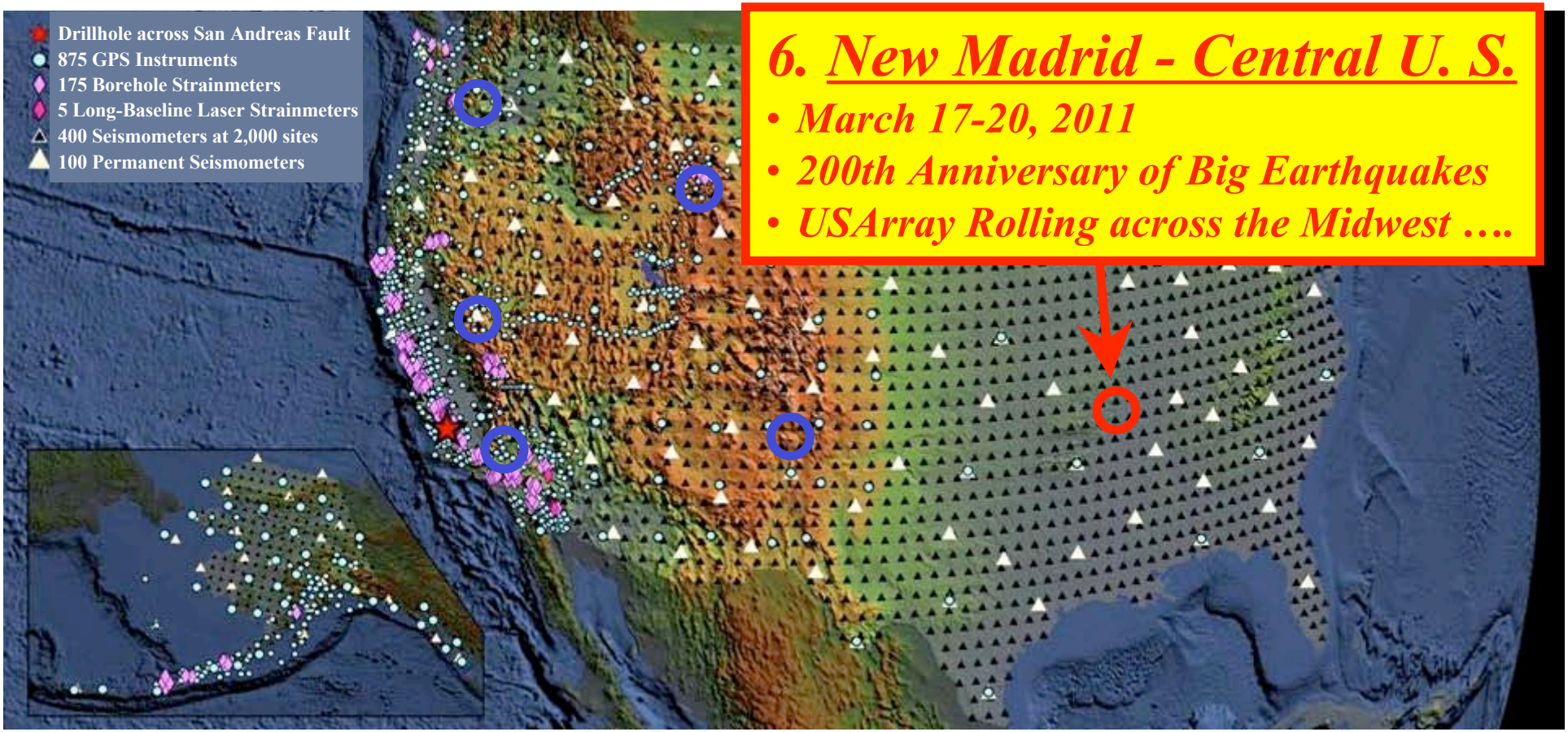


www.earthscope.org/eno/parks

EarthScope Interpretive Themes

- The EarthScope experiment—the most comprehensive exploration to date of the structure, dynamics, and geologic history of the North American continent—exemplifies the insatiable human drive to learn.
- EarthScope encourages a feeling of national interconnectedness—a continental sense of place—by openly inviting communities to actively participate in the experiment, and by fostering an understanding that their local environment and culture interact with other components within the larger, dynamic Earth system.

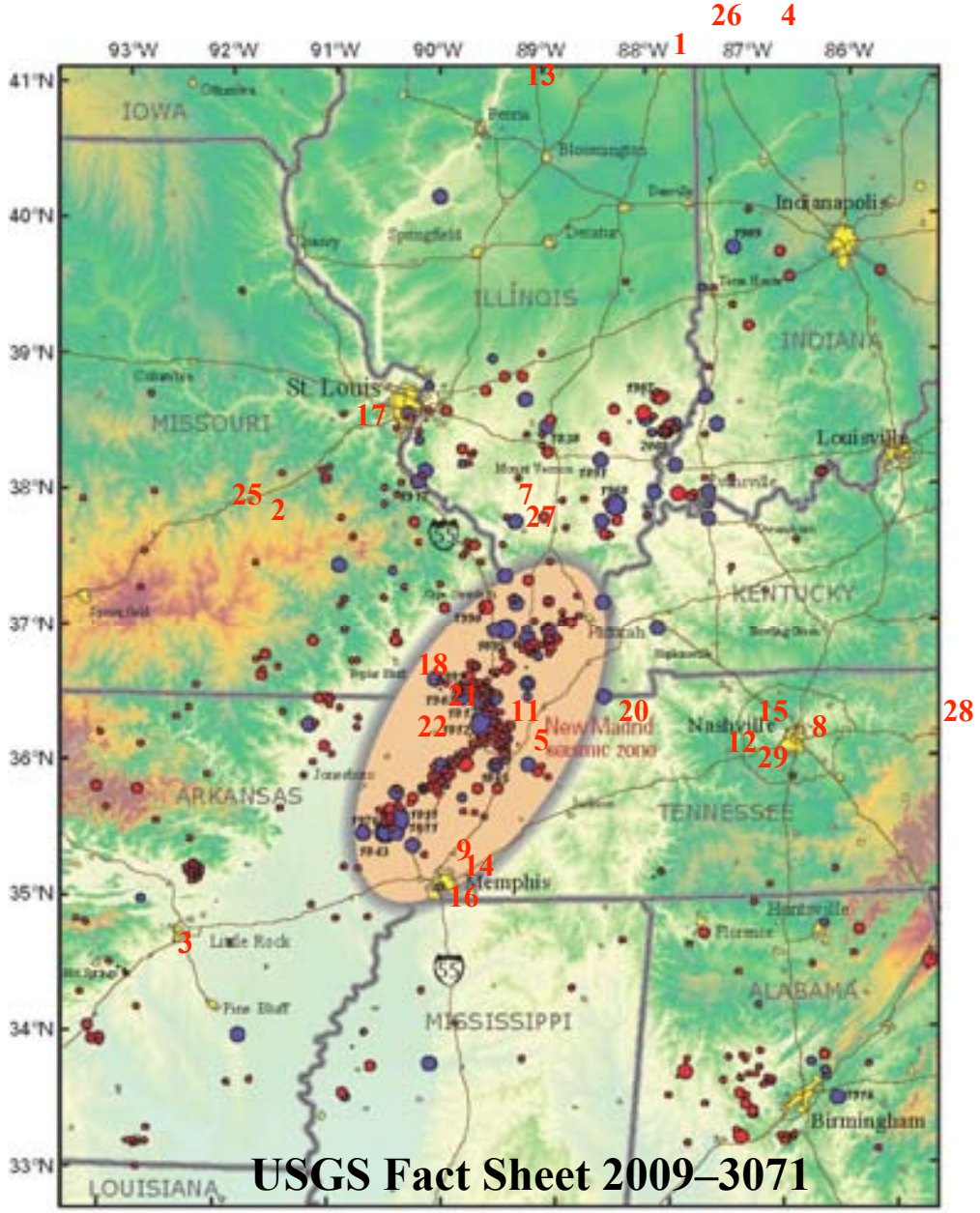
Bootheel Youth Museum, Malden, Missouri

http://www.bootheelyouthmuseum.org

EarthScope New Madrid–Central U.S. Interpretive Workshop

Participants

1. Aida Awad	Maine East High School	Park Ridge, IL
2. Lauren Begley	Newburg Children's Mus	Newberg ,MO
3. Susan Bennett	Museum of Discovery	Little Rock, AR
4. Laurie Bone	Longway Planetarium	Flint, MI
5. Kimberly Crew	Reelfoot Lake Res/Teach Cen	Hornbeak, TN
6. Vince Cronin	Baylor University	Waco, TX
7. Holly Dunderdale	Sesser-Valier School	Herrin, IL
8. Larry Dunlap-Berg	Adventure Science Center	Nashville, TN
9. Alice Eilers	Pink Palace Museum	Memphis, TN
10. Carol Engelmann	EarthScope Ed/Out Subcom	Omaha, NE
11. David Haggard	Reelfoot Lake State Park	Tiptonville, TN
12. Craig Hanrahan	Tenn Emergy Manag Agency	Kingston Springs, TN
13. Joe Jakupcak	Starved Rock State Park	Marseilles, IL
14. David Maness	Pink Pal Mus-Sharpe Plan	Memphis, TN
15. Kris McCall	Adventure Sci. Center	Nashville, TN
16. Mary McFarlen	Pink Palace Museum	Memphis, TN
17. Therese McKee	Signature Design	St. Louis, MO
18. Tammy Morgan	Bootheel Youth Museum	Dexter, MO
19. Debra Noel	Public Lands Inter Assocc	Parks, AZ
20. Kelsea Reagan	Paris Landing State Park	Paris, TN
21. Patsy Reublin	Bootheel Youth Museum	Malden, MO
22. Heather Runyan	Crowley's Ridge State Park	Paragould, AR
23. Eugene Singer	Geology Writer	Palm Desert, CA
24. Ramesh Singh	Chapman University	Tustin, CA
25. Elizabeth te Groen	Newburg Children's Museum	Newburg, MO
26. Erika Vye	Michigan Tech University	Hancock, MI
27. Tammy Waters	Fr of Crab Orchard Pub Libr	Marion, IL
28. April Welch	Norris Dam State Park	Lake City, TN
29. Joshua Wickham	TEMA Hazard Mitig Plan	Nashville, TN



USGS Fact Sheet 2009–3071

Introductions

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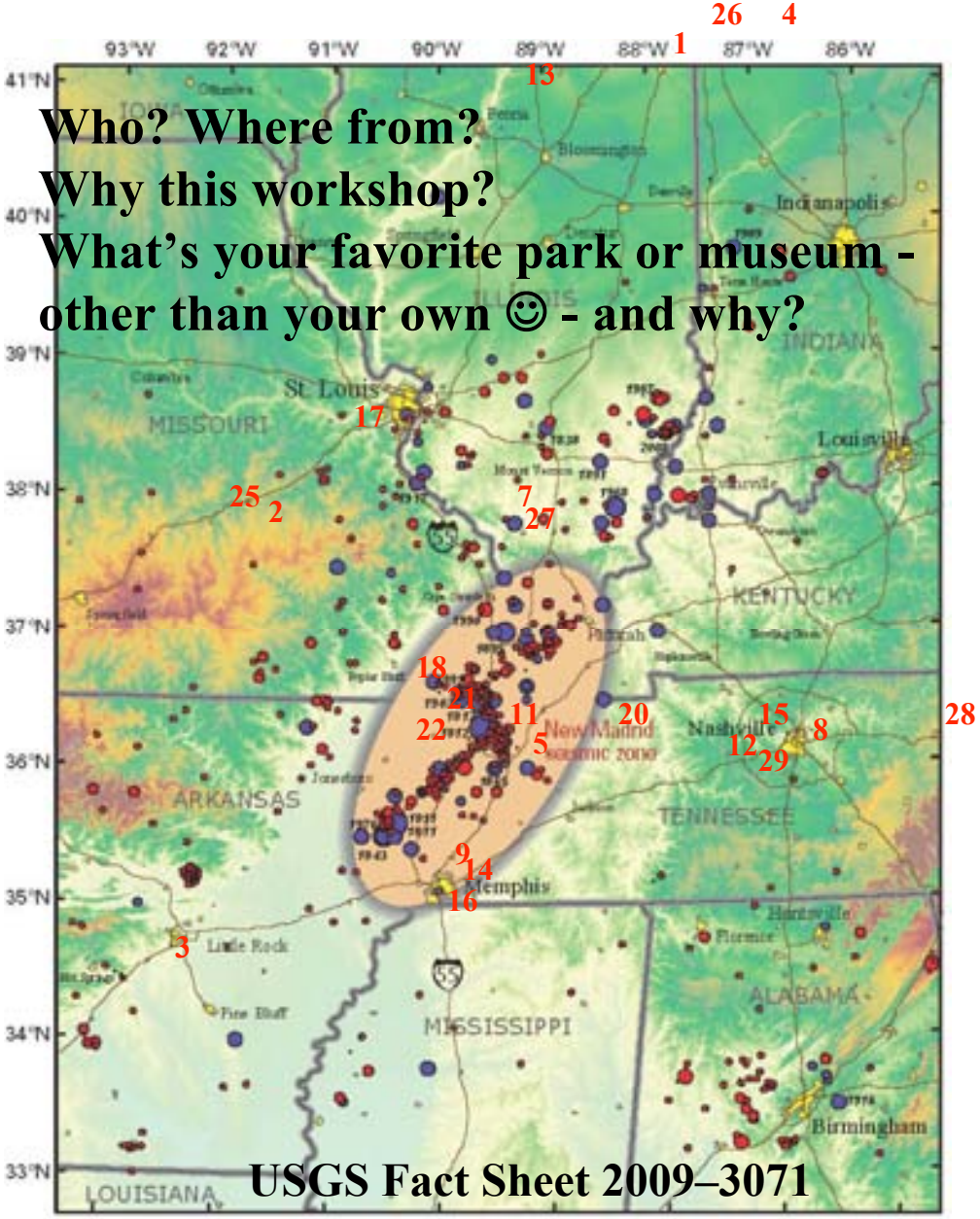
1. Who? Where from?
2. Why this workshop?
3. What's your favorite park or museum - other than your own ☺ - and why?



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EarthScope New Madrid–Central U.S. Interpretive Workshop

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Instructors

1. Jer Ming Chiu	University of Memphis	Memphis, TN
2. Bob de Groot	Sou Calif Earthquake Cen	Los Angeles, CA
3. Chuck Langston	University of Memphis	Memphis, TN
4. Bob Lillie	Oregon State University	Corvallis, OR
5. Beatrice Magnani	University of Memphis	Memphis, TN
6. Patrick McQuillan	Incor Res. Instit for Seis	Washington, DC
7. Kent Moran	University of Memphis	Memphis, TN
8. Skip Nelson	Illinois State University	Urbana, IL
9. Shelley Olds	UNAVCO, Inc	Boulder, CO
10. Chris Powell	University of Memphis	Memphis, TN
11. Roy Van Arsdale	University of Memphis	Memphis, TN

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Teaching Assistants

13. Yanjun Hao	University of Memphis	Memphis, TN
14. Akram Mostafanejad	University of Memphis	Memphis, TN
15. John Wagle	Illinois State University	Urbana, IL

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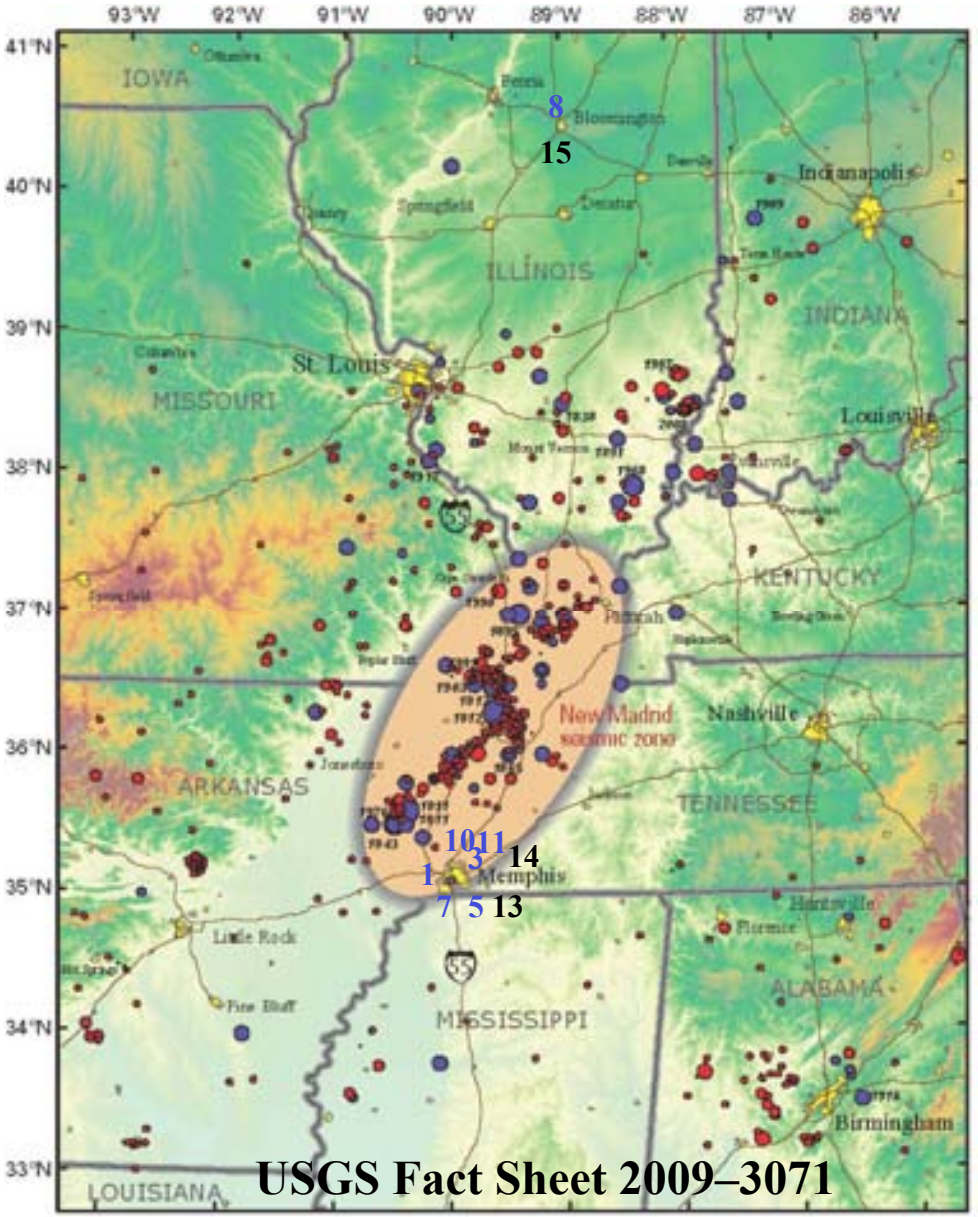

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Workshop Overview

"Beauty and the Beast: Plate Tectonics, Landscape Development, and Geological Hazards of the United States"

Bob Lillie
EarthScope Education and Outreach Manager
EarthScope National Office
Oregon State University

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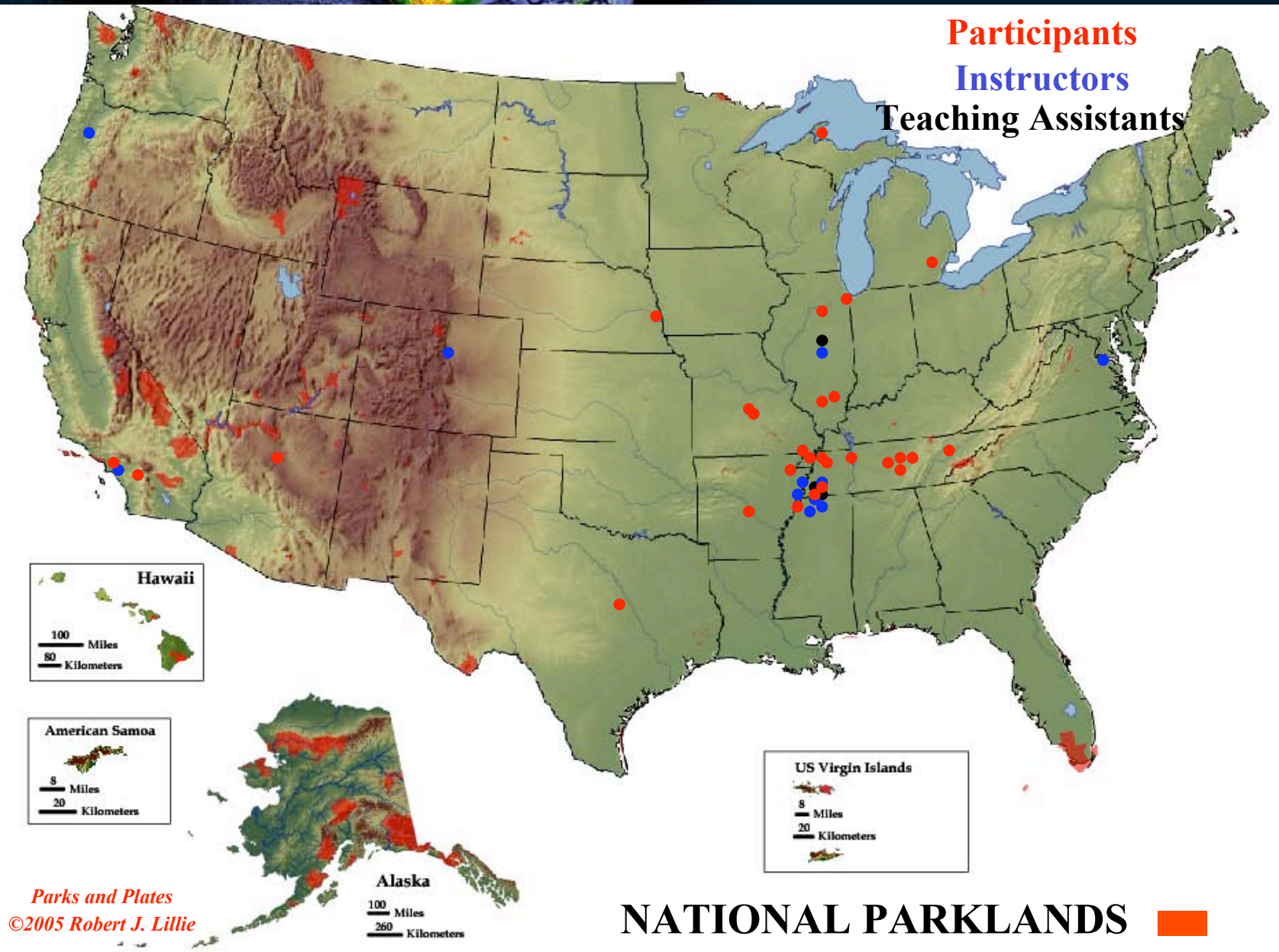

Parks and Plates
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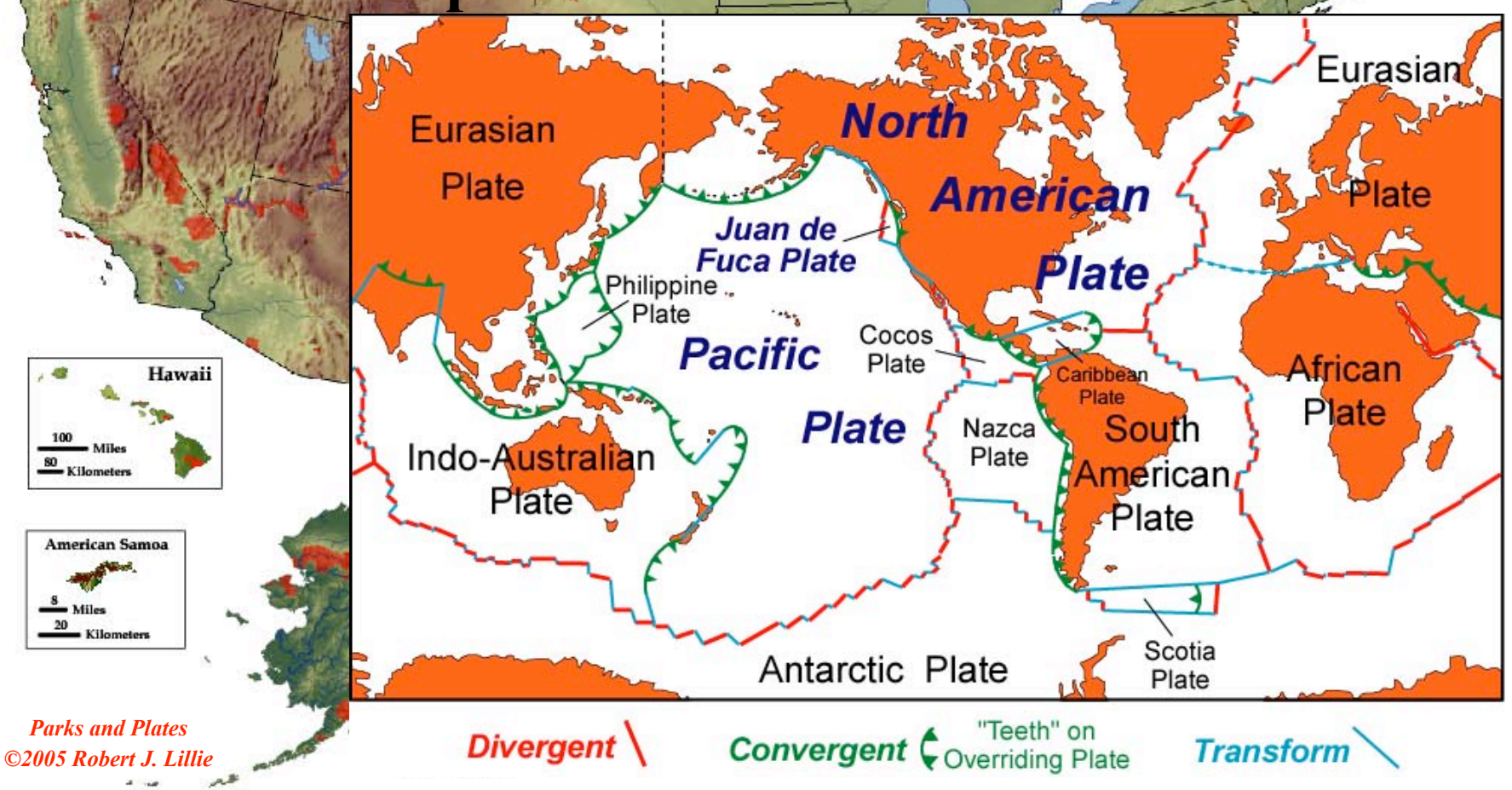
Park Lands: East vs. West

- **Why are there more National Parks in the West compared to the East?**
- **Why is the topography more rugged in the West compared to the East?**



Parks and Plates
©2005 Robert J. Lillie

PLATE TECTONICS

- **Tectonics:**
- **From the Greek "*tecton*"**
  - **builder**
  - **"architect"**
- **The study of large features on Earth's surface and the processes that form them.**

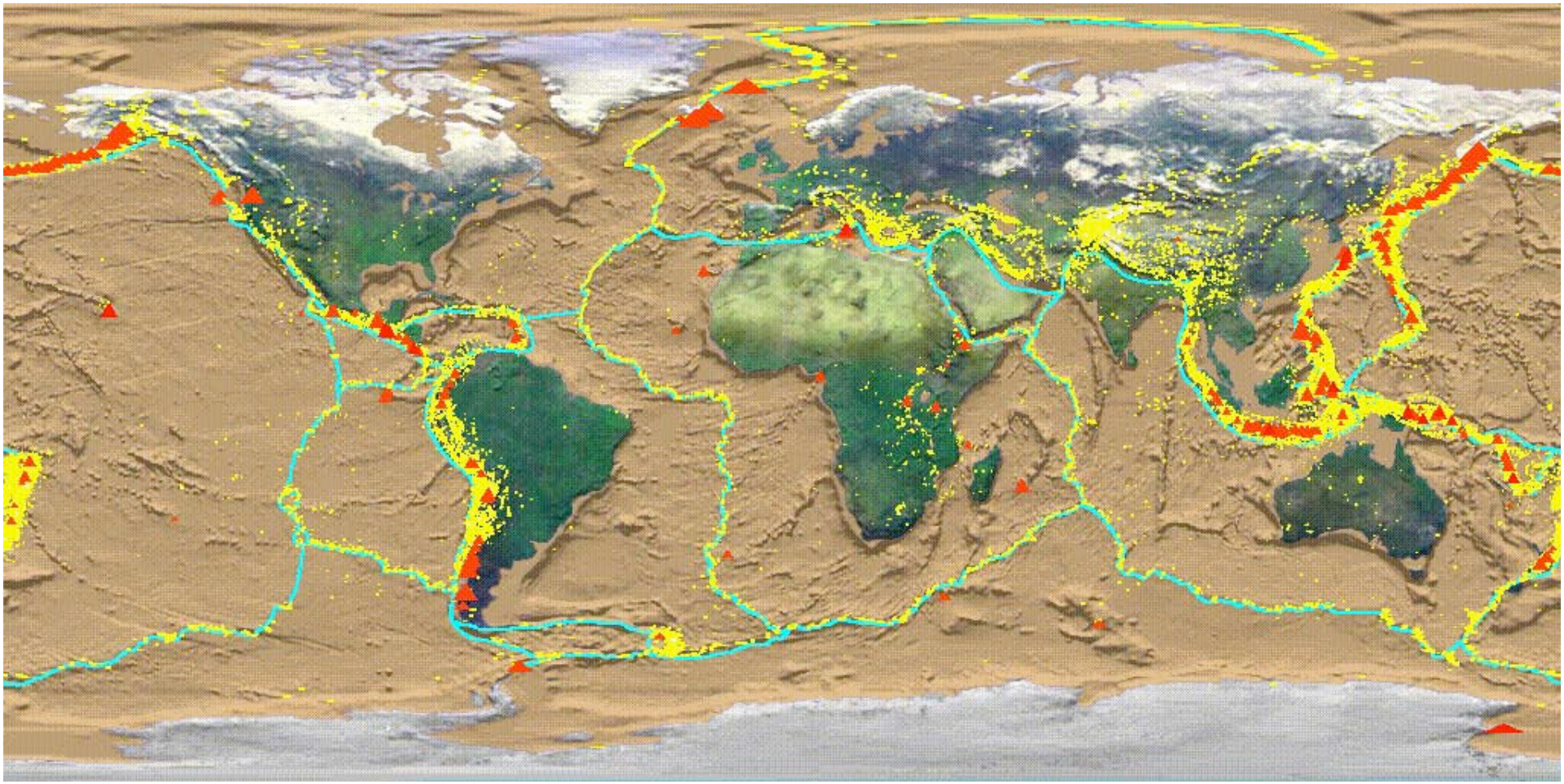
"PLATE TECTONICS"

- **Large features:**
  - **continents**
  - **ocean basins**
  - **mountain ranges**
- **and processes:**
  - **earthquakes**
  - **volcanic eruptions**
- **due to movement of plates of Earth's outer shell.**

Cracked Egg Shell!

Plate Boundaries

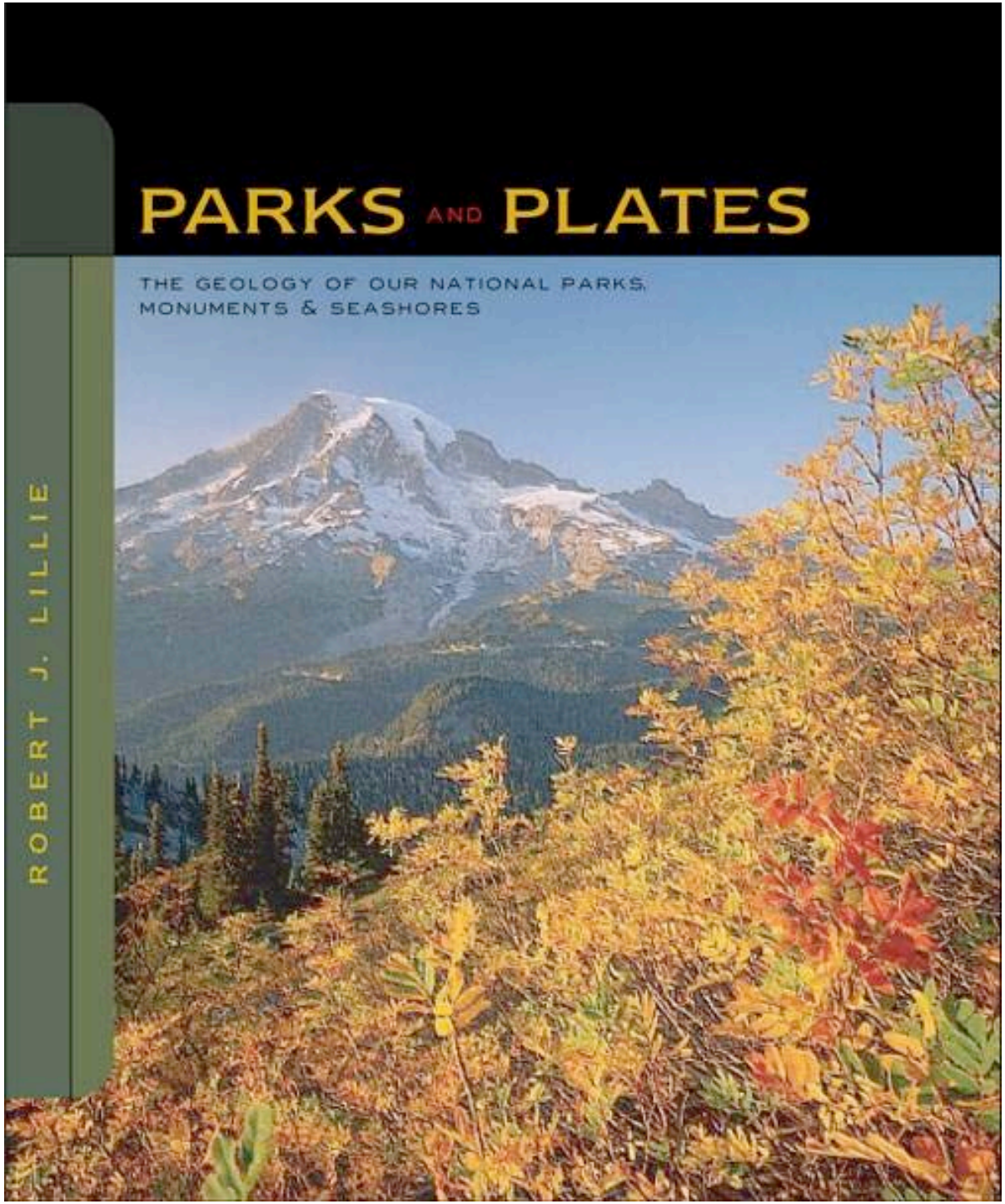
Earthquakes (yellow dots)
Active Volcanoes (orange triangles)



http://www.geo.utep.edu/kidd/Vol_eq_plates.html

Landscapes of national parks due to processes:

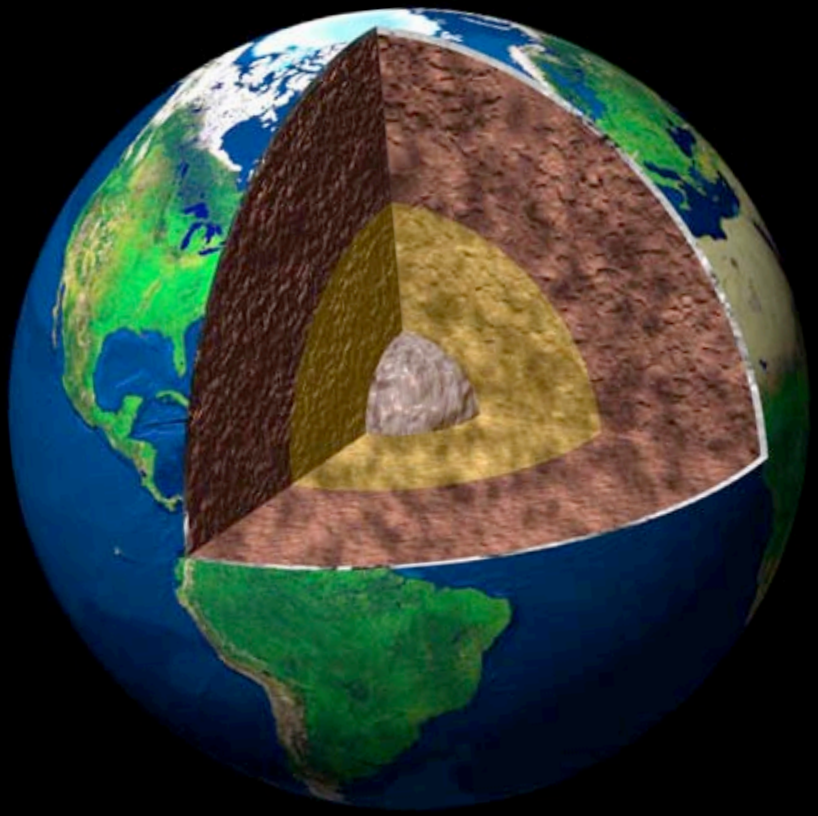
- At plate boundaries
  1. Where they pull apart (divergent)
  2. Where they crash together (convergent)
  3. Where they slide past one another (transform)
- And at hotspots



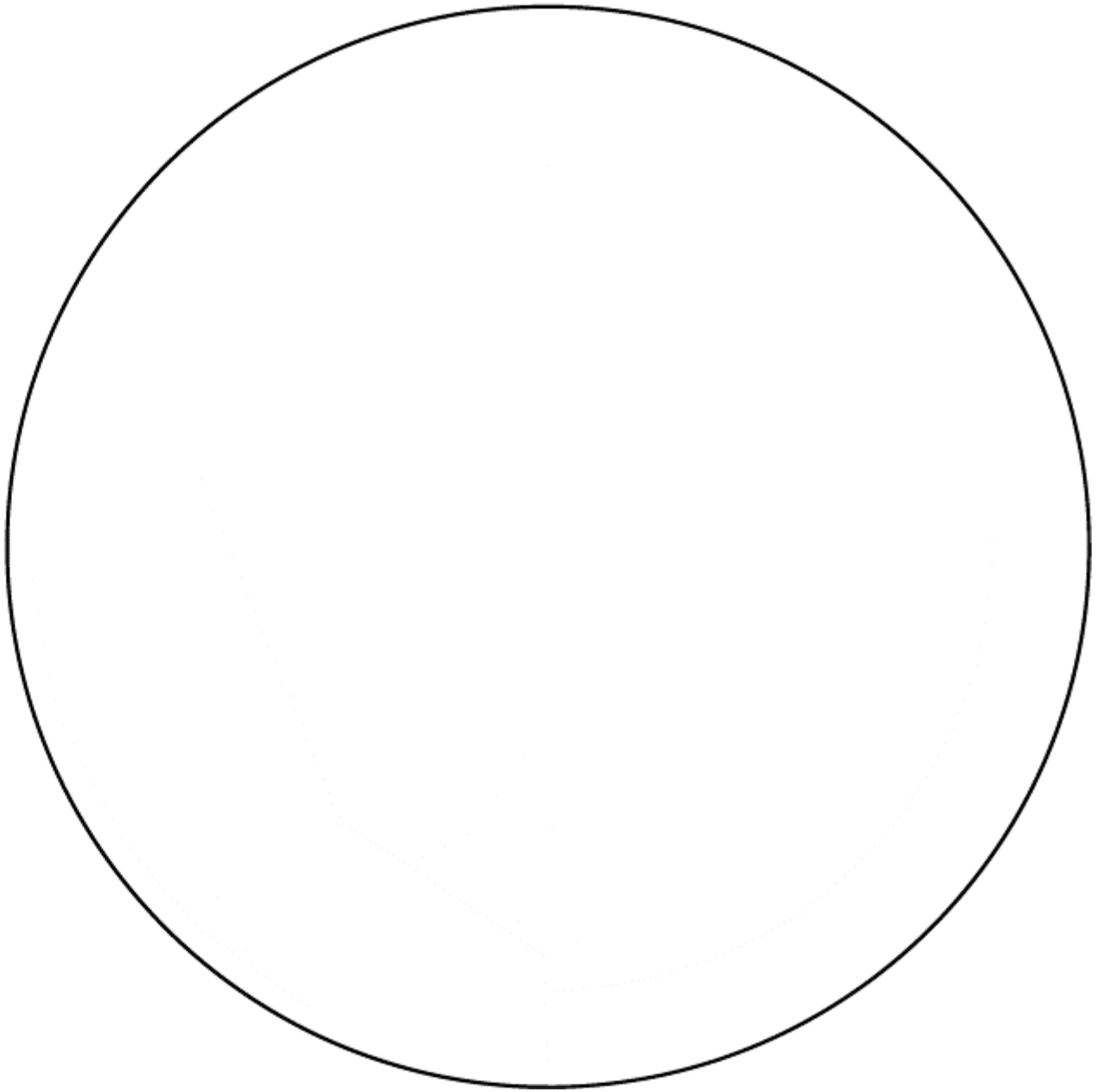
National Aeronautics and Space Administration

EarthScope

Like a "Hubble Telescope" aimed into the Earth ☺



Classical Divisions of the Earth
(Chemical Composition)



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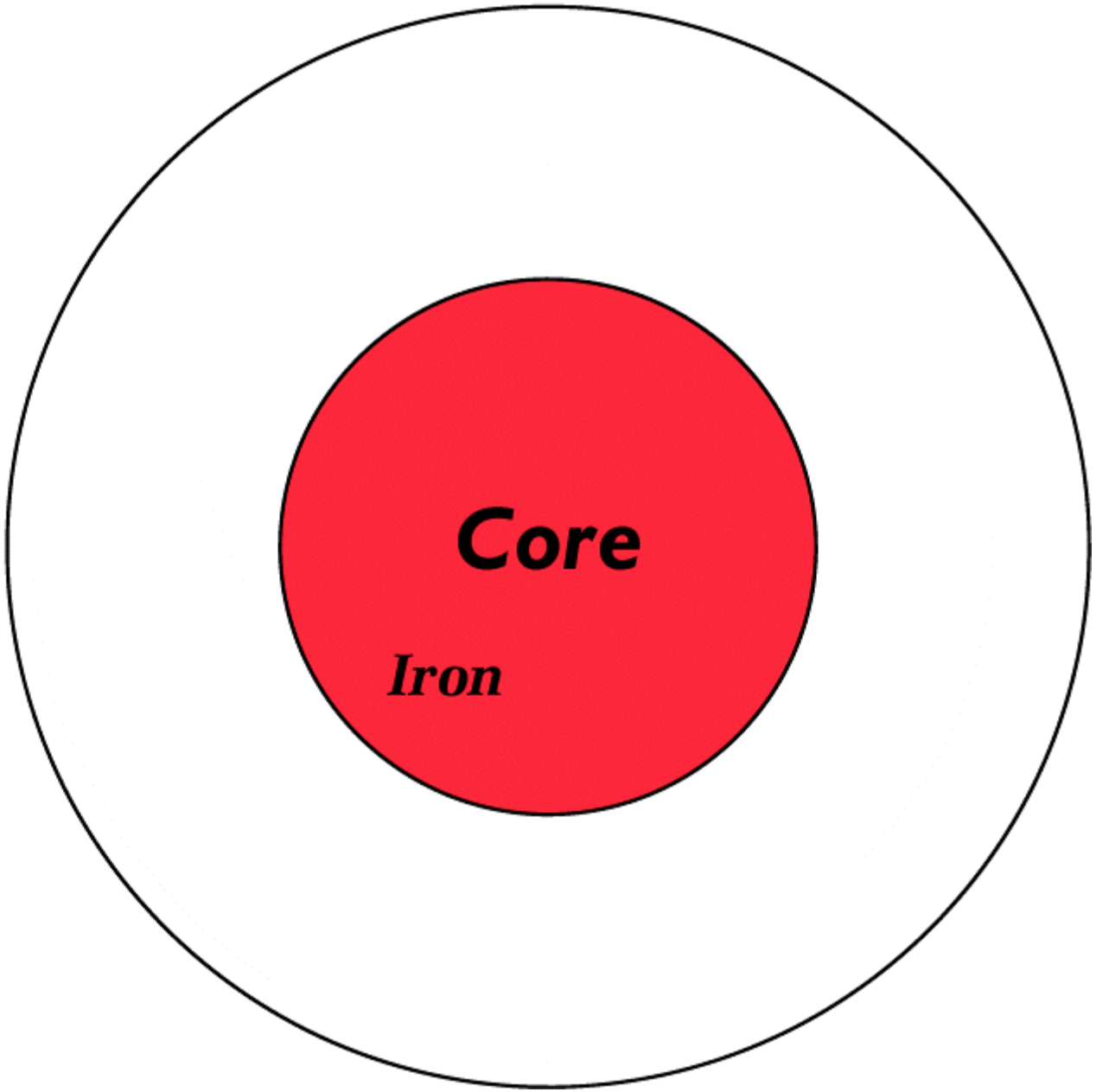
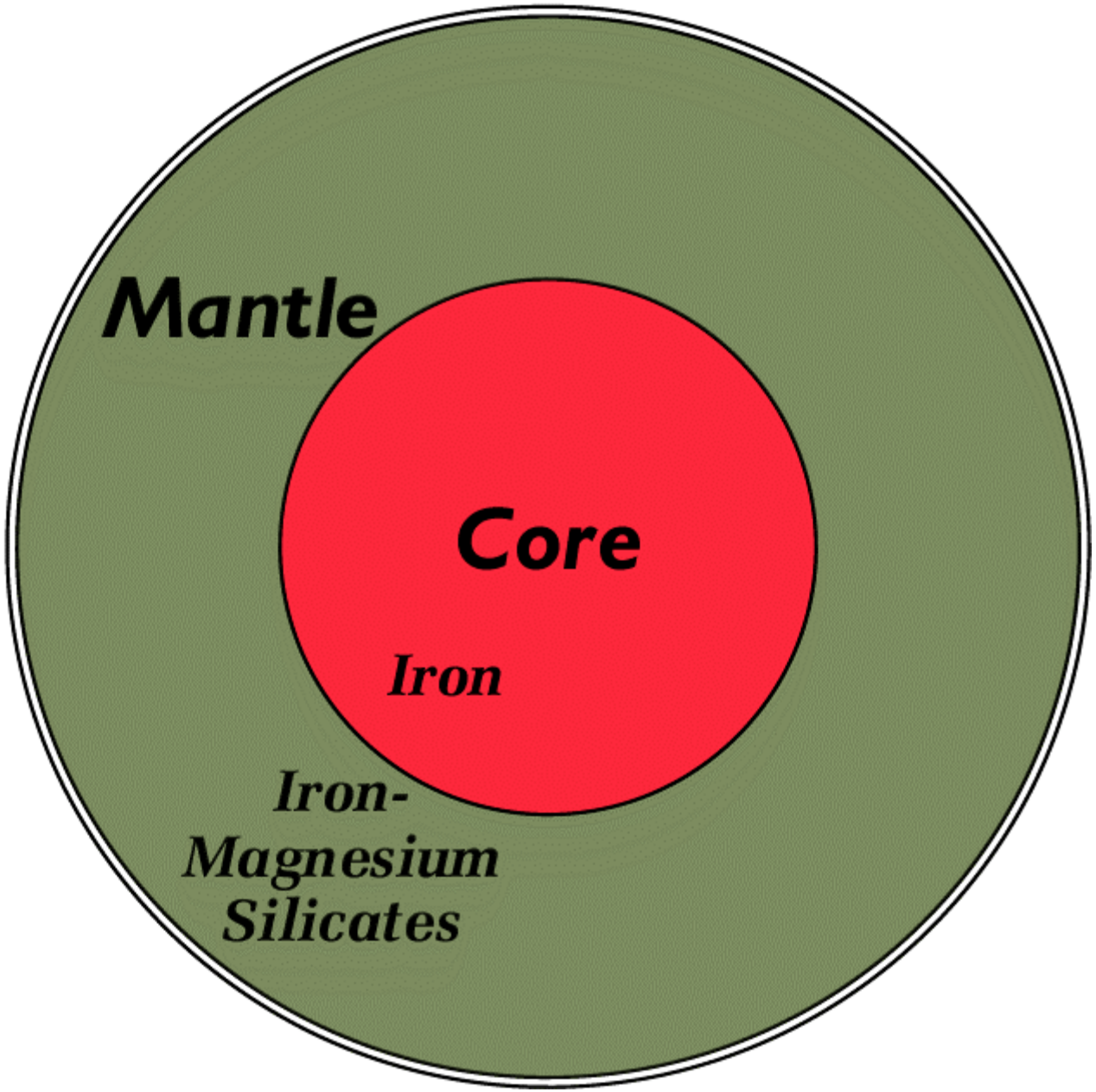


Classical Divisions of the Earth (Chemical Composition)



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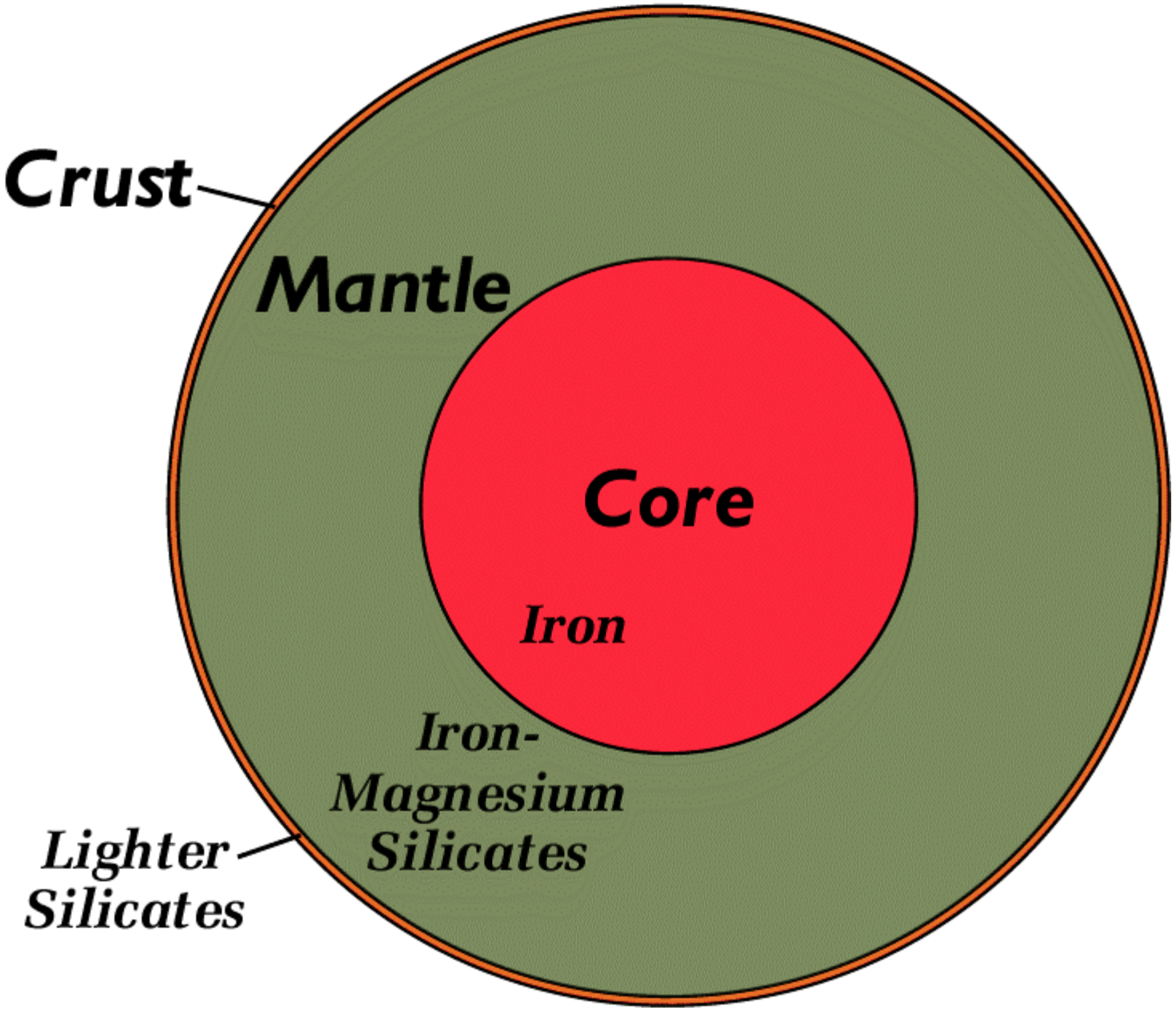
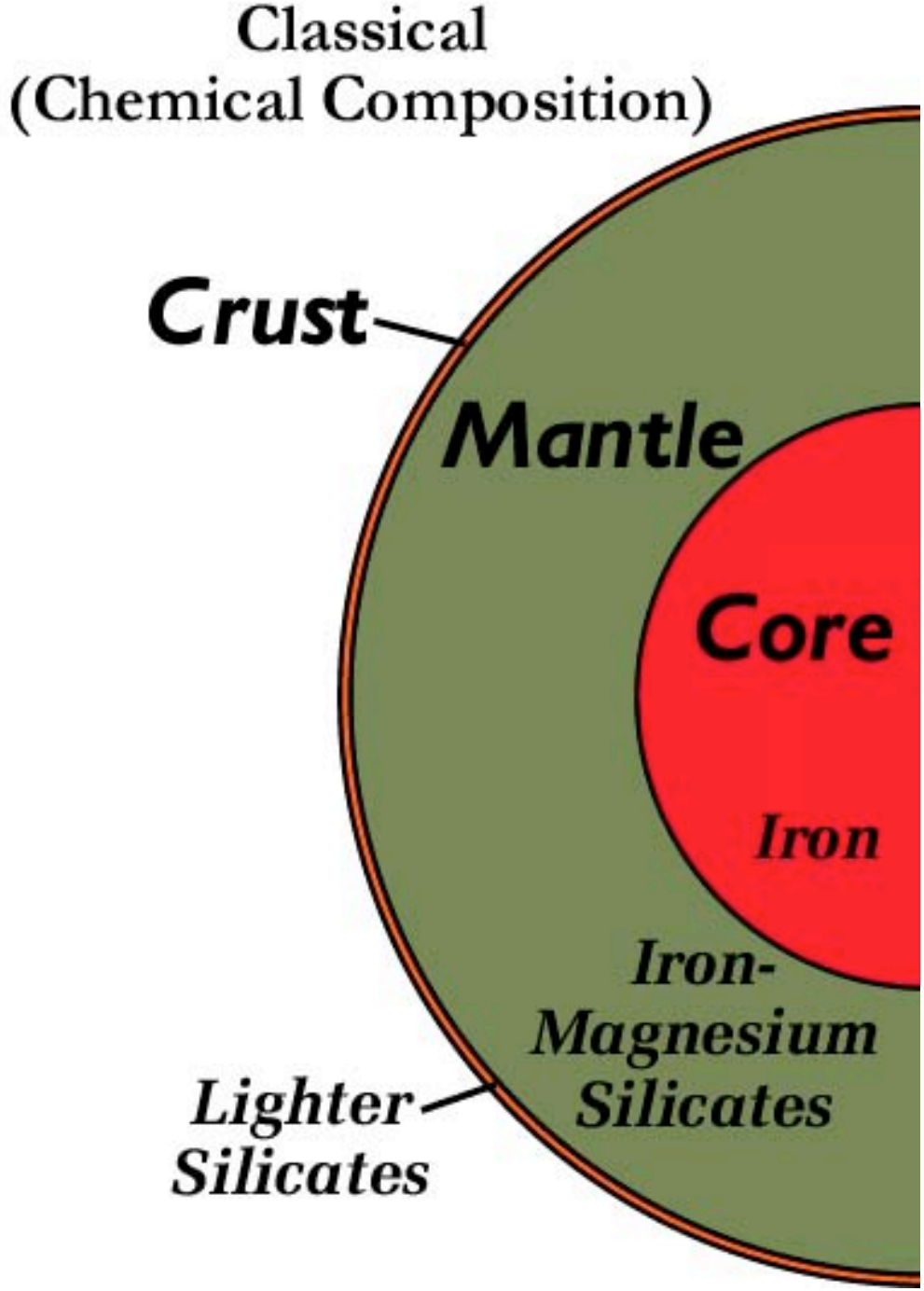
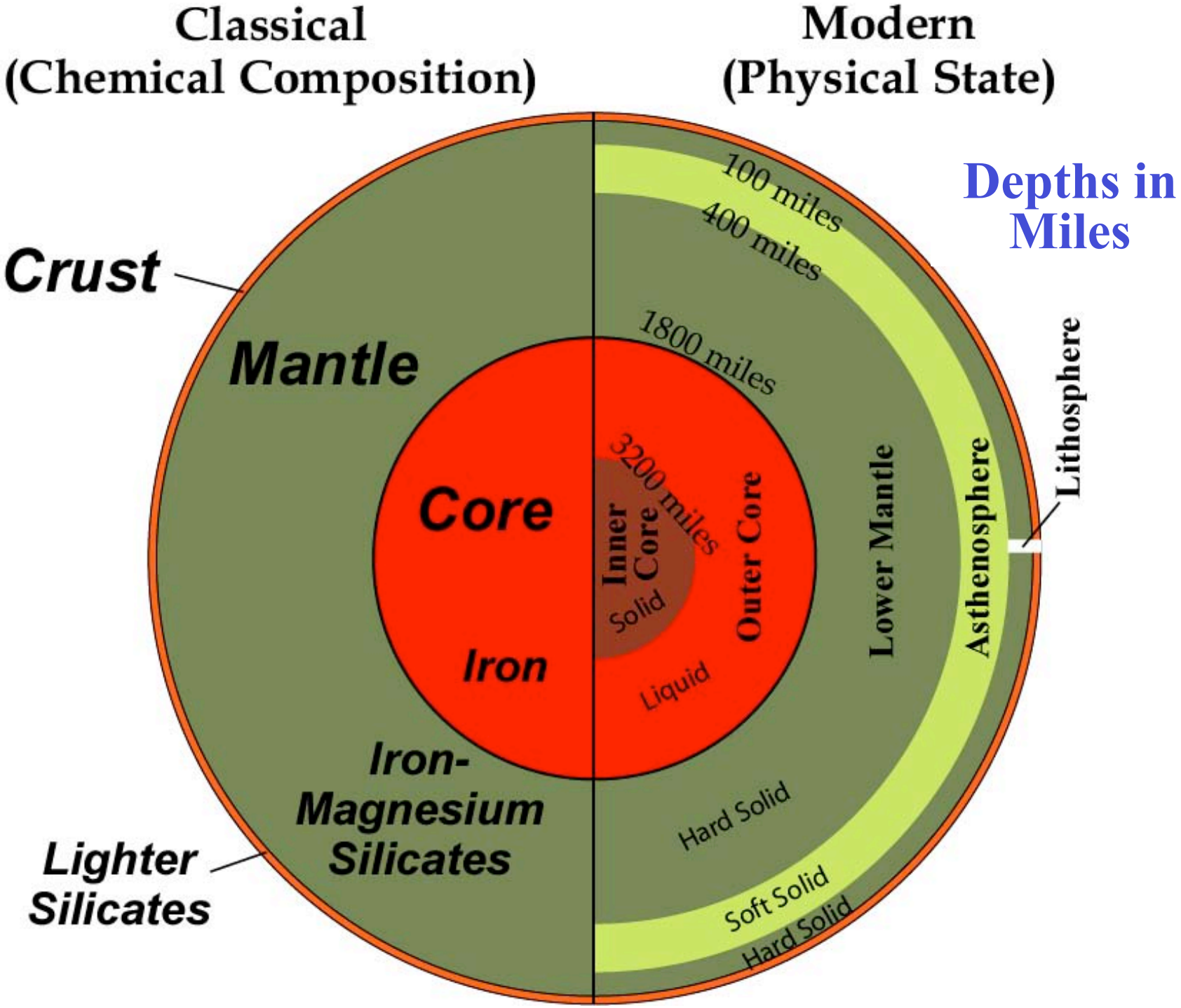
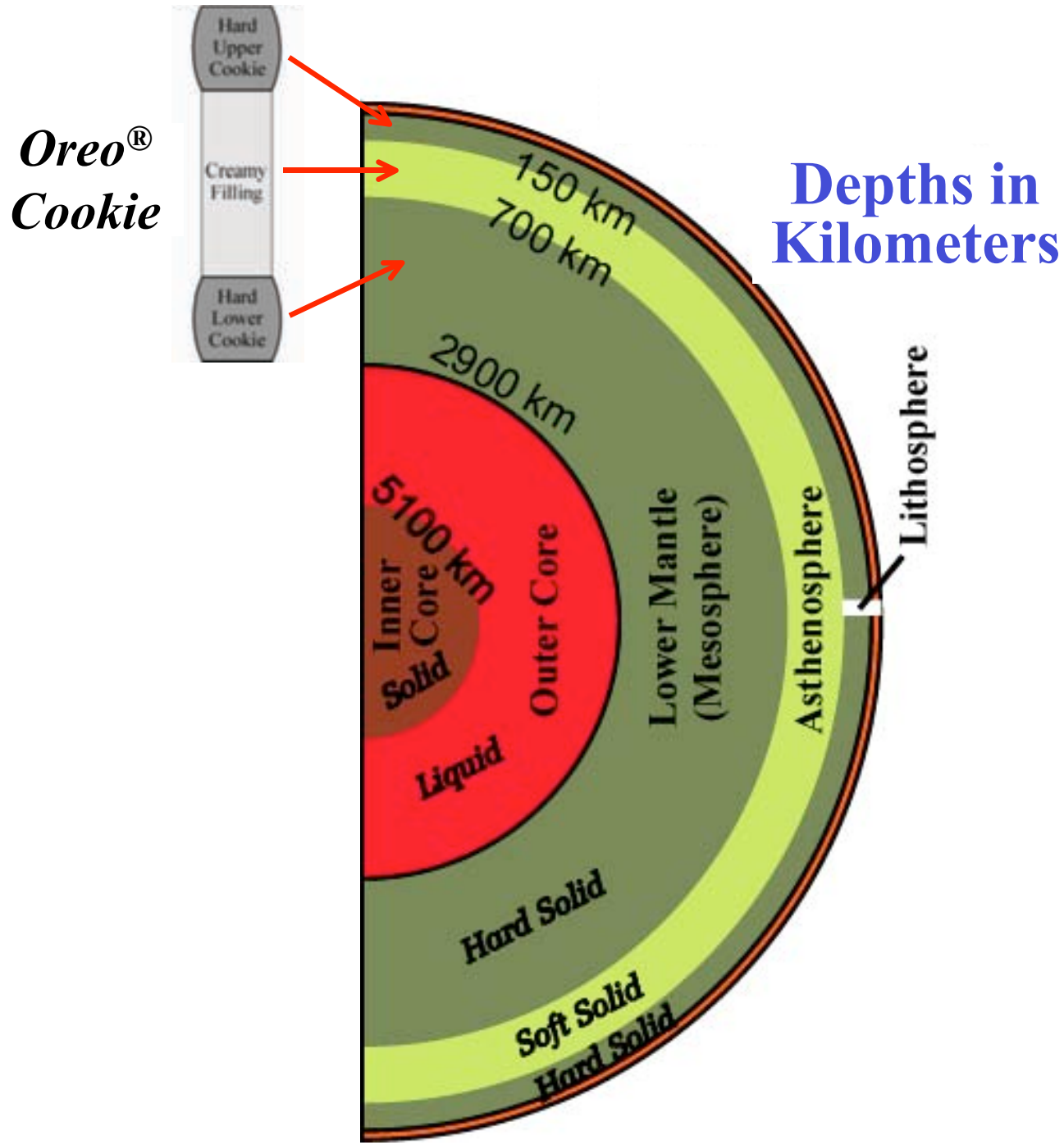



Classical
(Chemical Composition)
Crust
Mantle
Core
Iron
Iron-
Magnesium
Silicates
Lighter
Silicates


Classical
(Chemical Composition)
Modern
(Physical State)
Depths in Miles
Crust
Mantle
Core
Iron
Iron-
Magnesium
Silicates
Lighter
Silicates
100 miles
400 miles
1800 miles
3200 miles
Inner Core
Solid
Outer Core
Liquid
Lower Mantle
Hard Solid
Asthenosphere
Soft Solid
Lithosphere
Hard Solid


Oreo®
Cookie
Hard Upper Cookie
Creamy Filling
Hard Lower Cookie
Depths in Kilometers
150 km
700 km
2900 km
5100 km
Inner Core
Solid
Outer Core
Liquid
Lower Mantle (Mesosphere)
Asthenosphere
Lithosphere
Hard Solid
Soft Solid
Hard Solid

Oreo® Cookie

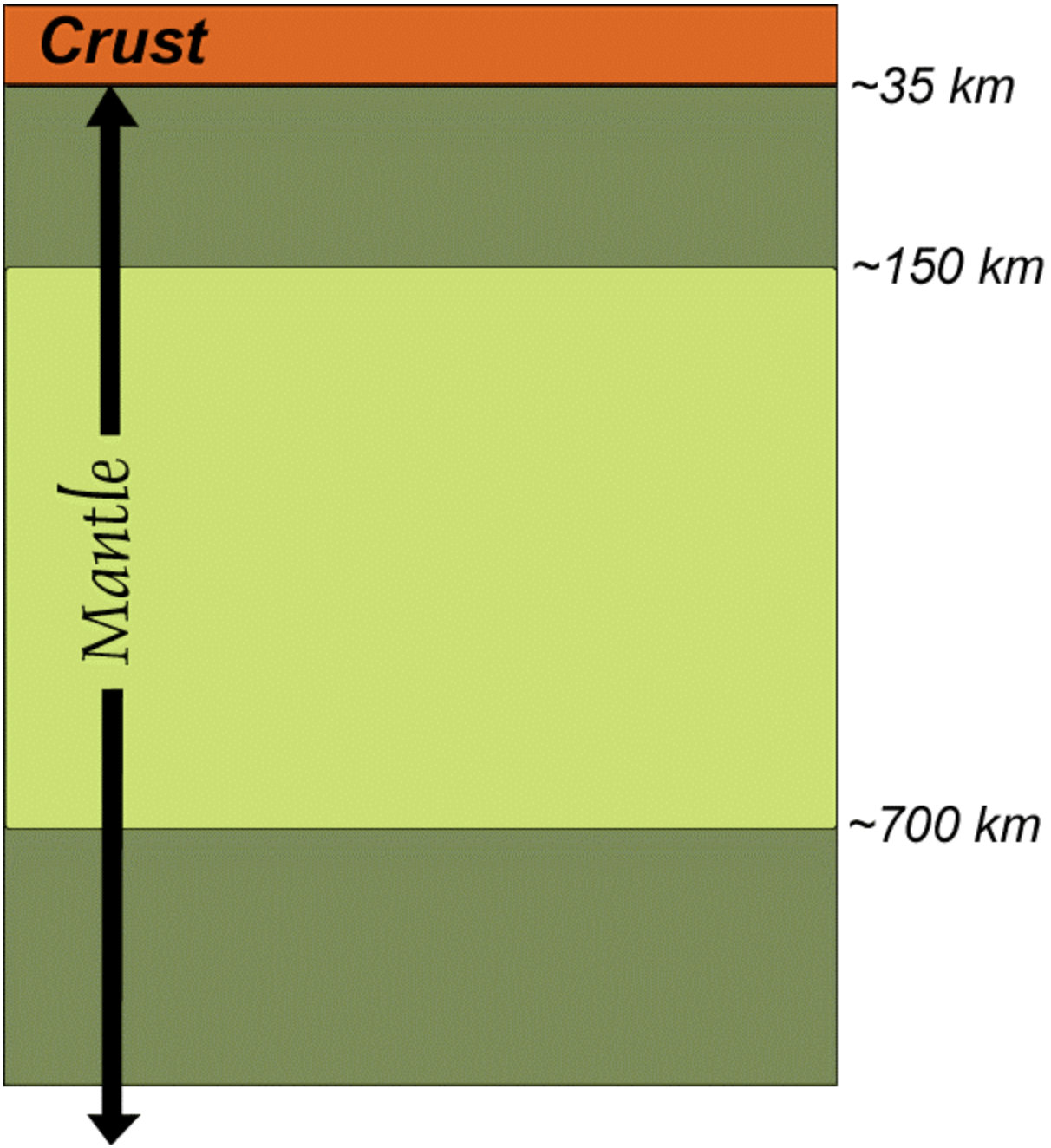
Oreo® Cookie


Hard
Upper
Cookie
Creamy
Filling
Hard
Lower
Cookie


Crust
~35 km

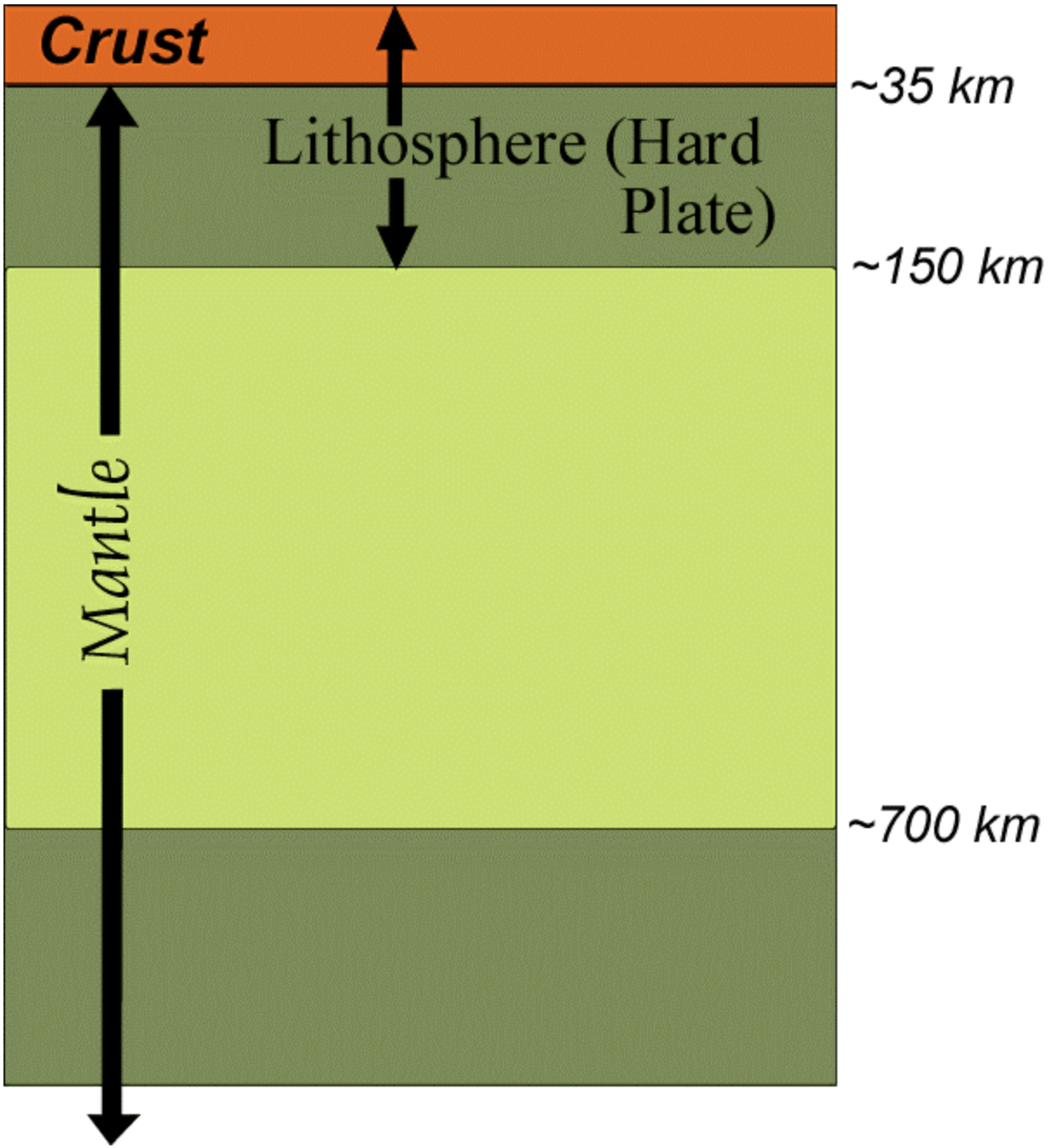
Oreo® Cookie


Hard
Upper
Cookie
Creamy
Filling
Hard
Lower
Cookie


Crust
~35 km
~150 km
Mantle
~700 km

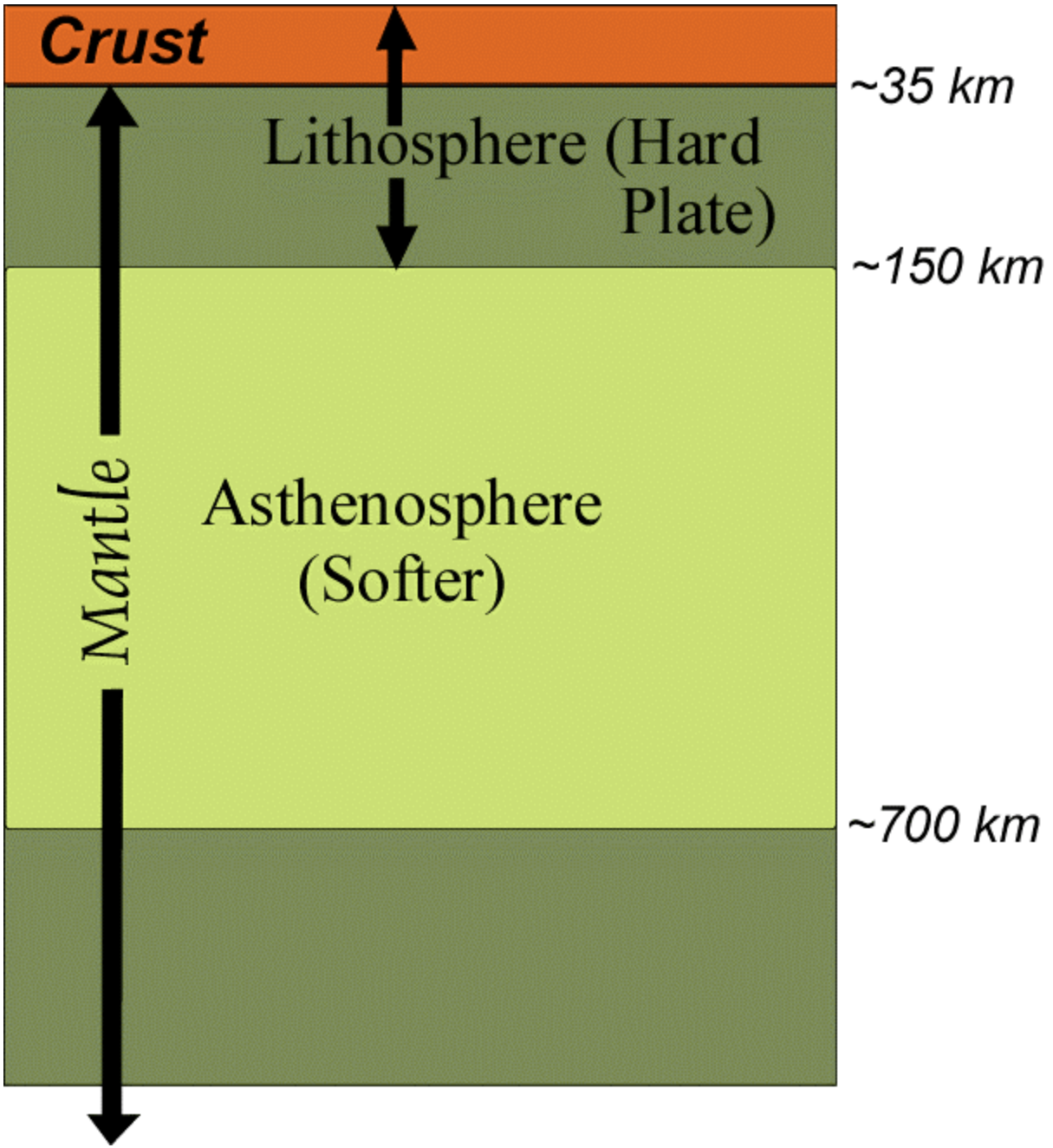
Oreo® Cookie


Hard Upper Cookie
Creamy Filling
Hard Lower Cookie


Crust
Lithosphere (Hard Plate)
Mantle
~35 km
~150 km
~700 km

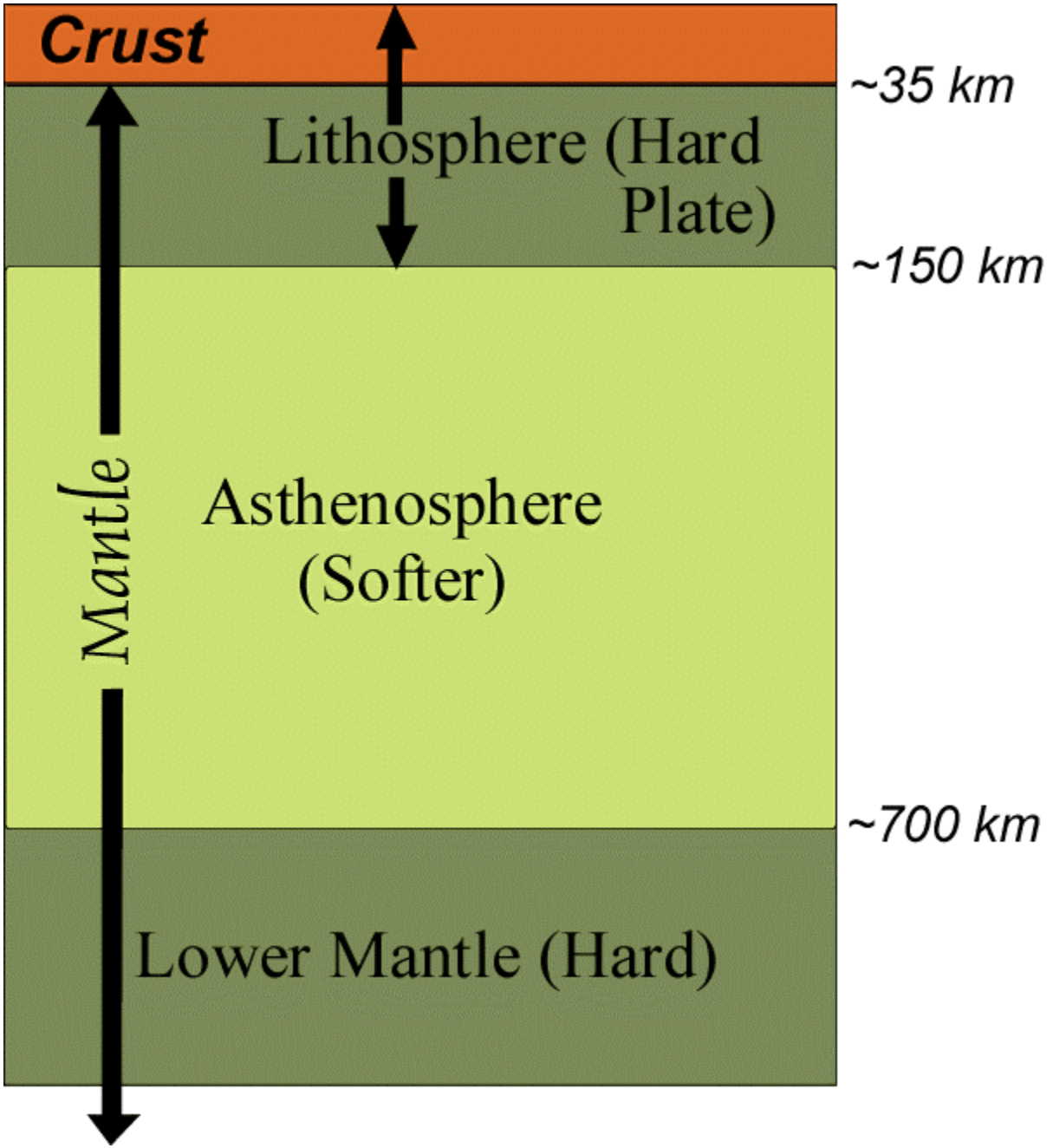
Oreo® Cookie


Hard Upper Cookie
Creamy Filling
Hard Lower Cookie


Crust
Lithosphere (Hard Plate)
Mantle
Asthenosphere (Softer)
~35 km
~150 km
~700 km

Oreo® Cookie


Hard Upper Cookie
Creamy Filling
Hard Lower Cookie


Crust
~35 km
Lithosphere (Hard Plate)
~150 km
Mantle
Asthenosphere (Softer)
~700 km
Lower Mantle (Hard)


Robert J. Lillie

Oreo® Psycho-Personality Test

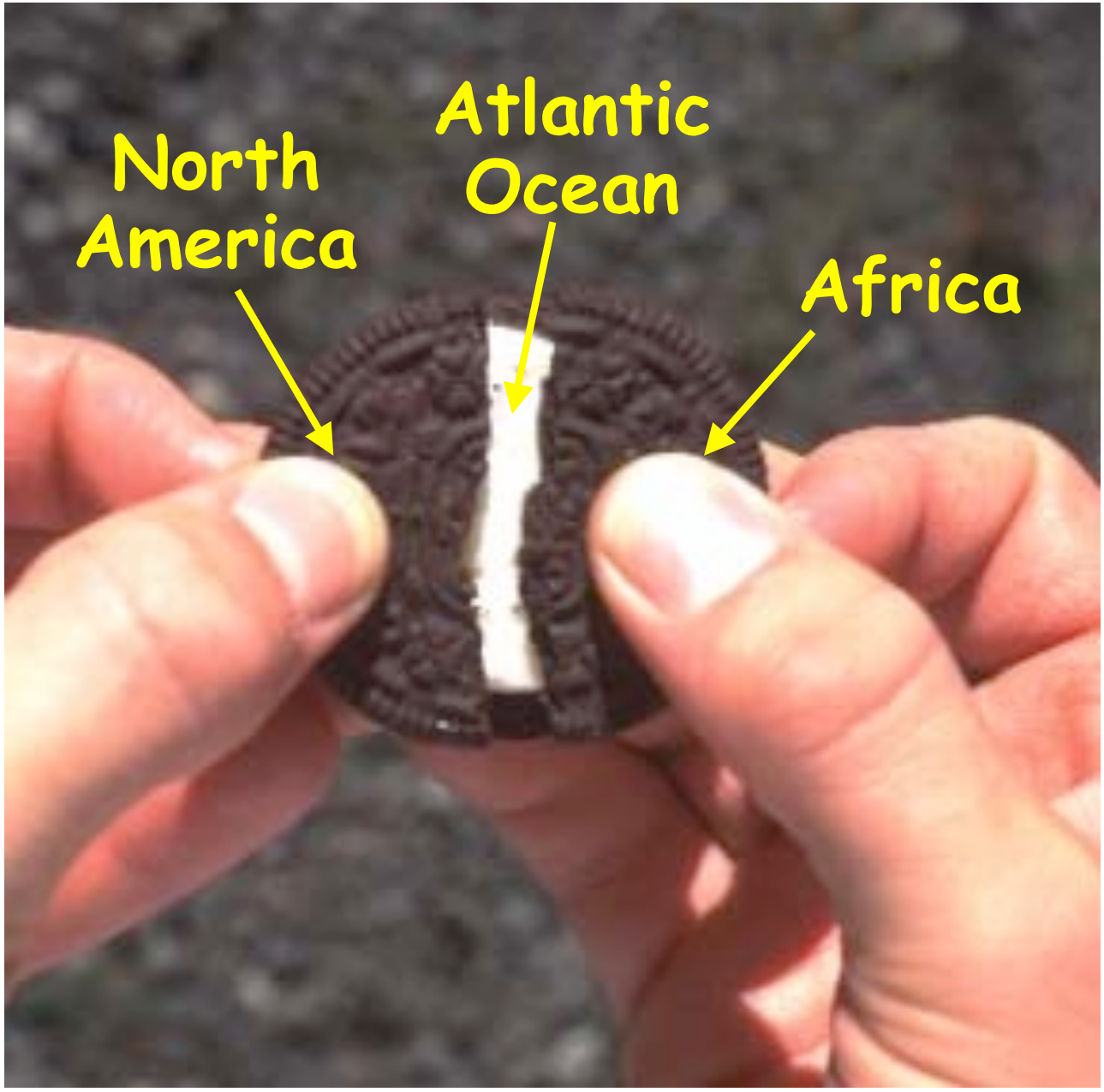
www.superkids.com/aweb/pages/humor/050199.sht

- **Psychologists have discovered that the manner in which people eat Oreo® cookies provides great insight into their personalities. Choose which method best describes your favorite method of eating Oreos:**
- **1. The whole thing at once.**
  2. One bite at a time.
  3. Slow and methodical nibbles examining the results of each bite afterwards.
  4. In little feverous nibbles.
  5. Dunked in some liquid (milk, coffee …..)
  6. Twisted apart, the inside, then the cookie.
  7. Twisted apart, the inside, and toss the cookie.
  8. Just the cookie, not the inside.
  9. I just like to lick them, not eat them.
  10. I don't have a favorite way because I don't like Oreos.

6. Twisted apart, the inside, then the cookie.

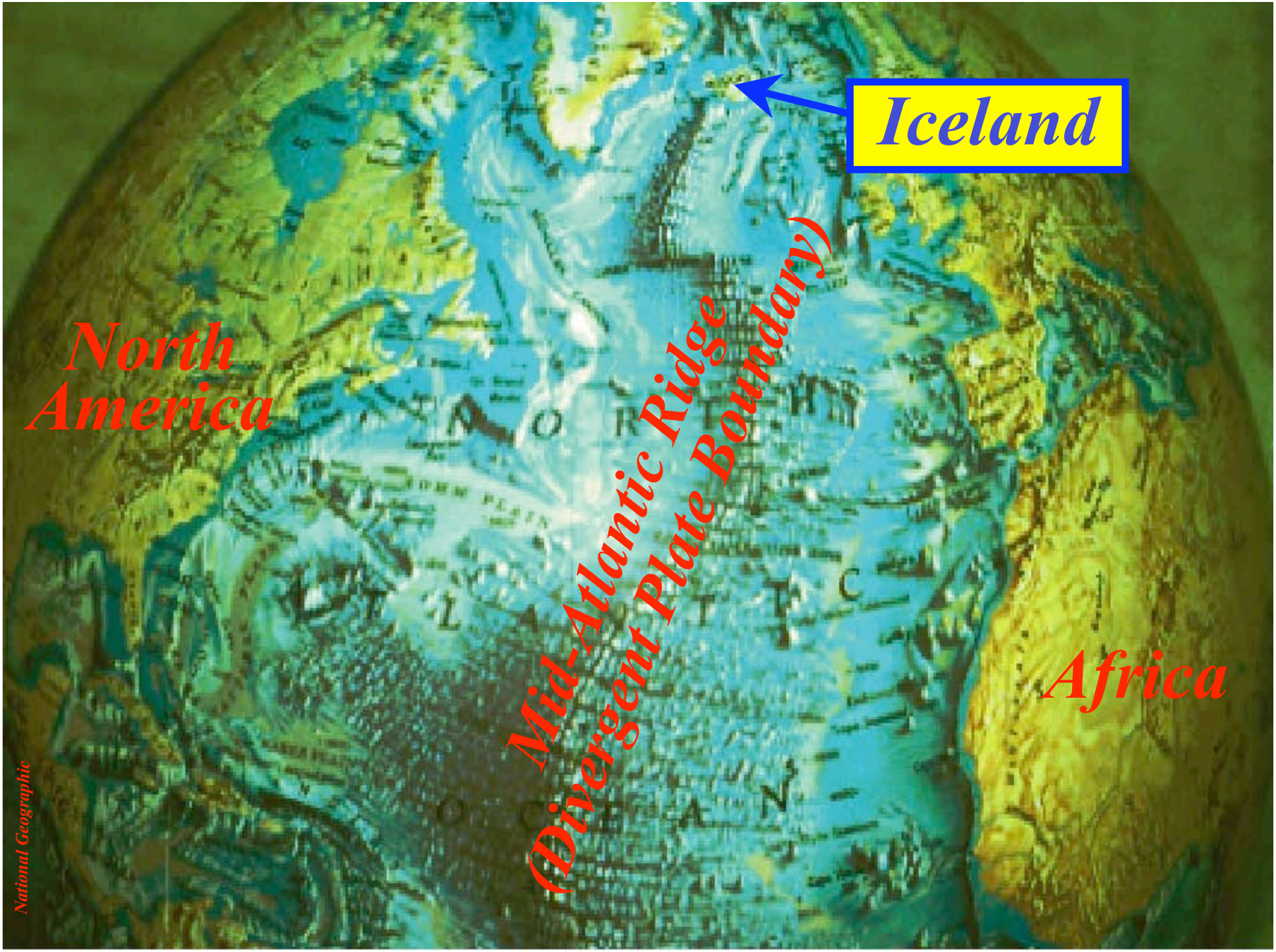
- You have a highly curious nature.
- You take pleasure in breaking things apart to find out how they work, though you're not always able to put them back together, so you destroy all the evidence of your activities.
- You deny your involvement when things go wrong.
- You are a compulsive liar and exhibit deviant, if not criminal, behavior.

Sliding Plate over Asthenosphere



Robert J. Lillie

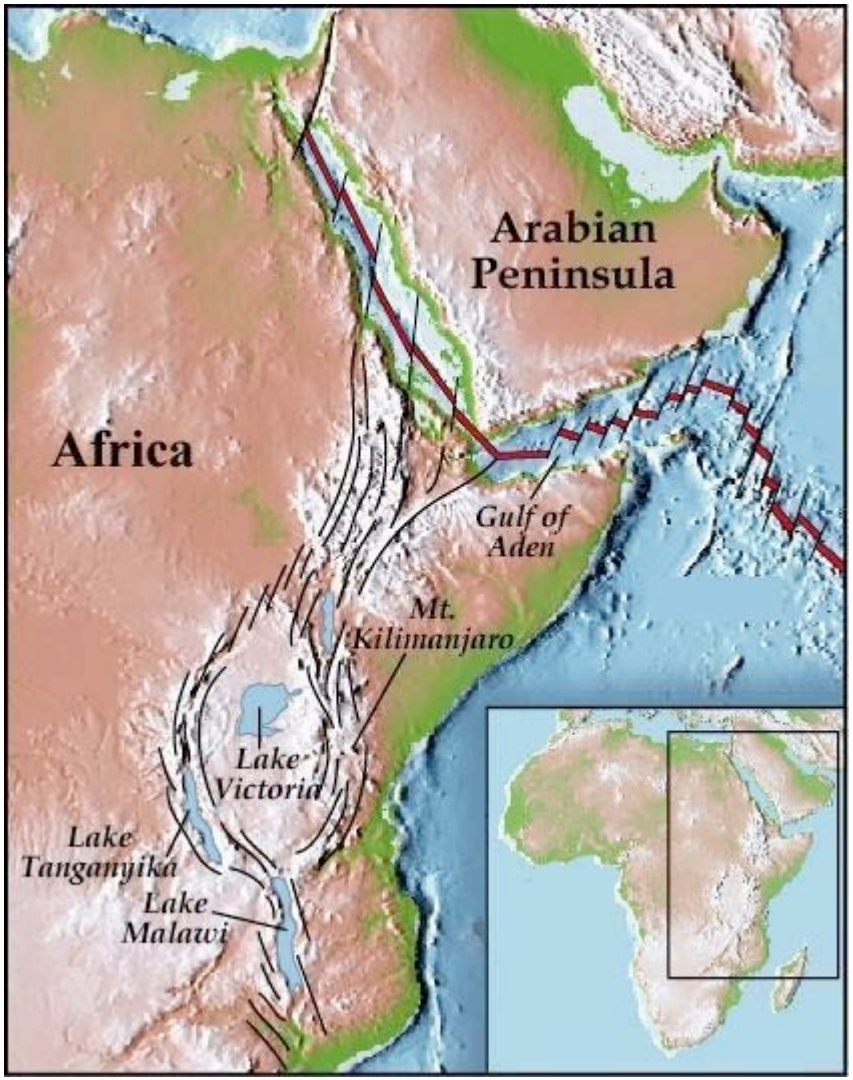
Divergent Plate Boundary


Iceland
North America
Mid-Atlantic Ridge
(Divergent Plate Boundary)
Africa
National Geographic

Iceland

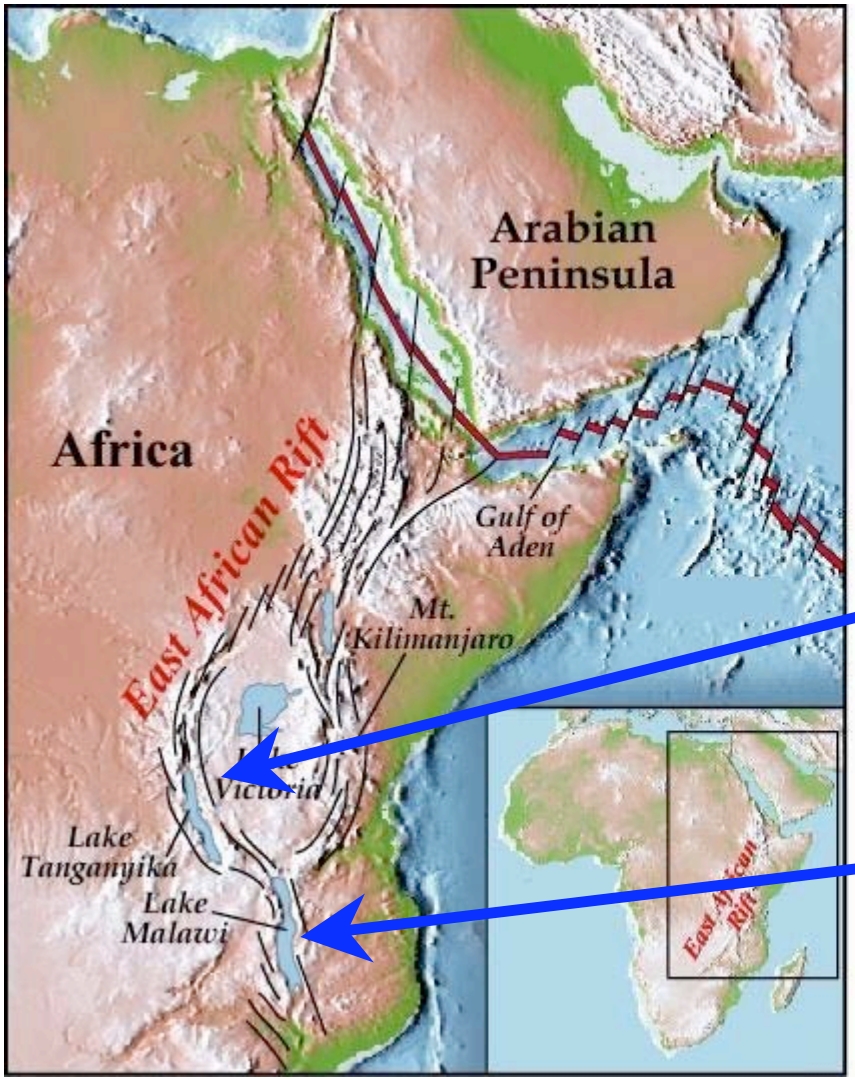

Iceland

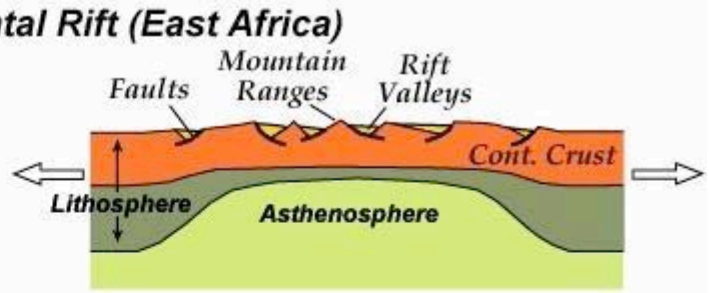
Three Stages of Divergent Plate Boundary Development



Marshak, EARTH (Norton, 2005)

Three Stages of Divergent Plate Boundary Development



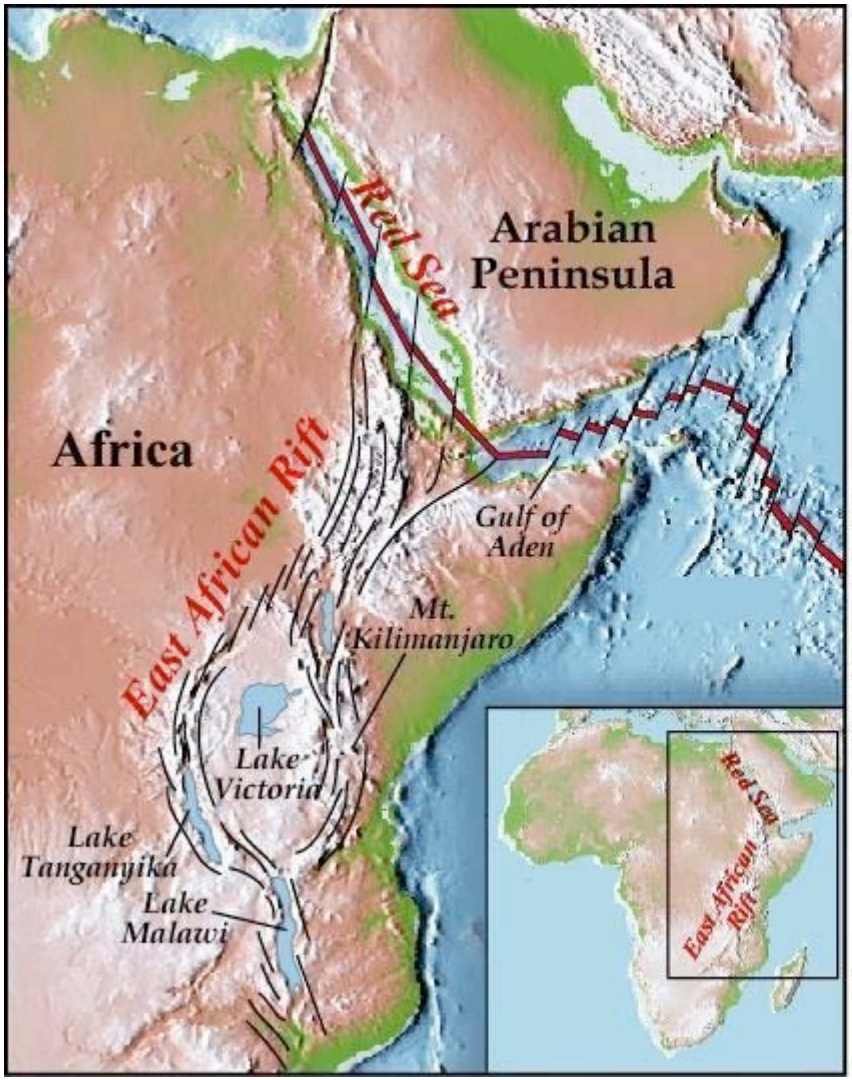


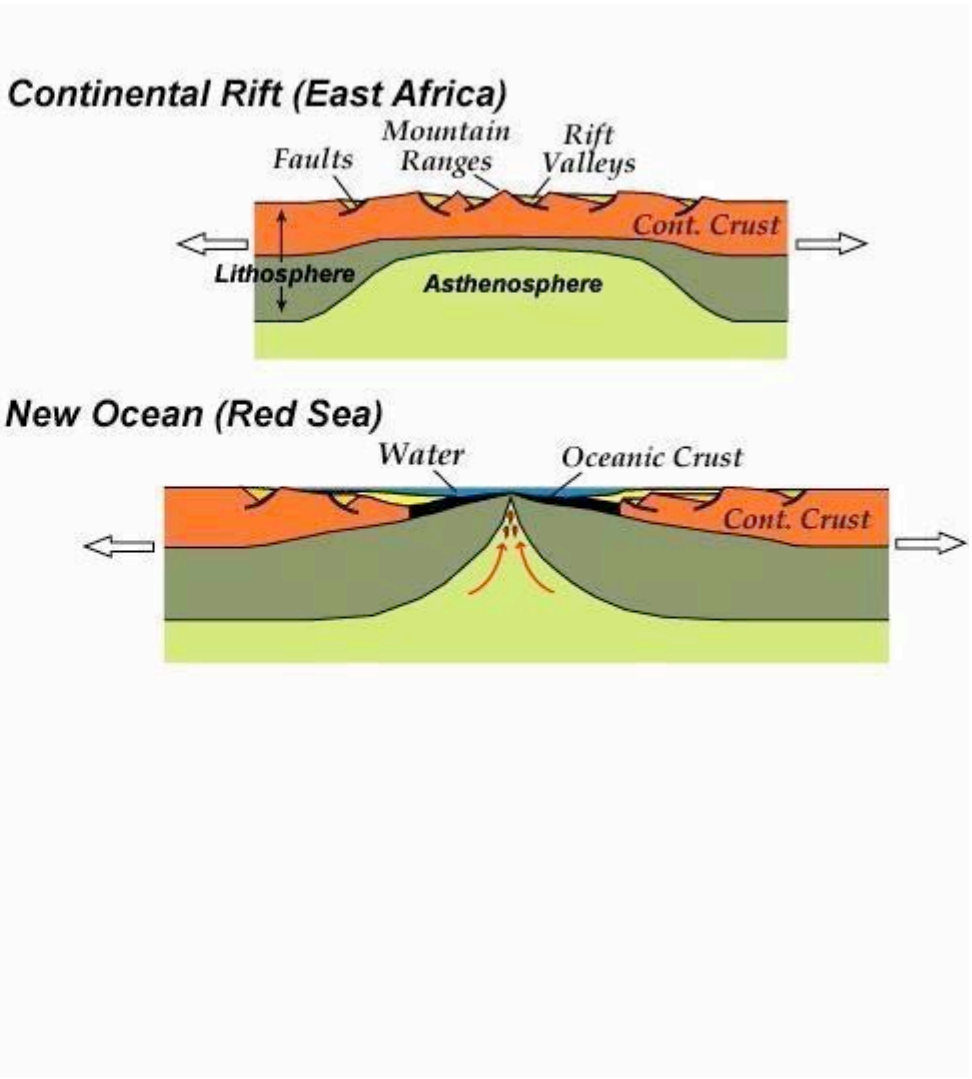
World's 2nd Deepest Lake

World's 4th Deepest Lake

Marshak, EARTH (Norton, 2005)

Three Stages of Divergent Plate Boundary Development

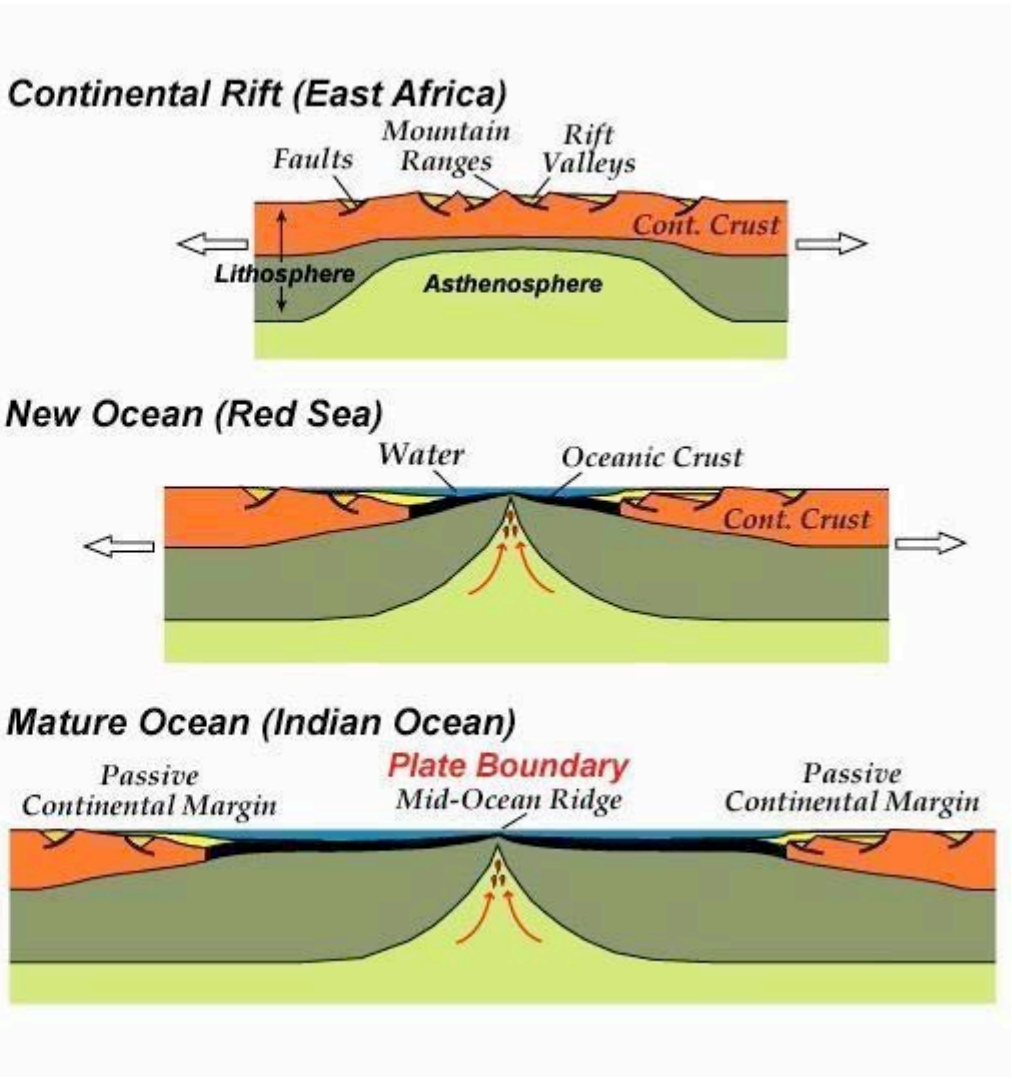




Marshak, EARTH (Norton, 2005)

Parks and Plates
©2005 Robert J. Lillie

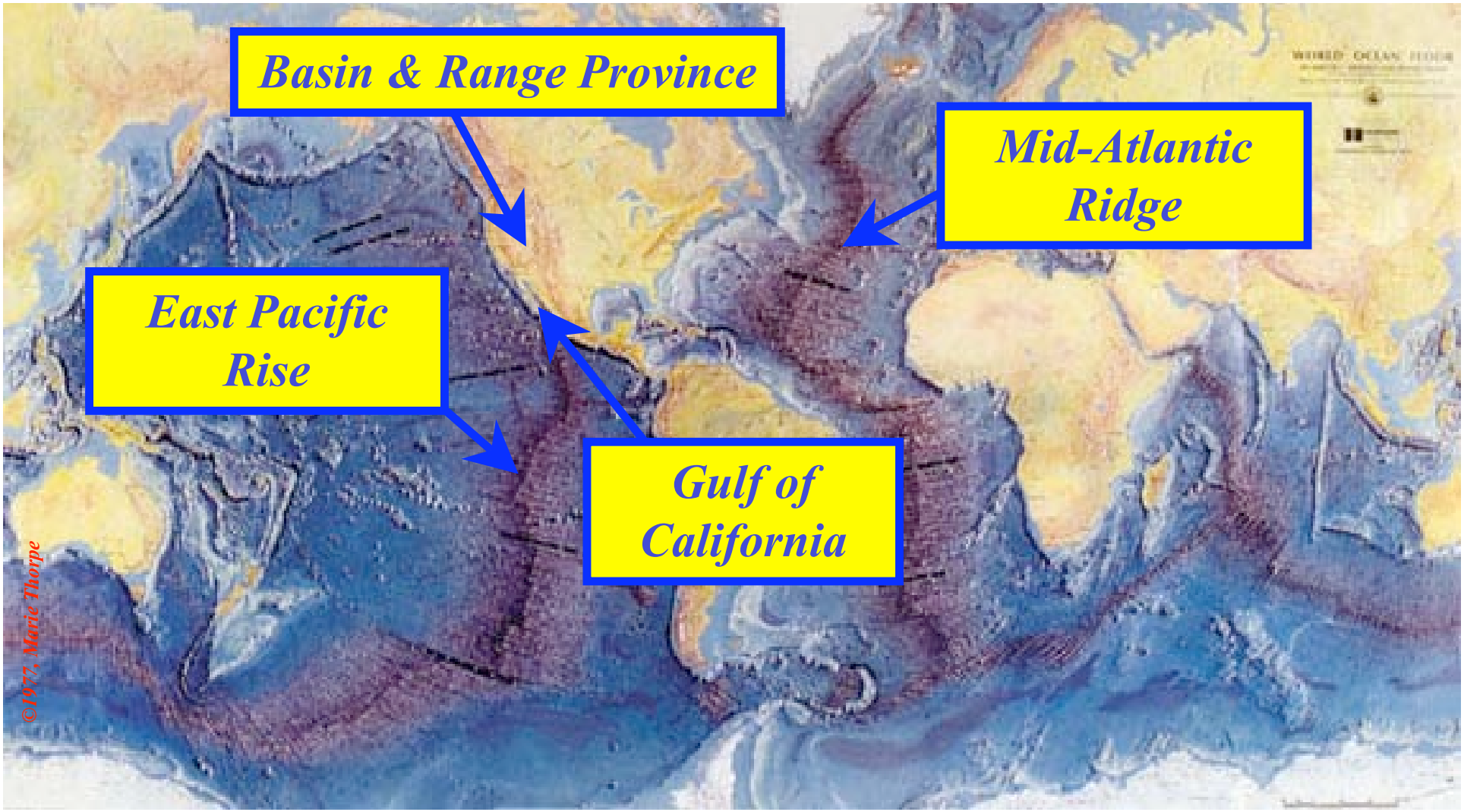
Three Stages of Divergent Plate Boundary Development



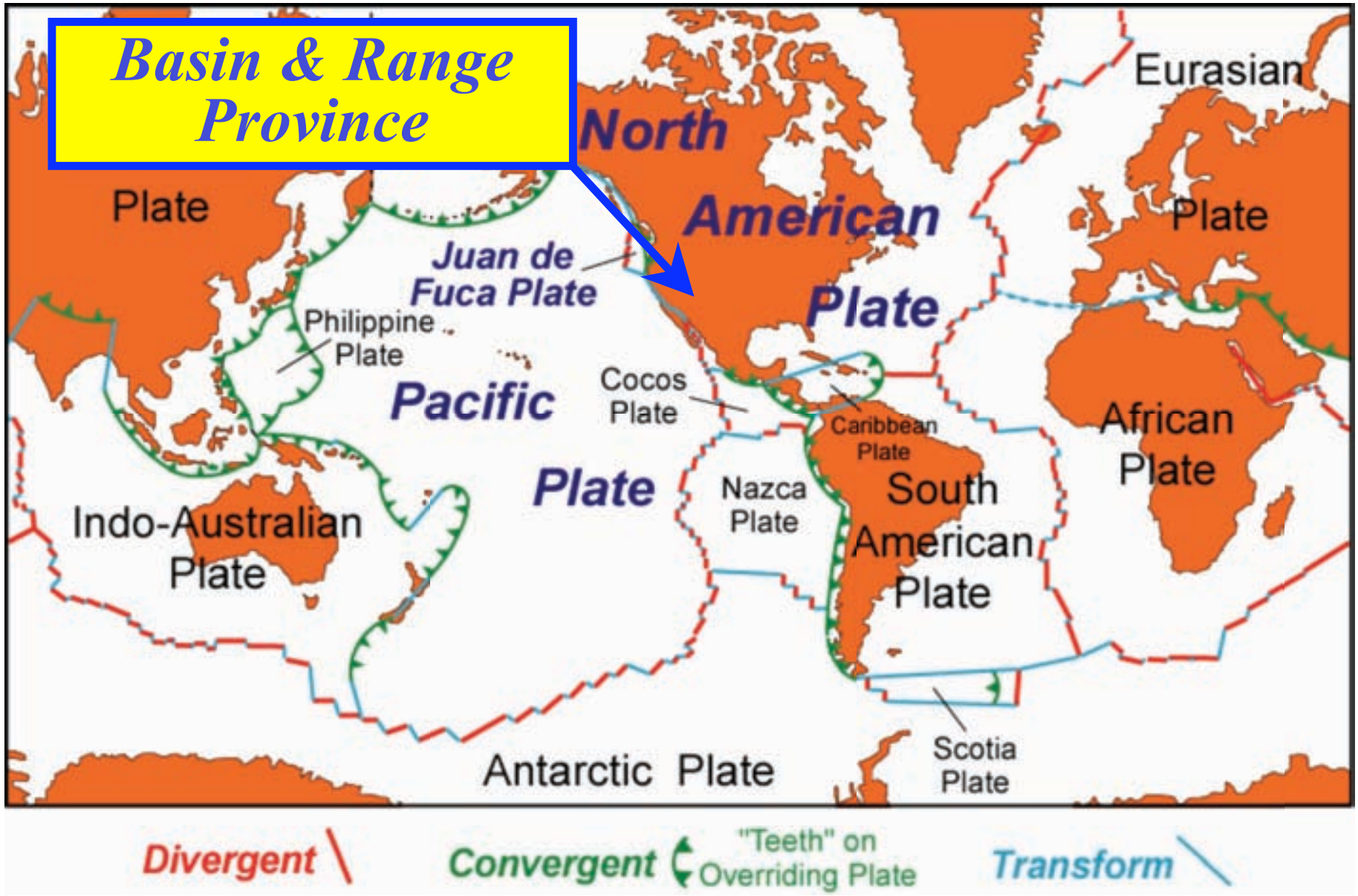
Marshak, EARTH (Norton, 2005)

Parks and Plates

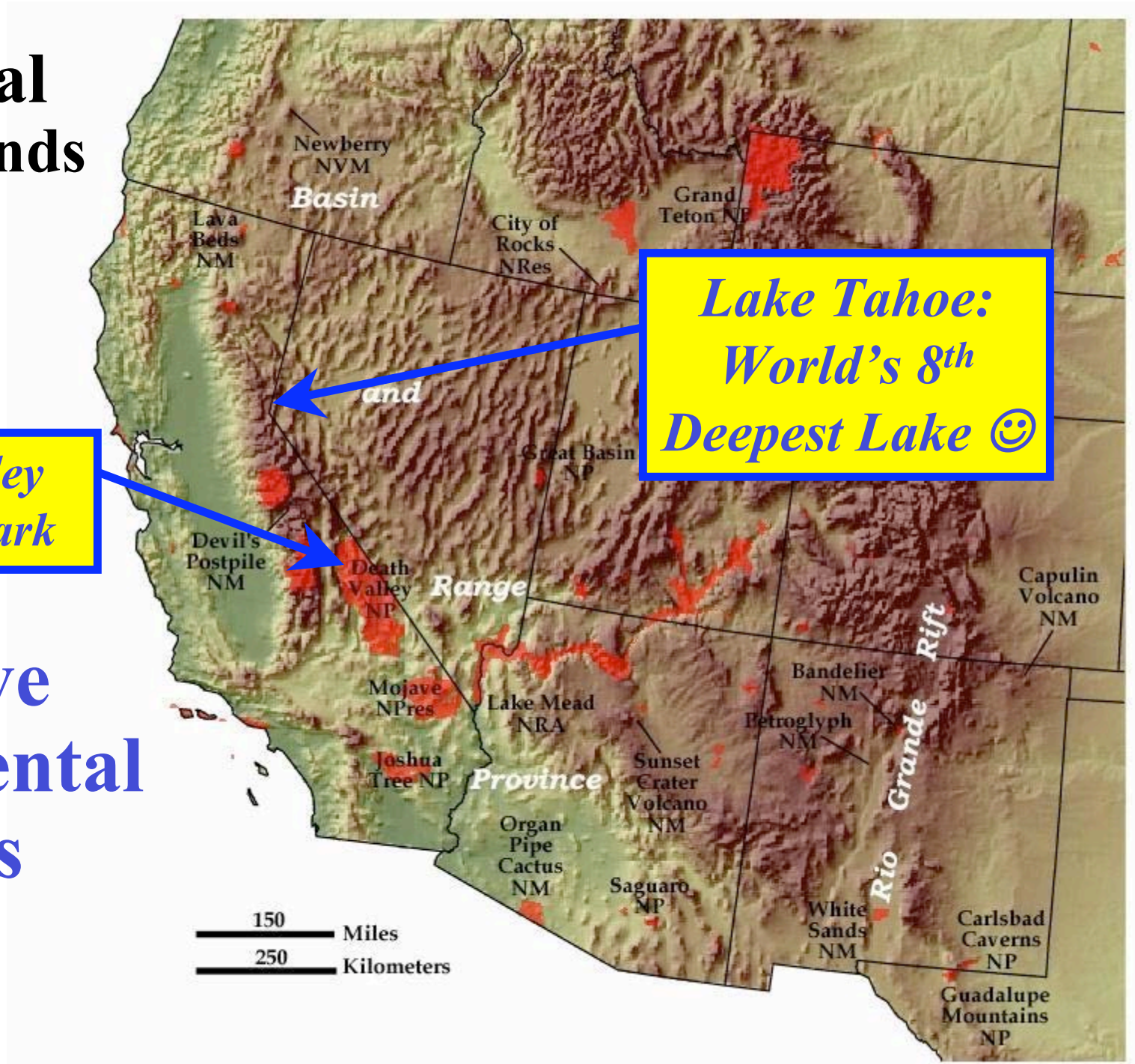
A Continental Rift might be Viewed as the On-land Continuation of a Mid-Ocean Ridge



Continental Rift features formed by processes at Divergent Plate Boundaries

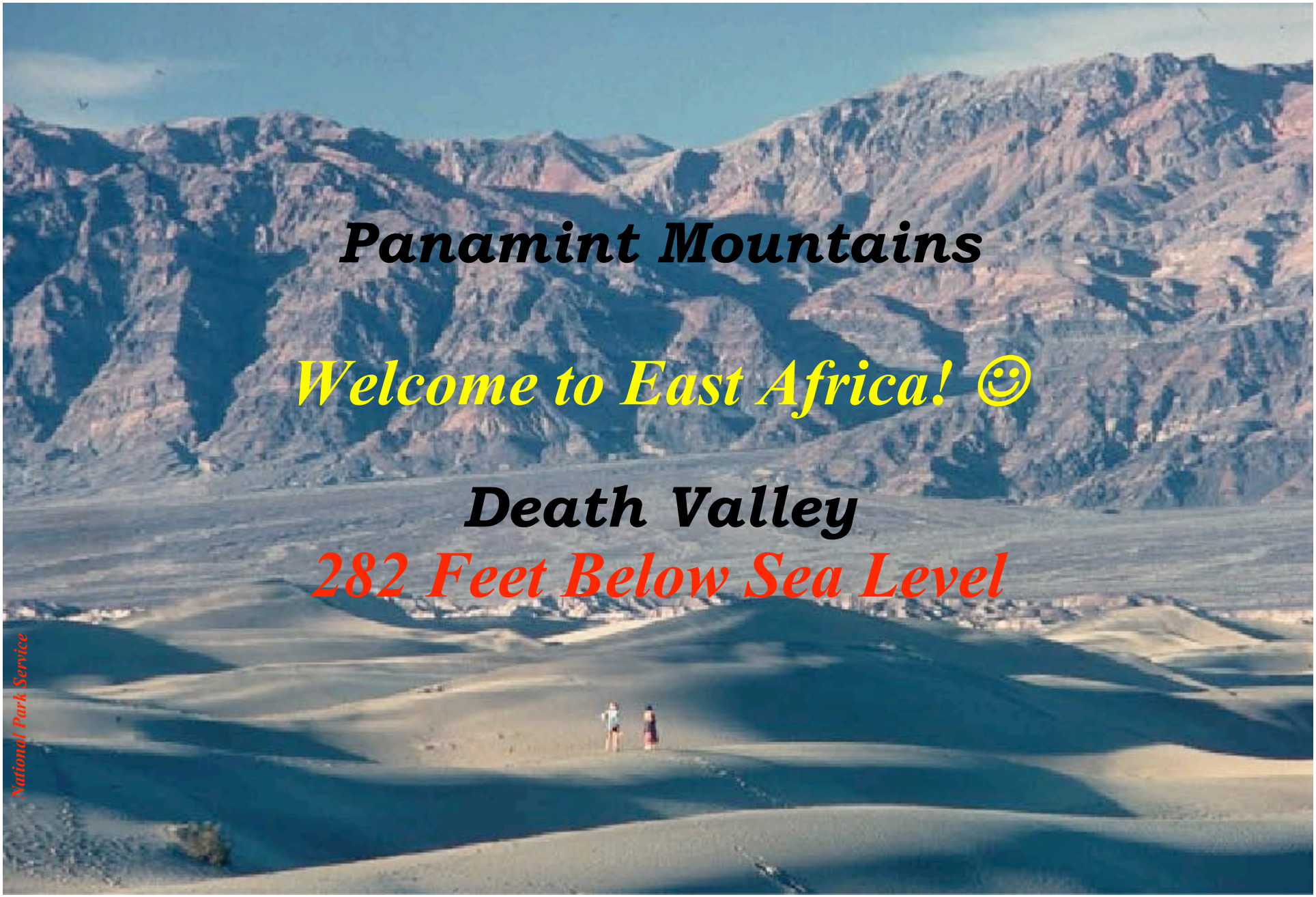


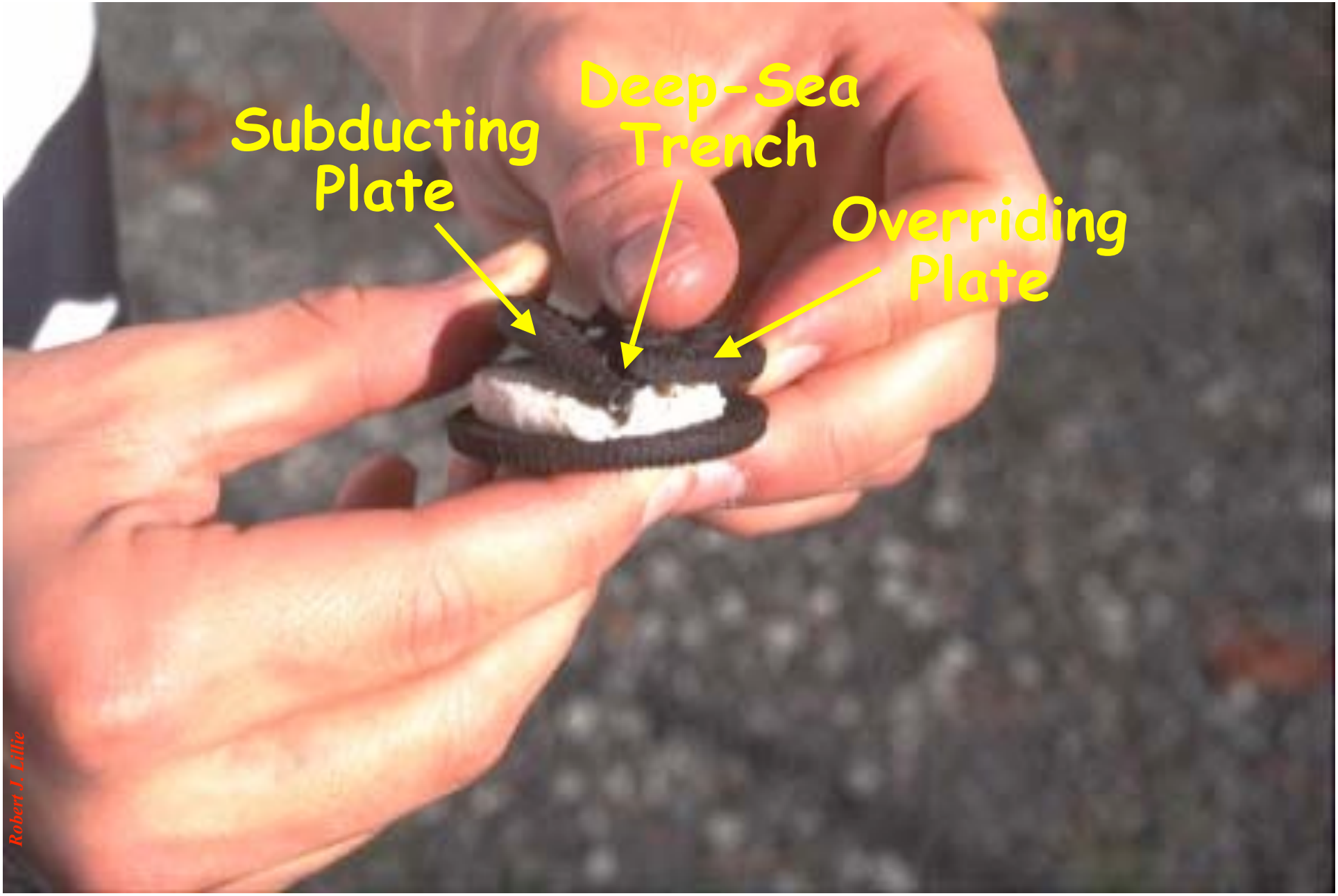
National Park Lands



Active Continental Rifts

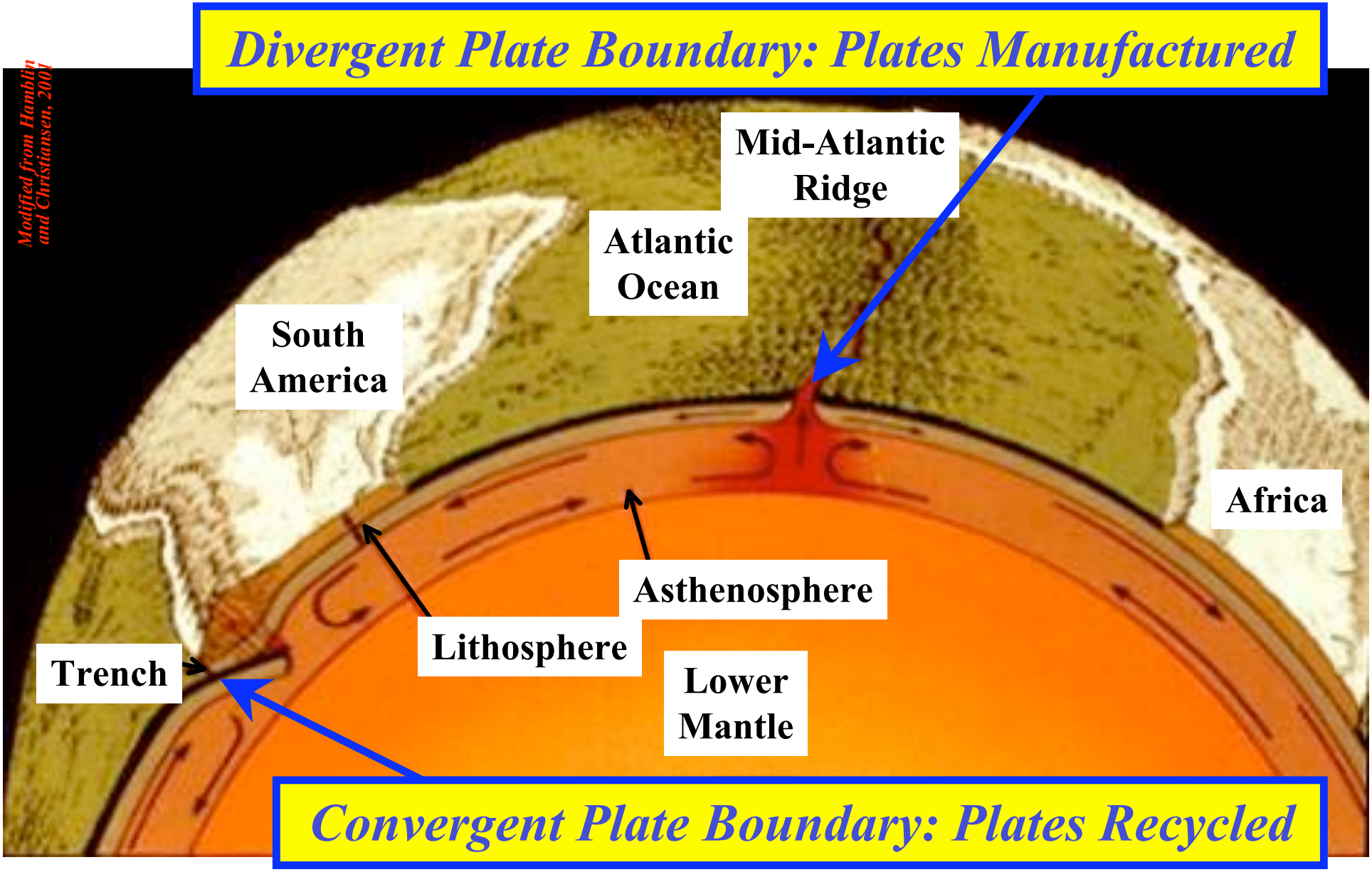
Death Valley National Park, California





Convergent Plate Boundary

Giant Re-Cycling Machine!! ☺

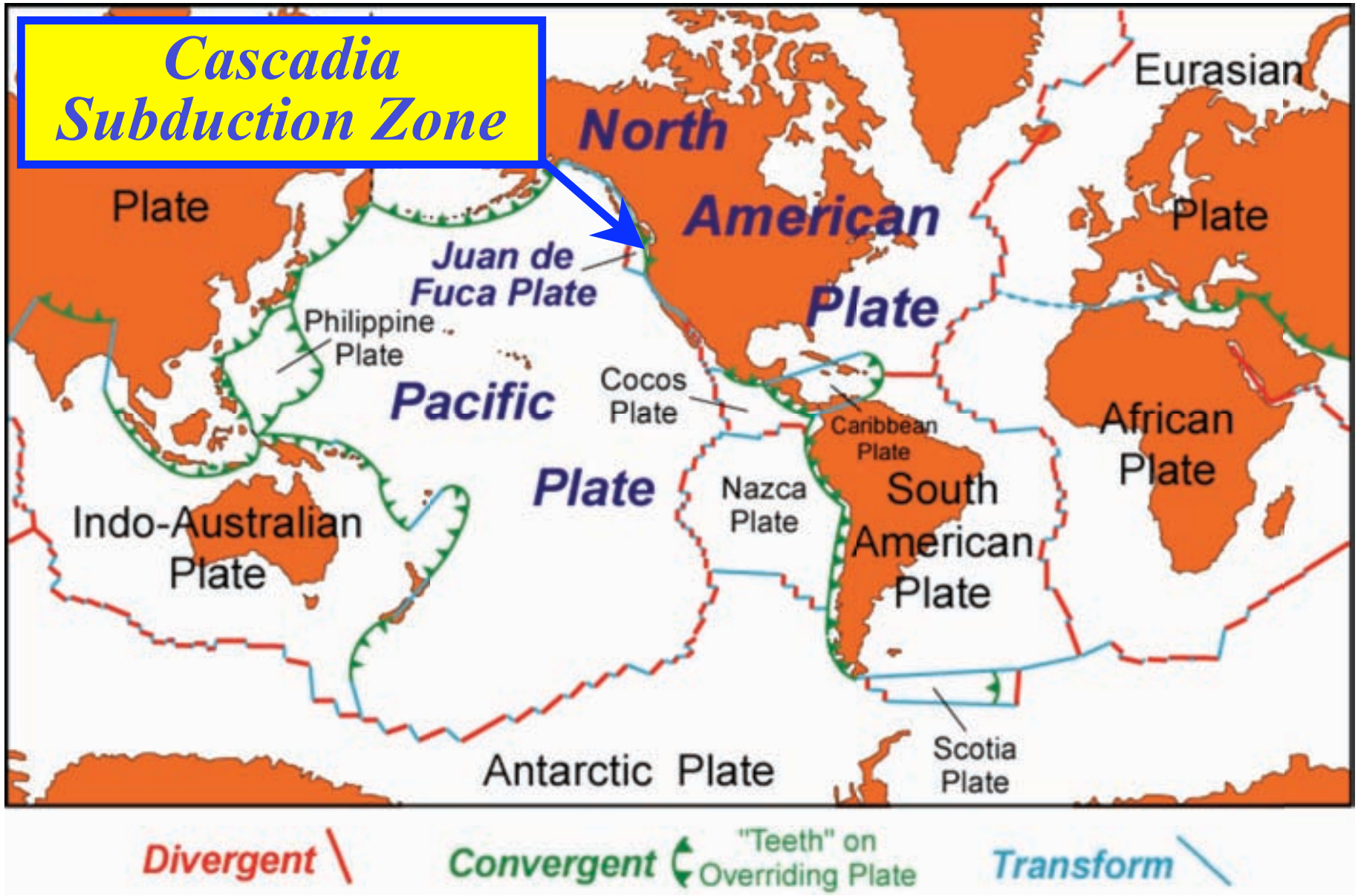


Andes Mountains, South America

Osorno volcano near Puerto Montt, Chile

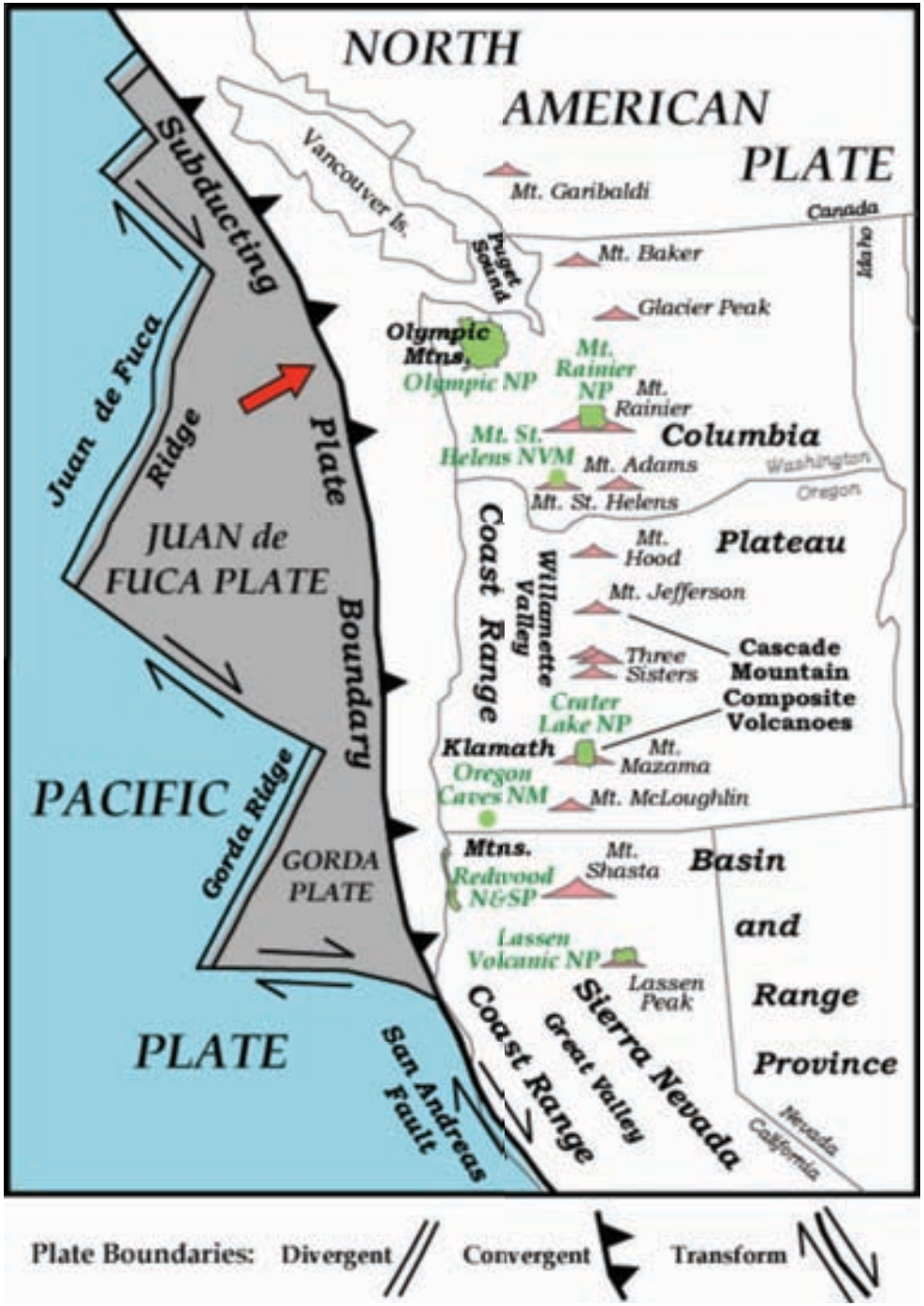
http://whatonearth.olehnielsen.dk/volcanoes.asp

Subduction Zone features formed by processes at Convergent Plate Boundaries

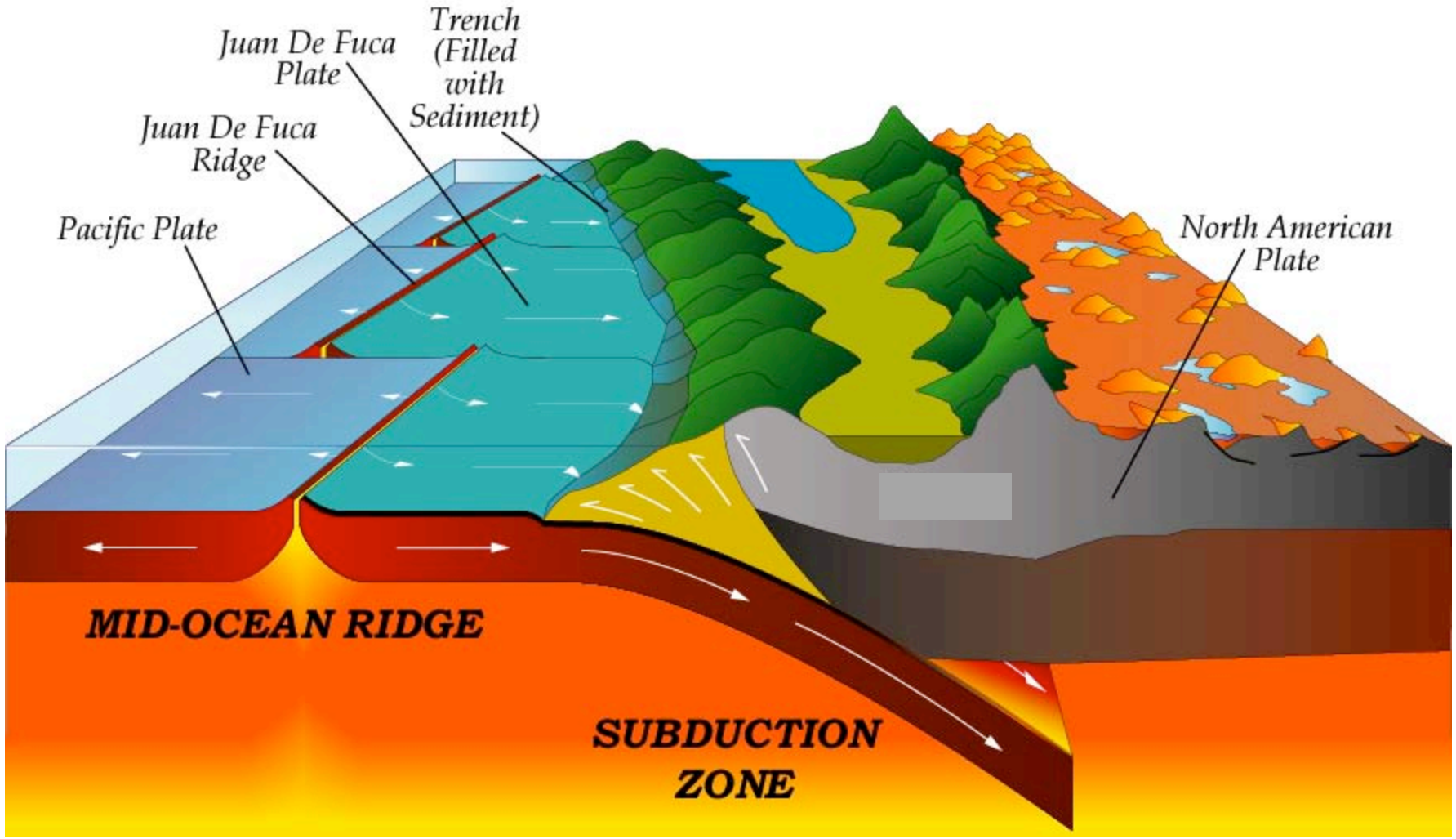


Parks in the Pacific Northwest Display Convergent Plate Boundary Motion

Some Park Lands in the Cascadia Subduction Zone

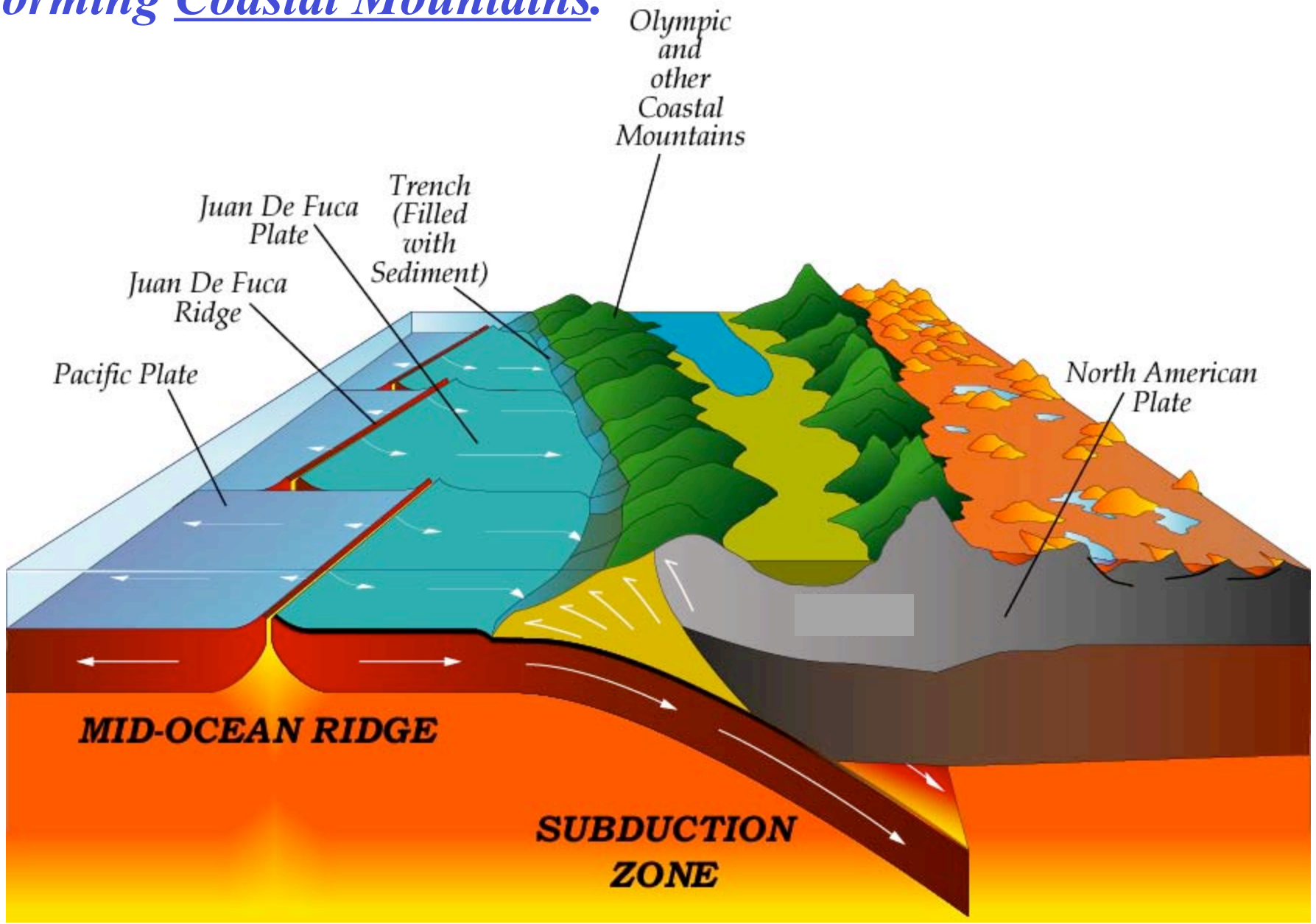


Subducting Juan de Fuca Plate forms two parallel mountain ranges in the Pacific Northwest.



Robert J. Lillie
Bernard Garcia

Oceanic sediment and basalt scraped off subducting plate, forming Coastal Mountains.



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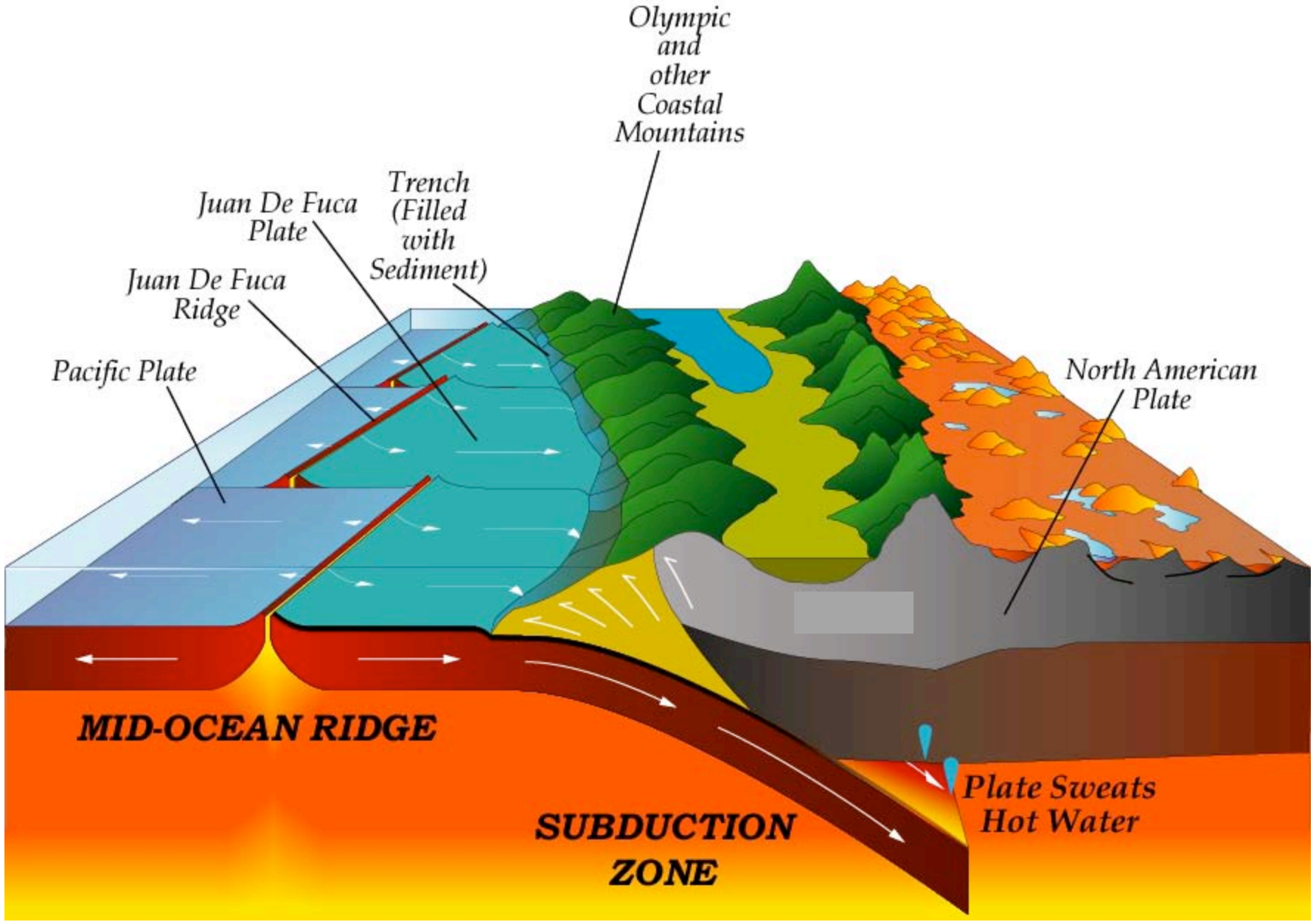
Subducting plate dehydrates, forming Cascade Volcanoes.



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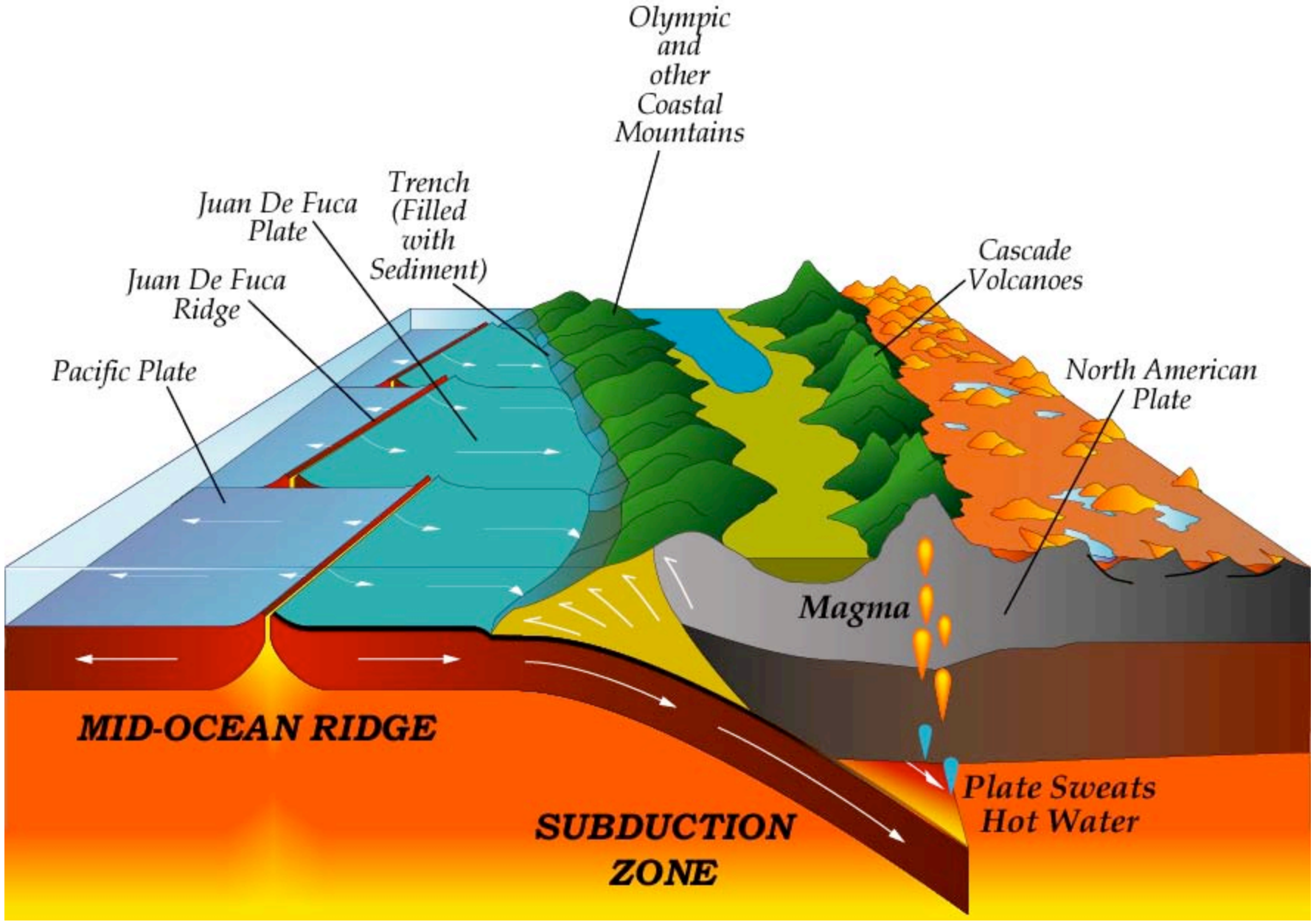
Bernard Garcia

Subducting plate dehydrates, forming Cascade Volcanoes.



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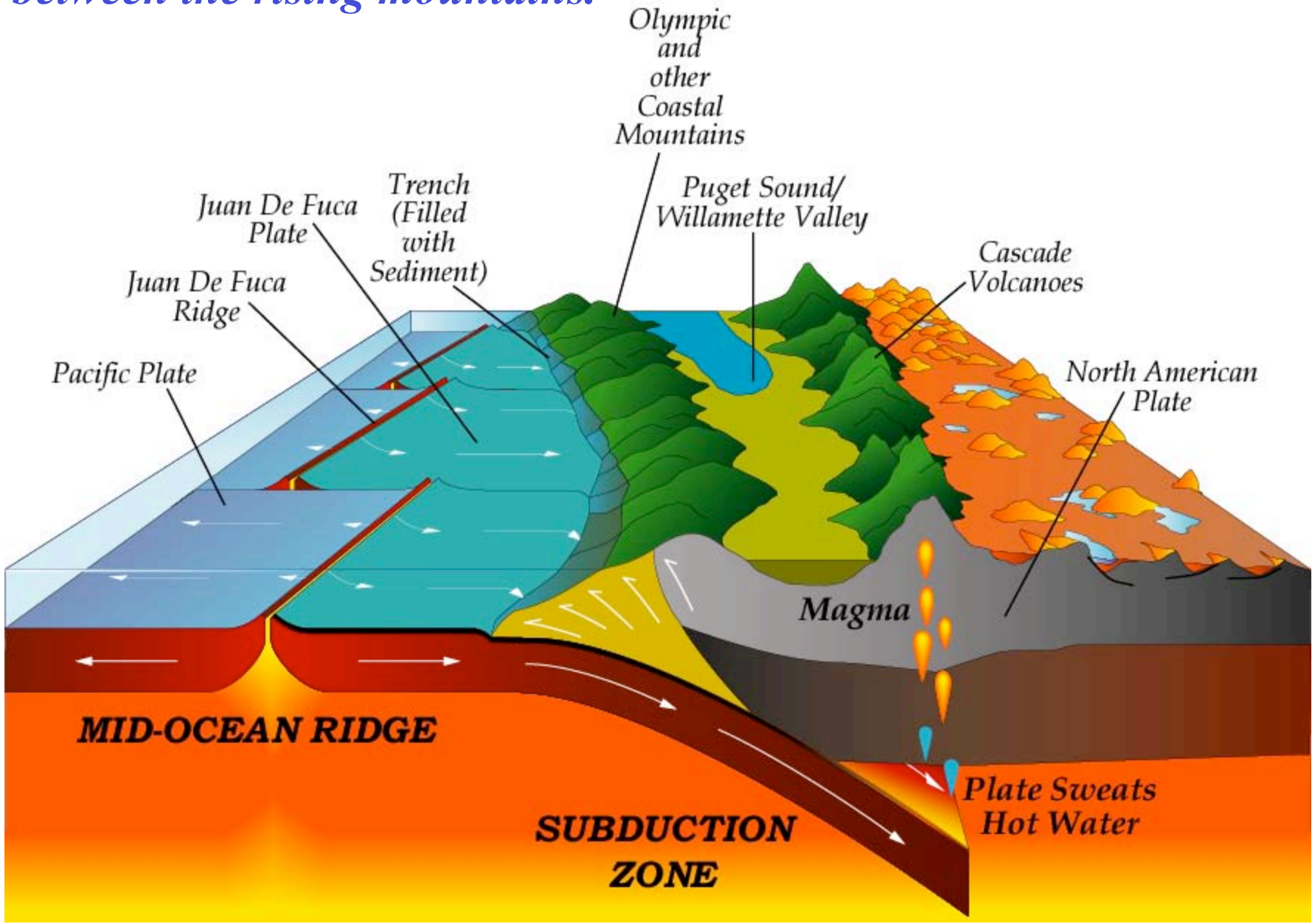
Bernard Garcia

***Puget Sound* and the *Willamette Valley* are low-lying regions between the rising mountains.**



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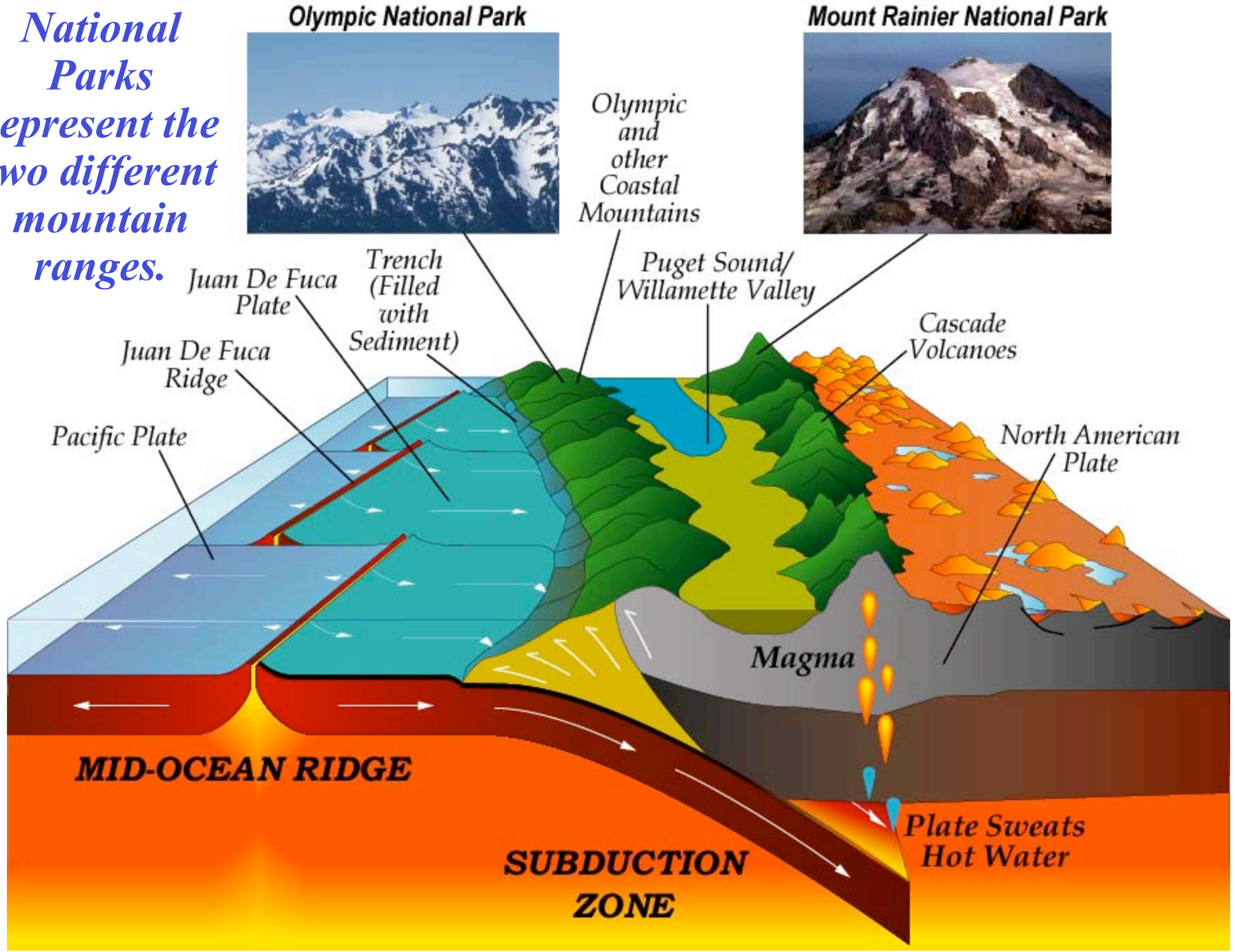
National Parks represent the two different mountain ranges.



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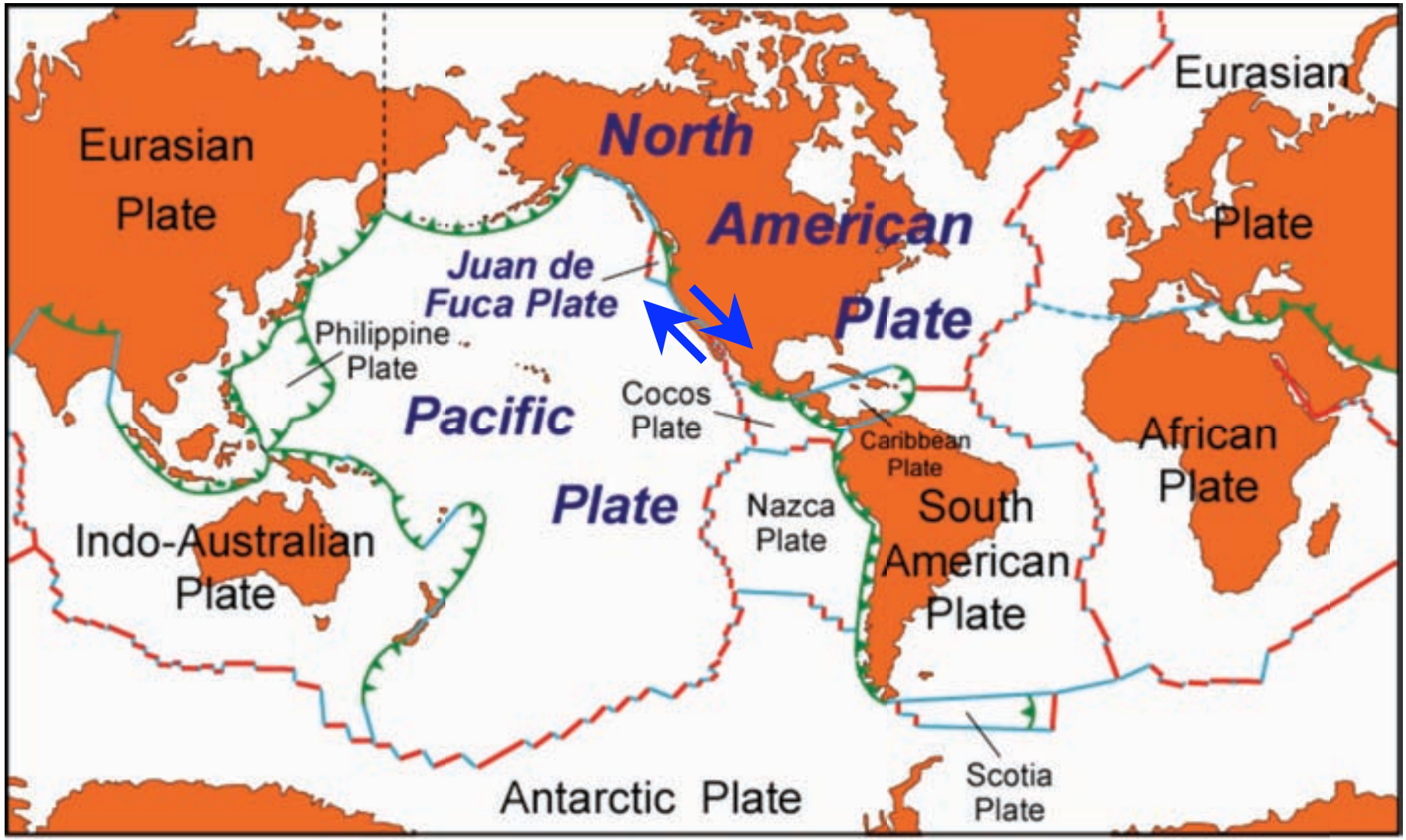
Transform Plate Boundary

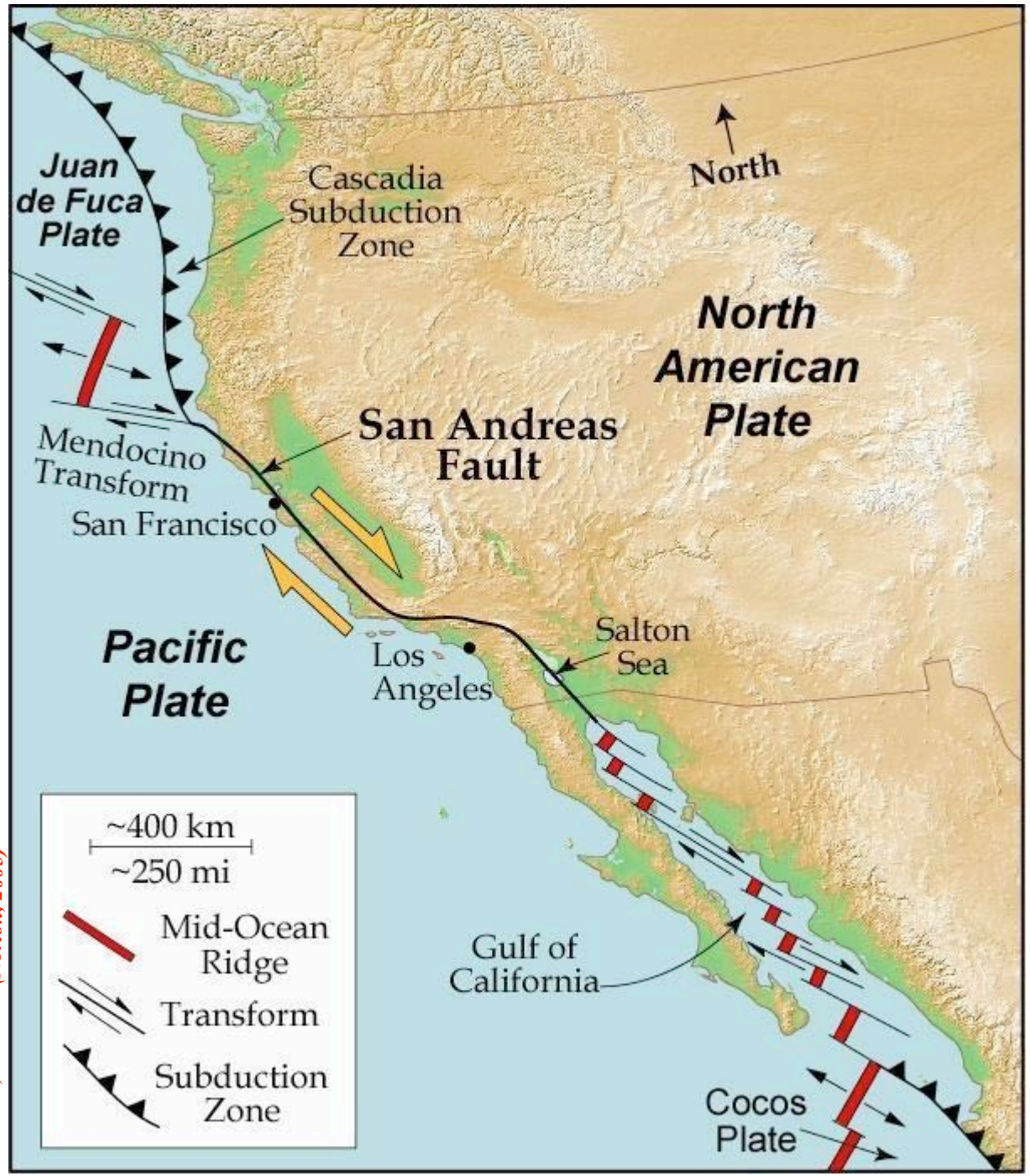
Transform Plate Boundary



San Andreas Fault

Transform Plate Boundary

The Pacific Plate slides past the North American Plate along the <u>San Andreas Fault</u> in California.

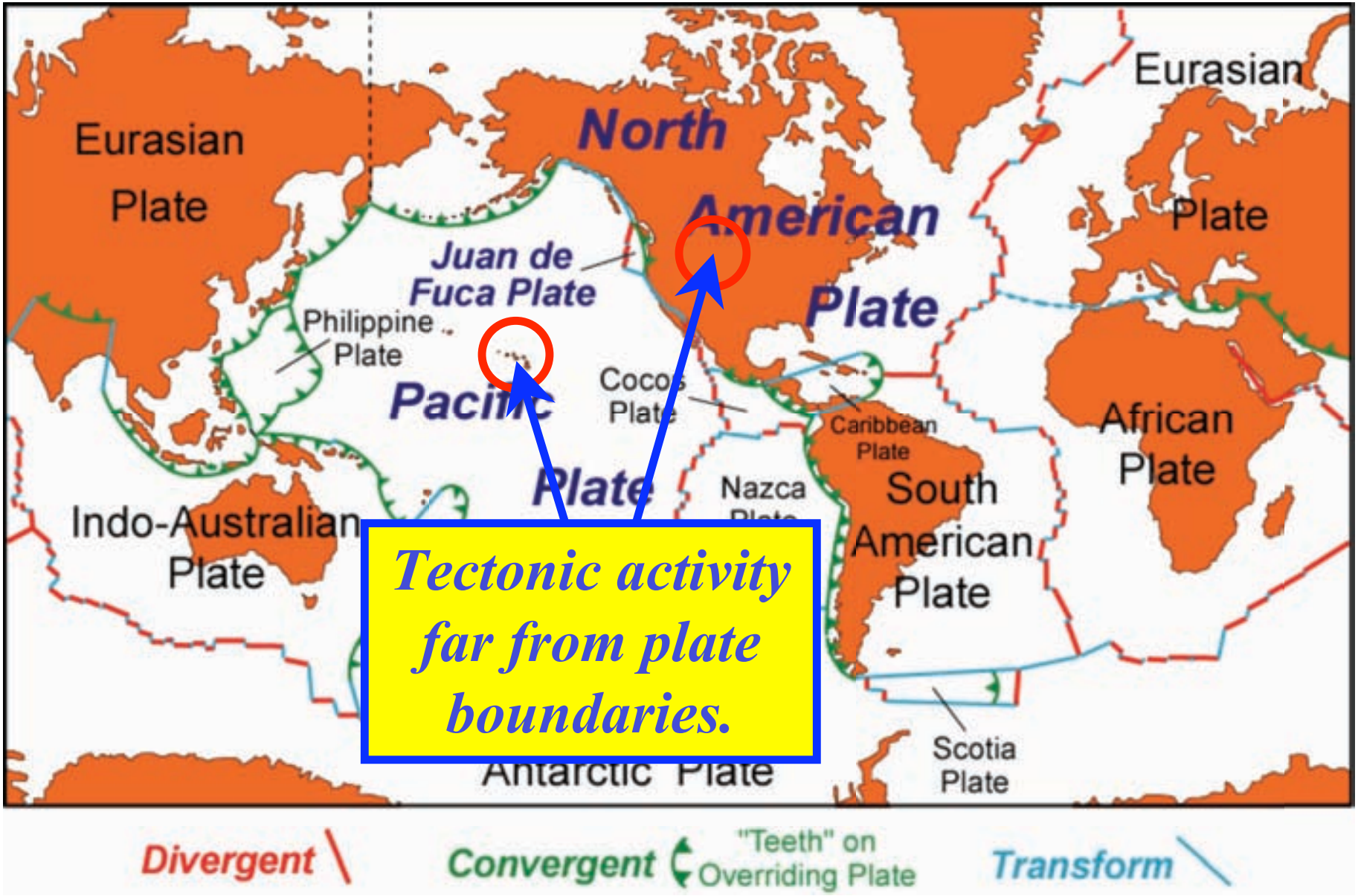


Marshak, EARTH (Norton, 2005)

SAN ANDREAS FAULT

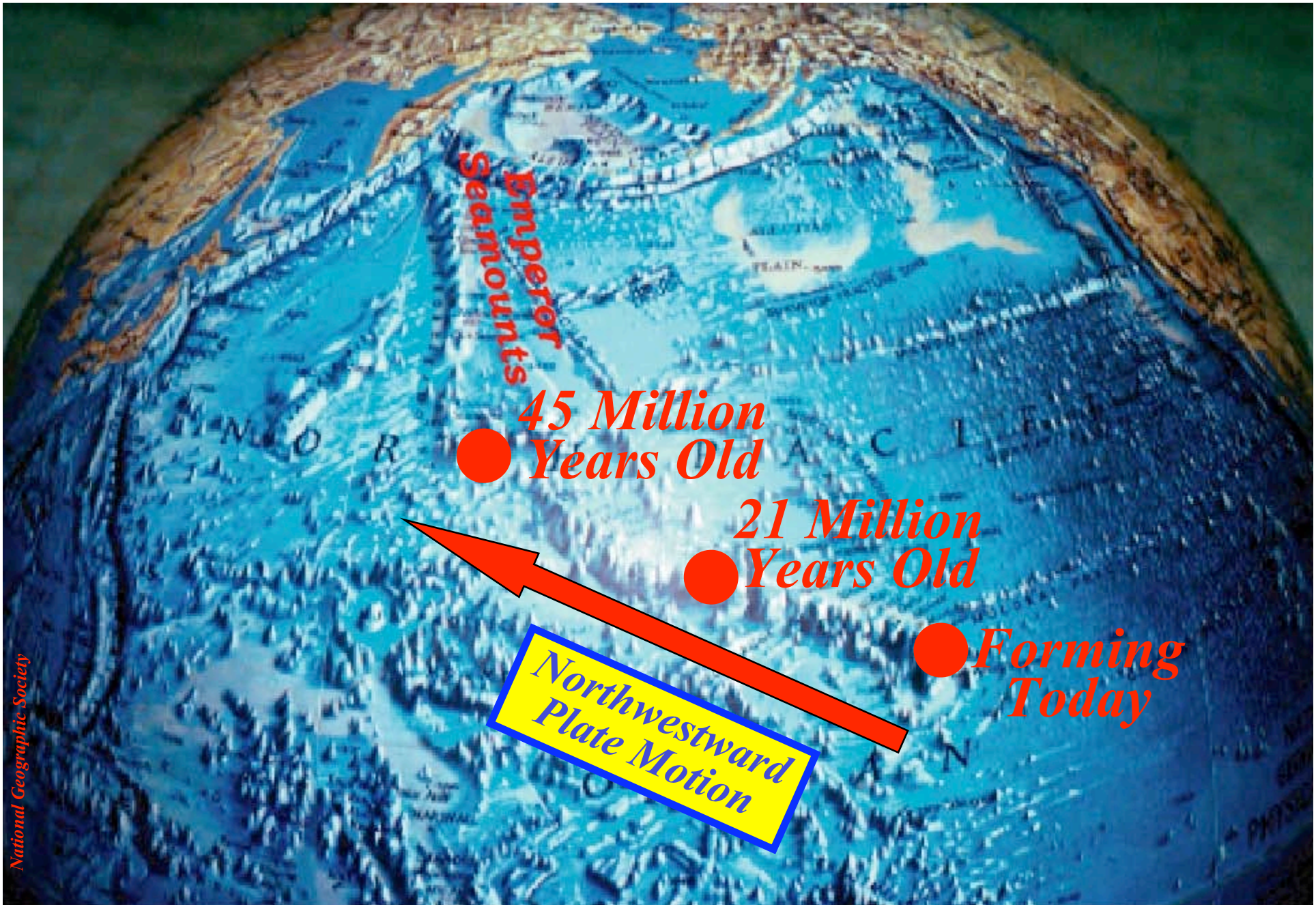
SAN ANDREAS FAULT

Plate Boundaries



Hotspot

Hawai`i – Emperor Hotspot Track



Hawai`i Volcanoes National Park, Hawai'i

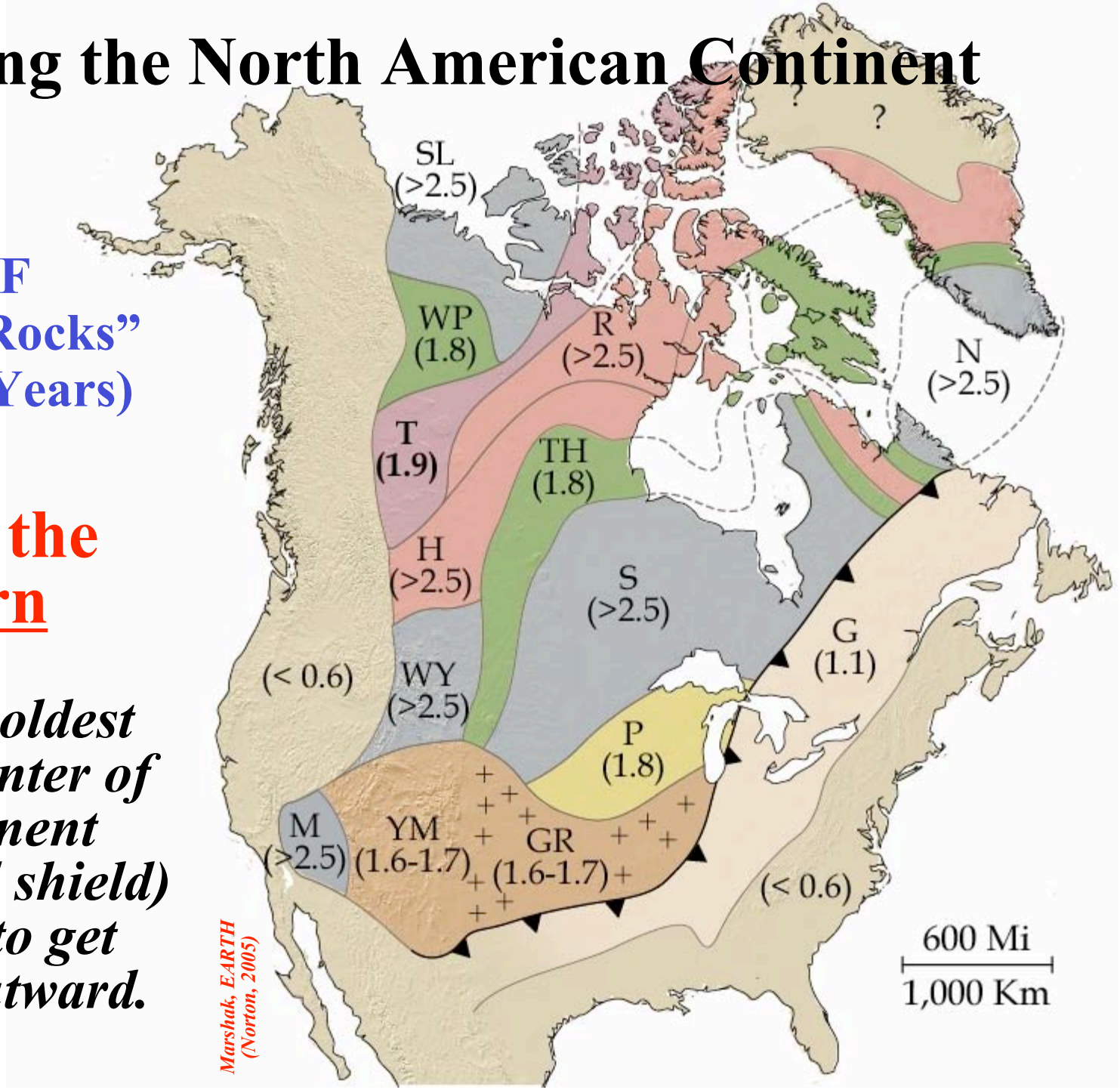
Above Oceanic Hotspot

Building the North American Continent

AGE OF "Basement Rocks" (Billions of Years)

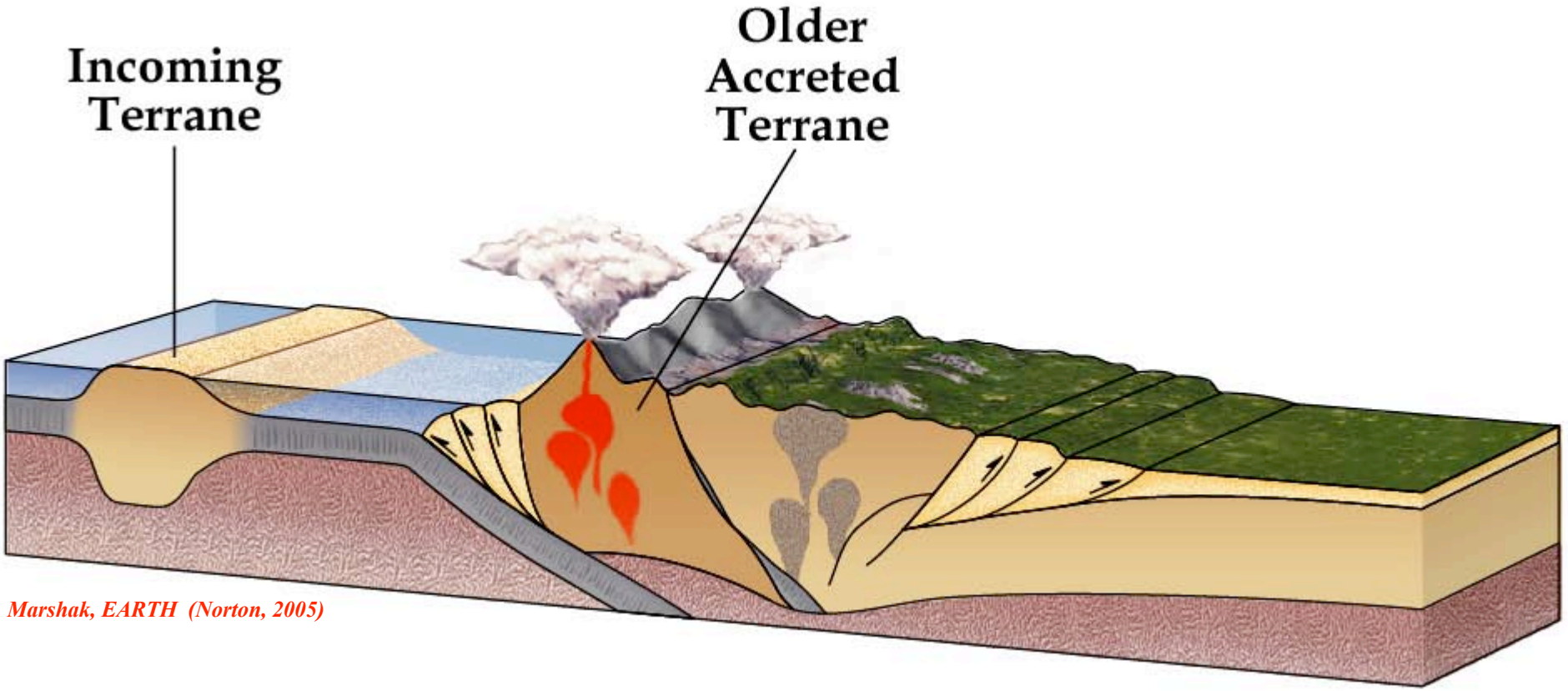
What's the Pattern

Rocks are oldest near the center of the continent (continental shield) and tend to get younger outward.



Terrane Accretion

- *A TERRANE consists of crust that is too thick and buoyant to subduct.*
- *A continent grows outward as terranes come crashing in.*



Marshak, EARTH (Norton, 2005)


Safeway Terrane Accretion ☺
Forth Terrane
Third Terrane
Second Terrane
Ocean Plate
First Terrane
North American Plate
Robert J. Lillie


Second Terrane
First Terrane
OREO
Double Stuf
Chocolate Sandwich Cookies
Ocean Plate
Robert J. Lillie

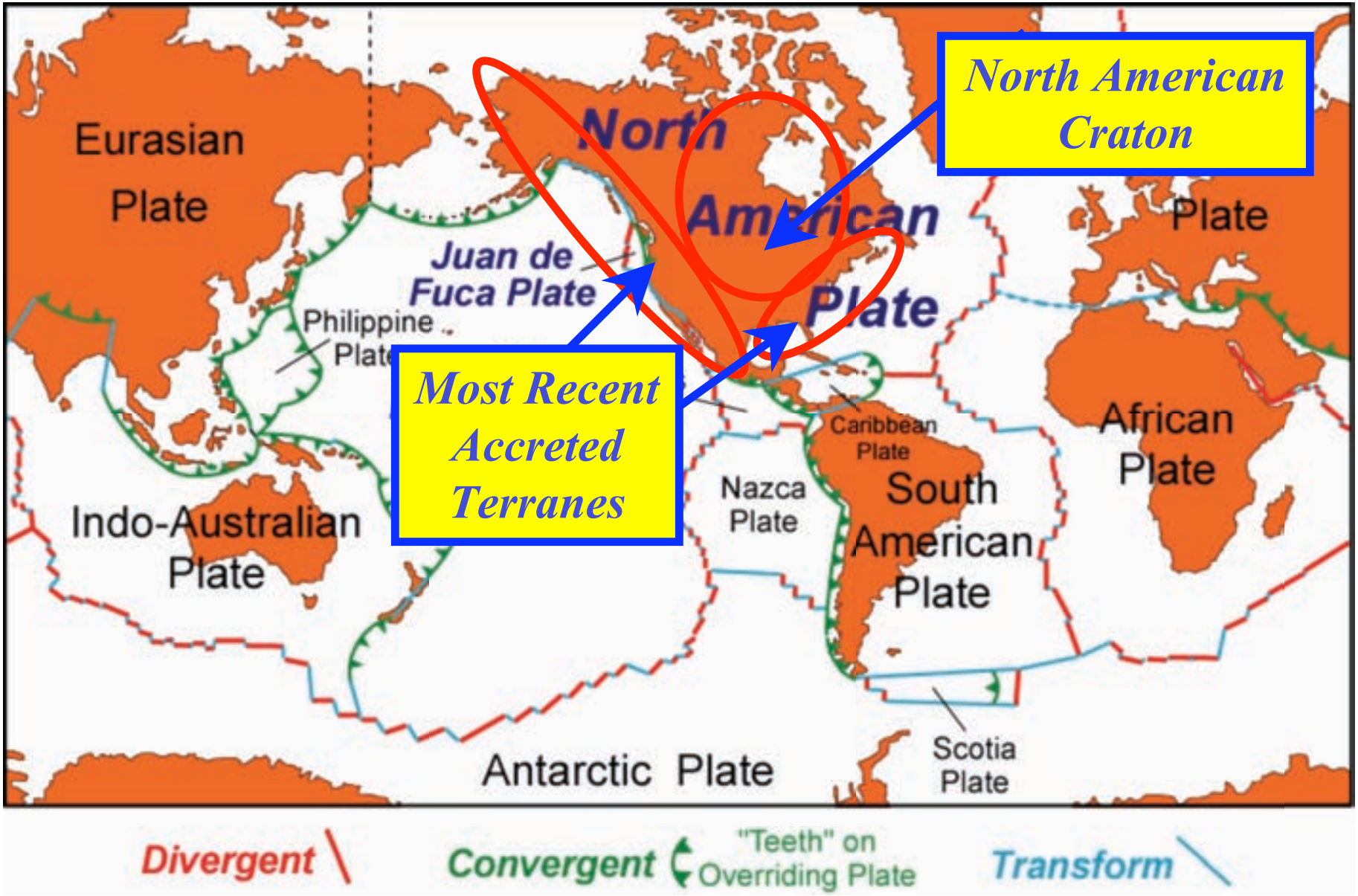
Ocean Plate


Third Terrane
4 Giant Rolls!
=10 REGULAR ROLLS
Charmin
BATHROOM TISSUE/PAPEL HIGIENICO
Charmin
4 Giant Rolls
OREO
Ocean Plate
Robert J. Lillie


Fourth
Terrane
Fat Free
Fig
Newtons
4 Giant Rolls
10 REGULAR ROLLS
Charmin
Charmin
4 Giant Rolls
Rollos Gigantes
Double Stuf
OREO
Ocean Plate
Robert J. Lillie

Ocean Plate
Forth Terrane
Third Terrane
Second Terrane
First Terrane
North American Plate
WARNING
Charmin
Charmin
4 Giant Rolls
Robert J. Lillie

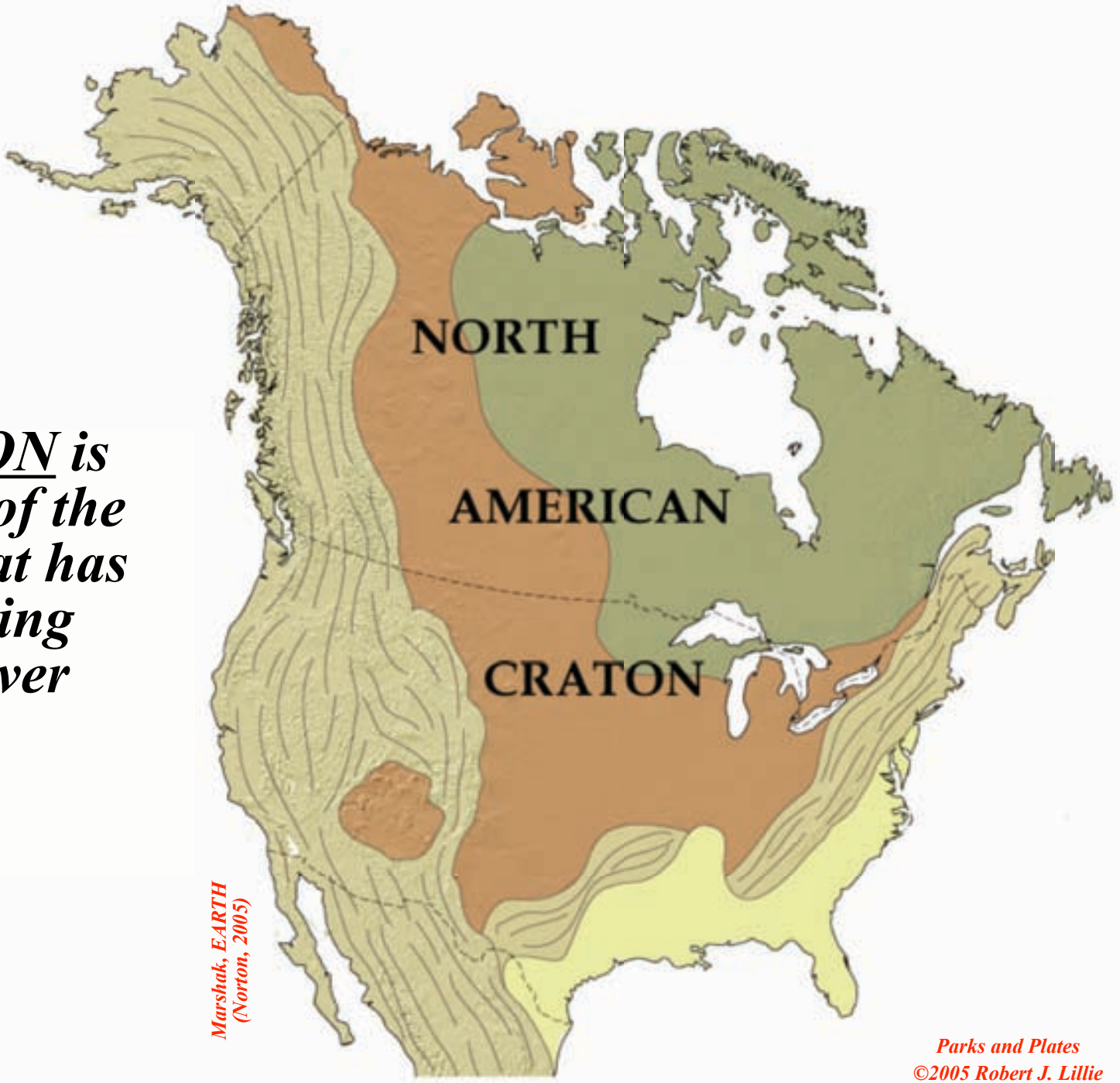
Plate Boundaries



Parks and Plates

BUILDING THE NORTH AMERICAN CONTINENT

The <u>CRATON</u> is the nucleus of the continent that has been growing outward over time.



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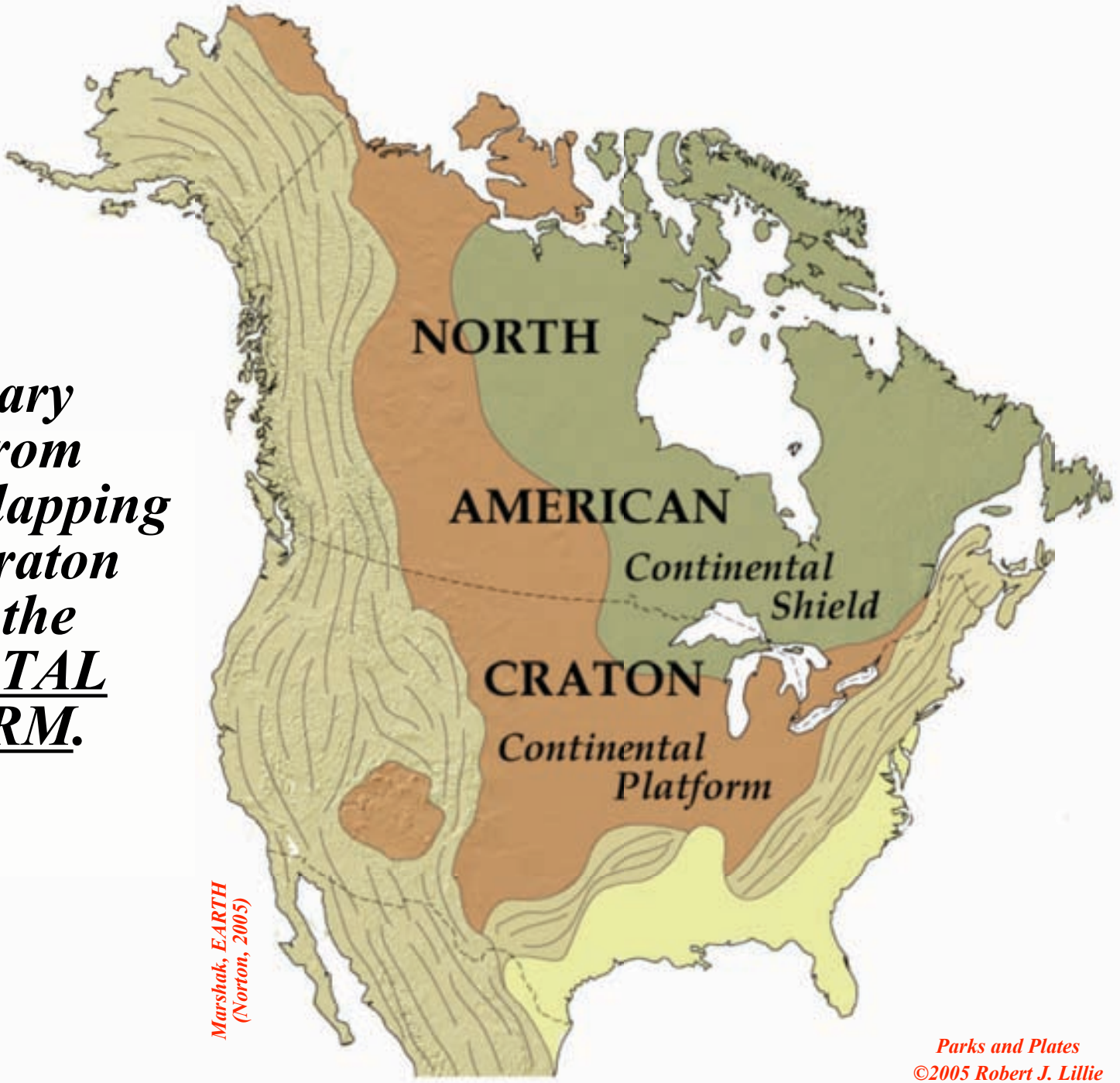
BUILDING THE NORTH AMERICAN CONTINENT

The <u>CONTINENTAL SHIELD</u> is exposures of very old igneous and metamorphic rocks.

Marshak, EARTH (Norton, 2005)

BUILDING THE NORTH AMERICAN CONTINENT

Sedimentary deposits from shallow seas lapping up on the craton comprise the <u>CONTINETAL PLATFORM</u>.



Marshak, EARTH (Norton, 2005)

BUILDING THE NORTH AMERICAN CONTINENT

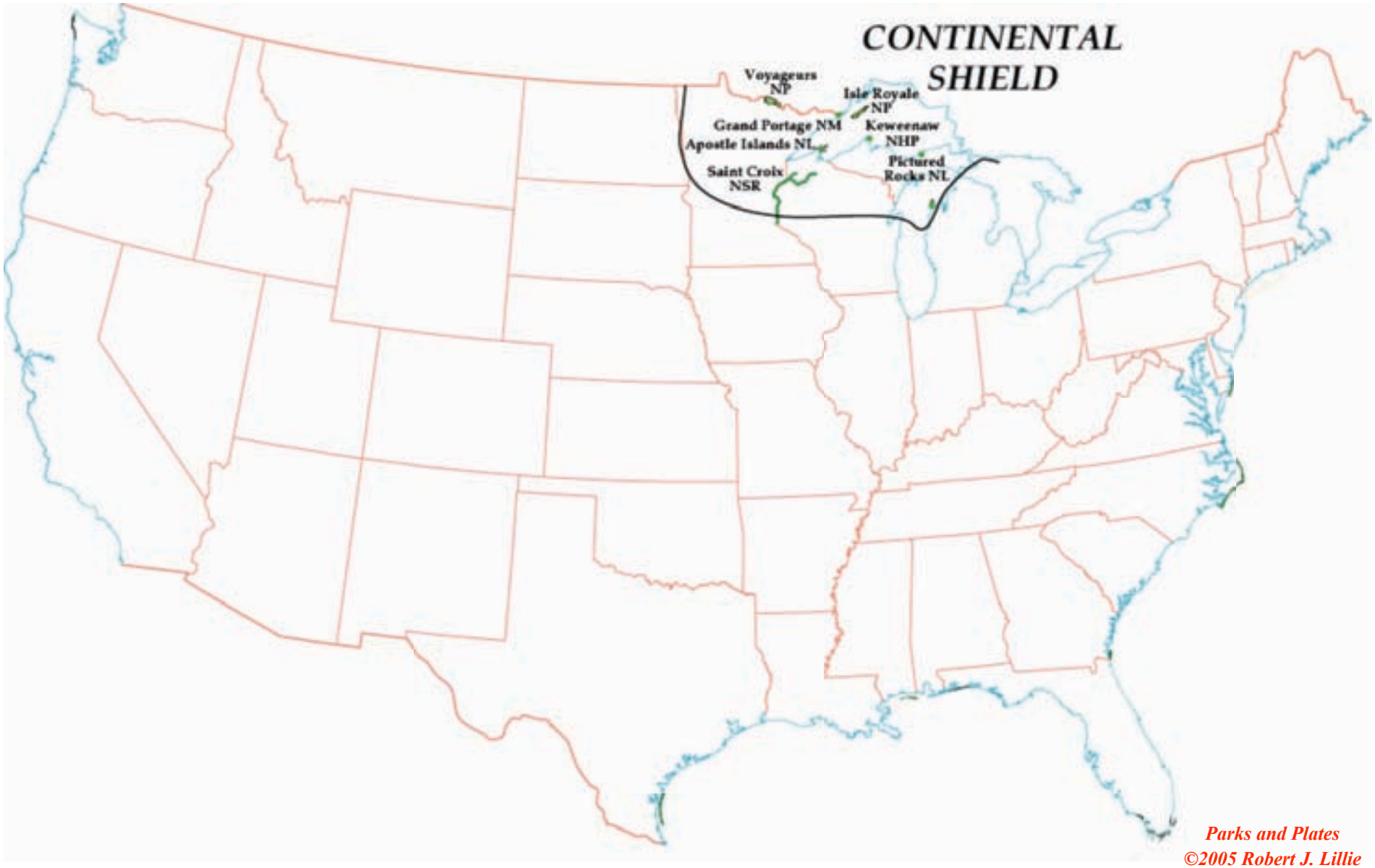
***PHANEROZOIC OROGENIC BELTS** are young mountain ranges ("accreted terranes") that surround the craton.*

BUILDING THE NORTH AMERICAN CONTINENT

The modern <u>COASTAL PLAIN</u> has young sedimentary layers deposited on the edge of the continent.

NORTH AMERICAN CRATON

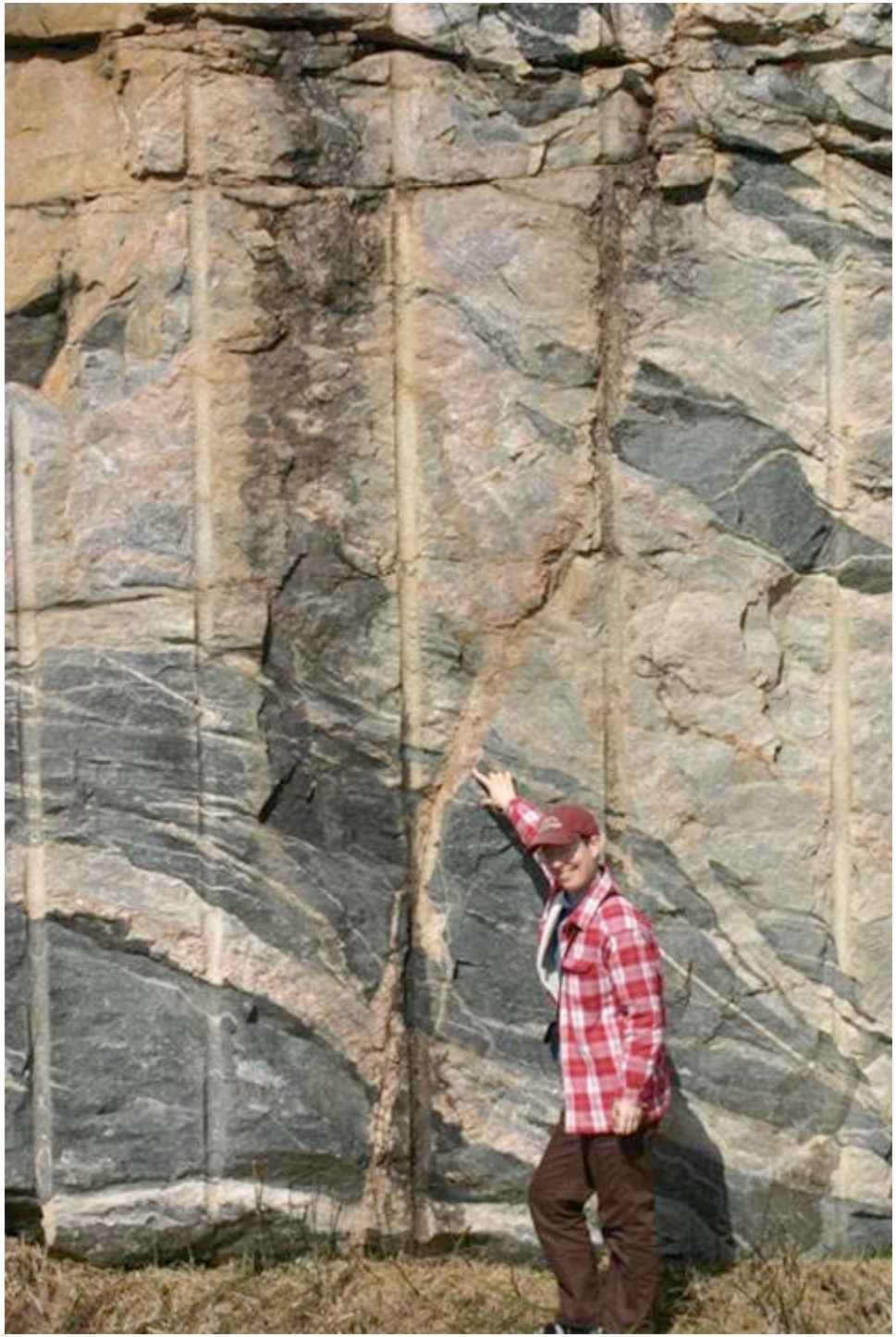
NATIONAL PARKLANDS




Voyageurs National Park, Minnesota
Continental Shield
National Park Service
Parks and Plates
©2005 Robert J. Lillie

Voyageurs National Park, Minnesota

2.5 Billion Year Old Igneous and Metamorphic Rocks



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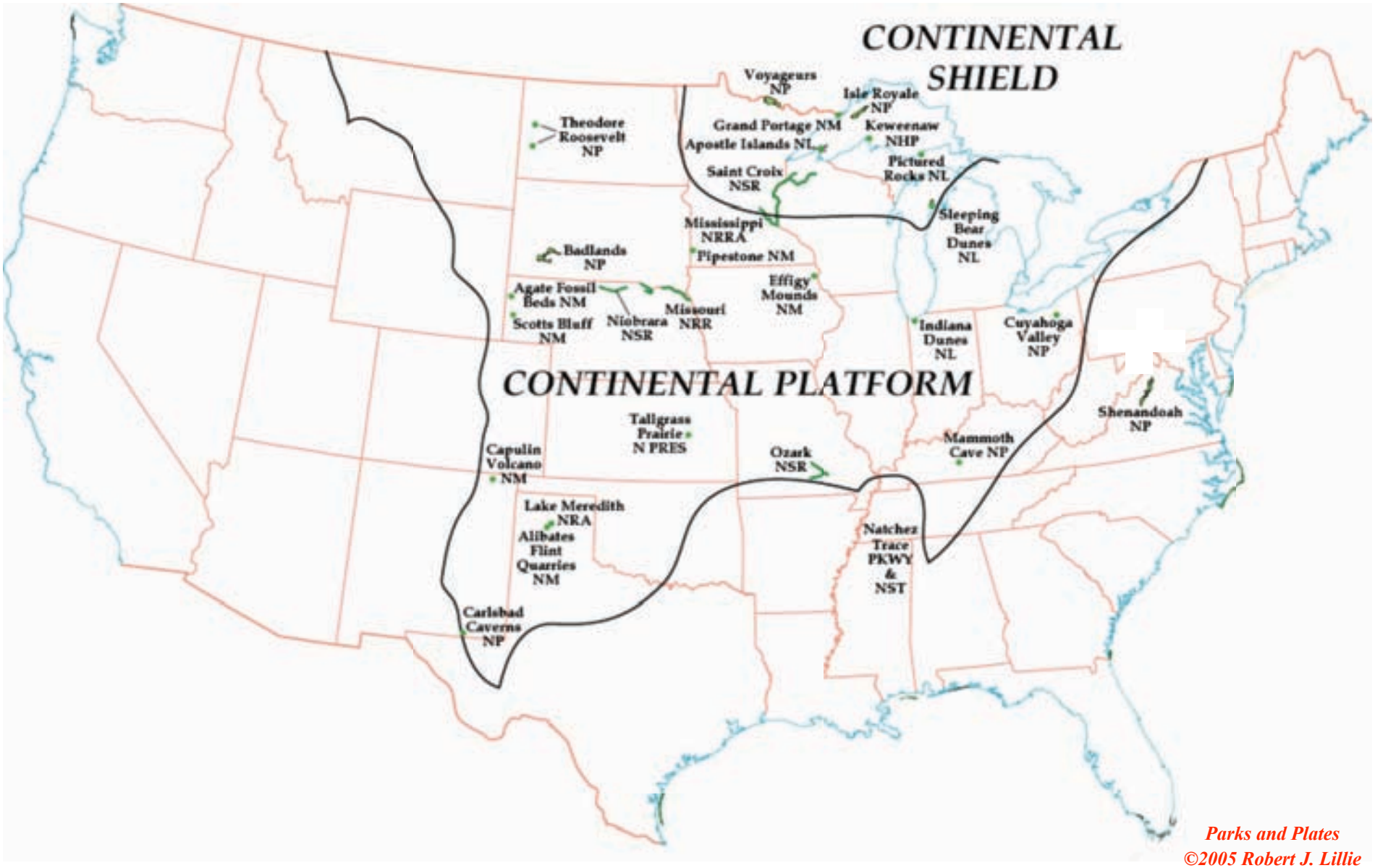
NORTH AMERICAN CRATON

NATIONAL PARKLANDS



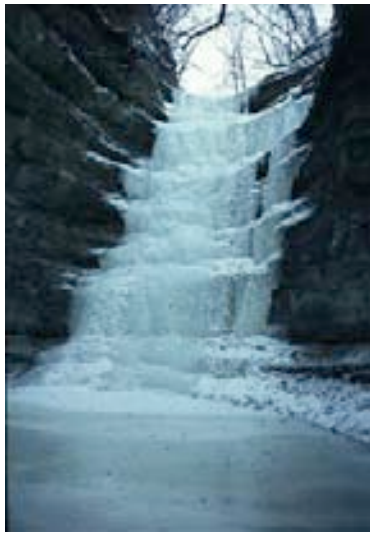
Parks and Plates

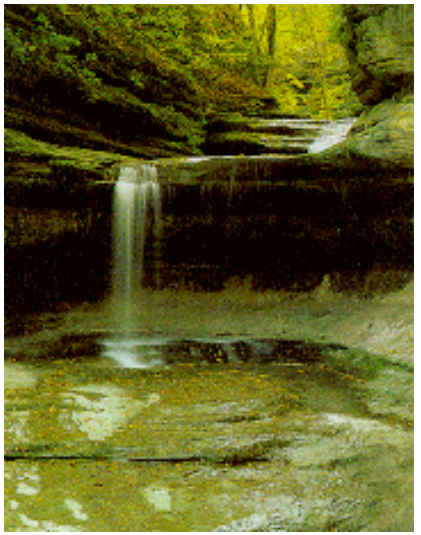
Cuyahoga Valley National Park, Ohio

Continental Platform

Starved Rock State Park, Illinois

Continental Platform

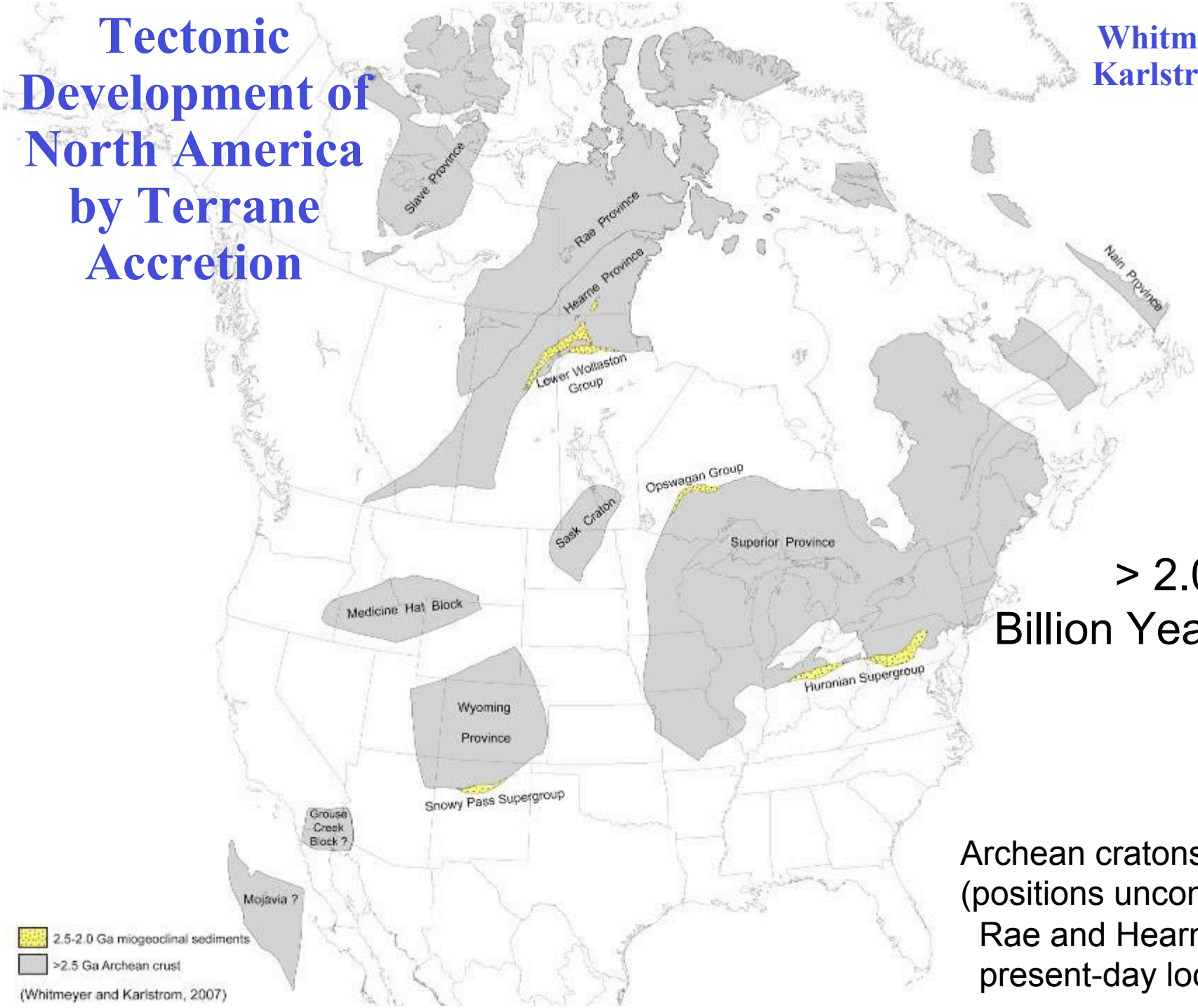




http://dnr.state.il.us/lands/landmgt/parks/i&m/east/starve/park.htm

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007

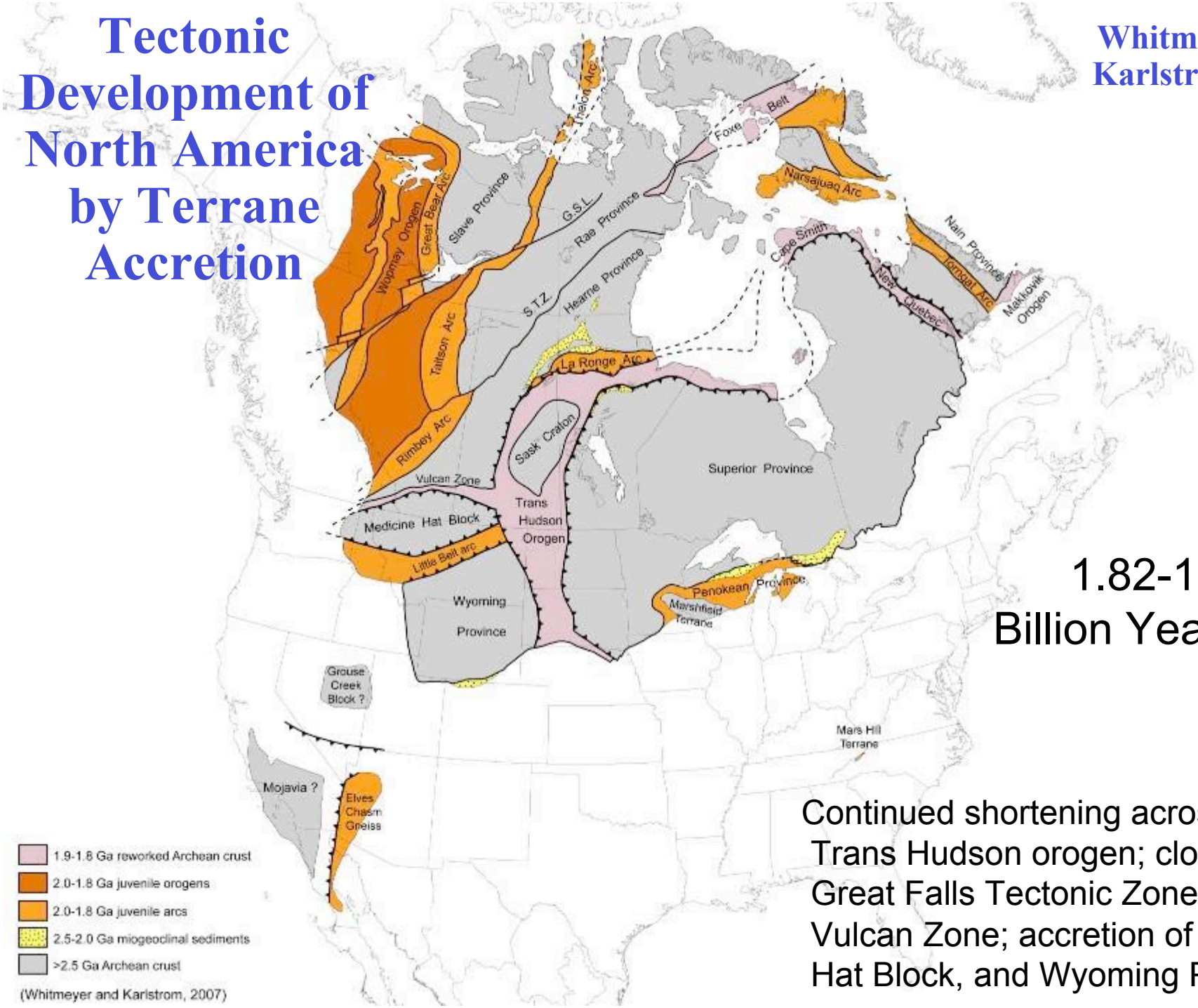


> 2.0 Billion Years Ago

Archean cratons (positions unconstrained; Rae and Hearne in present-day locations)

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007

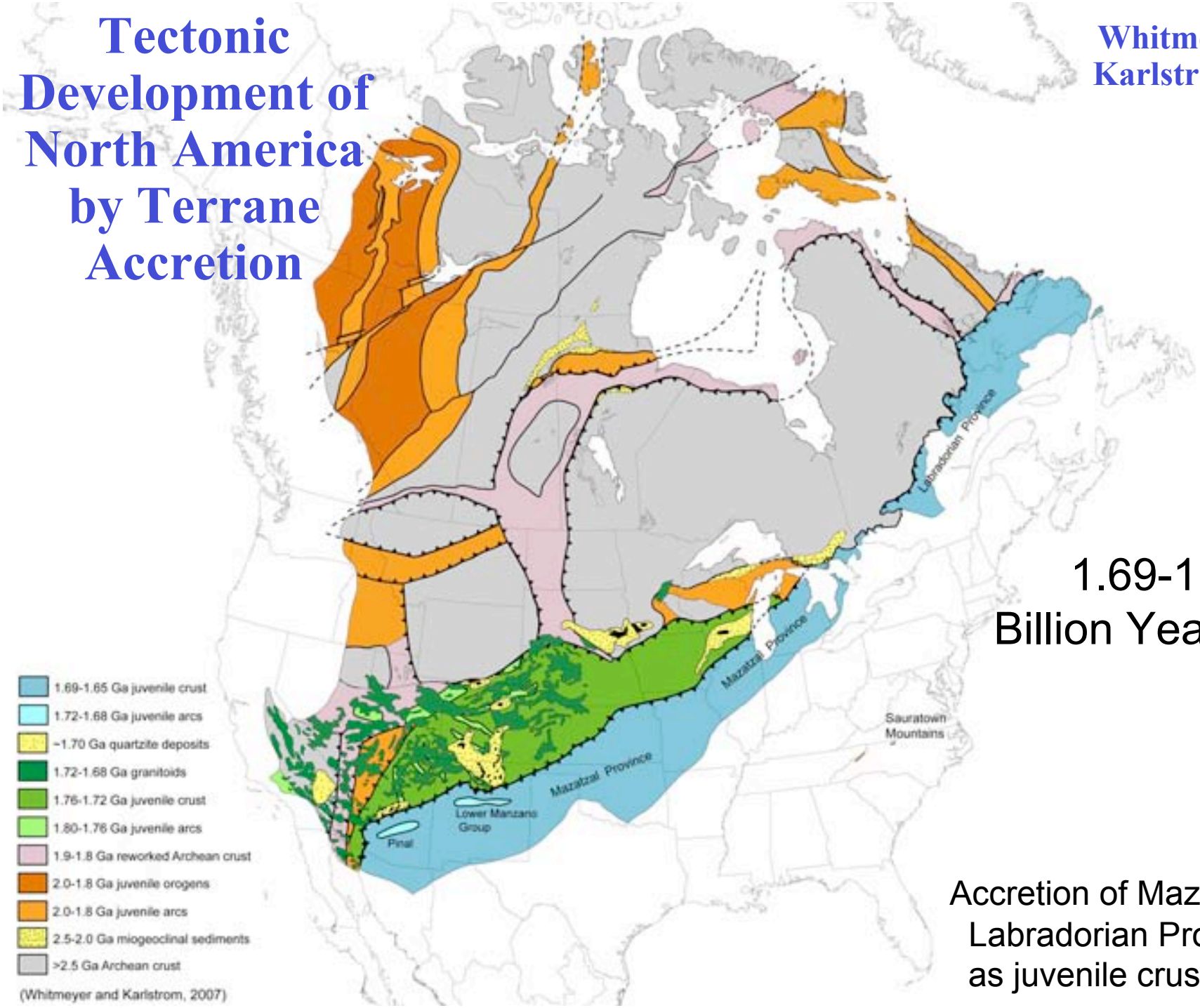


1.82-1.80 Billion Years Ago

Continued shortening across Trans Hudson orogen; closure of Great Falls Tectonic Zone and Vulcan Zone; accretion of Medicine Hat Block, and Wyoming Province

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007

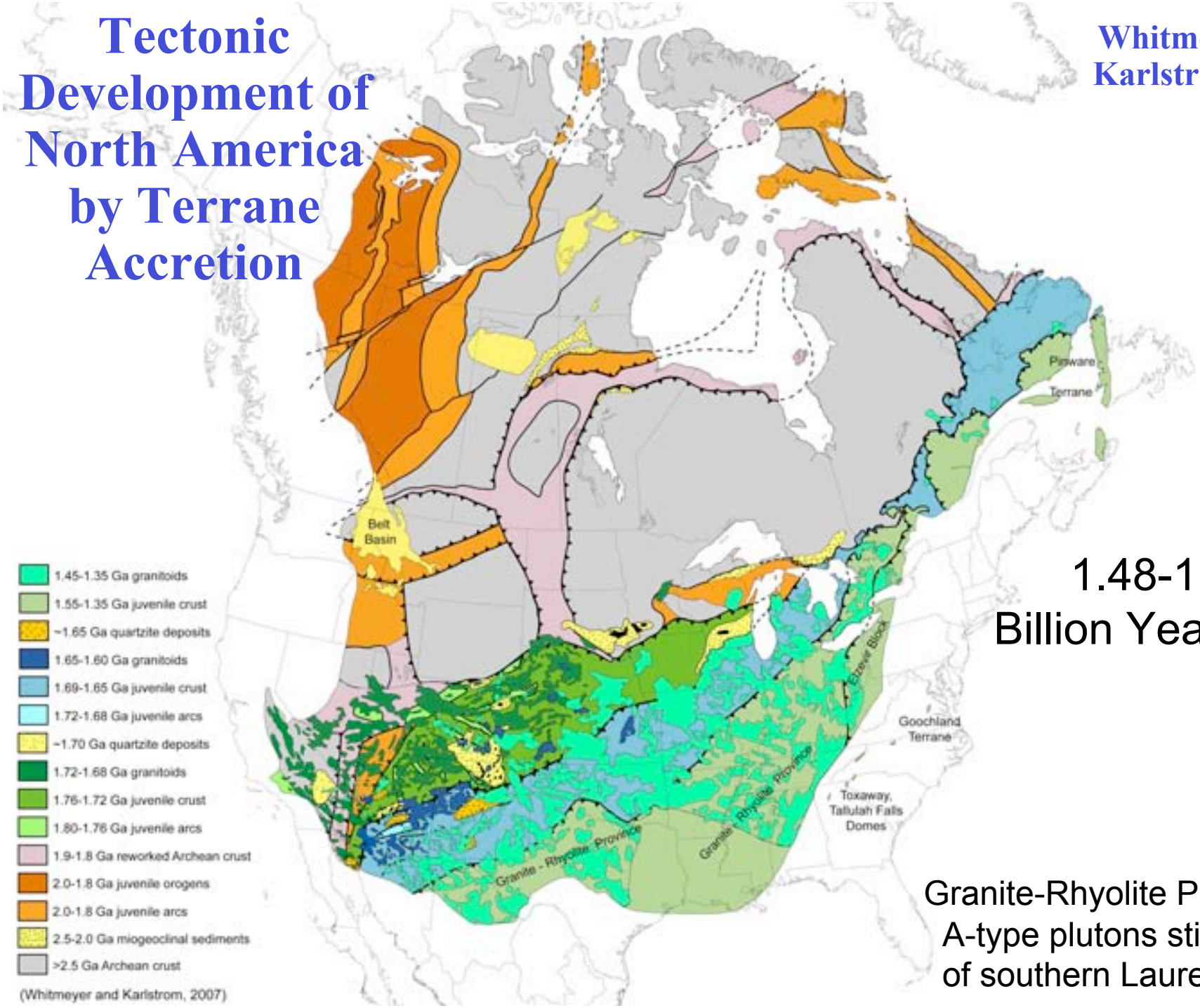


1.69-1.65 Billion Years Ago

Accretion of Mazatzal and Labradorian Provinces, as juvenile crust

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007

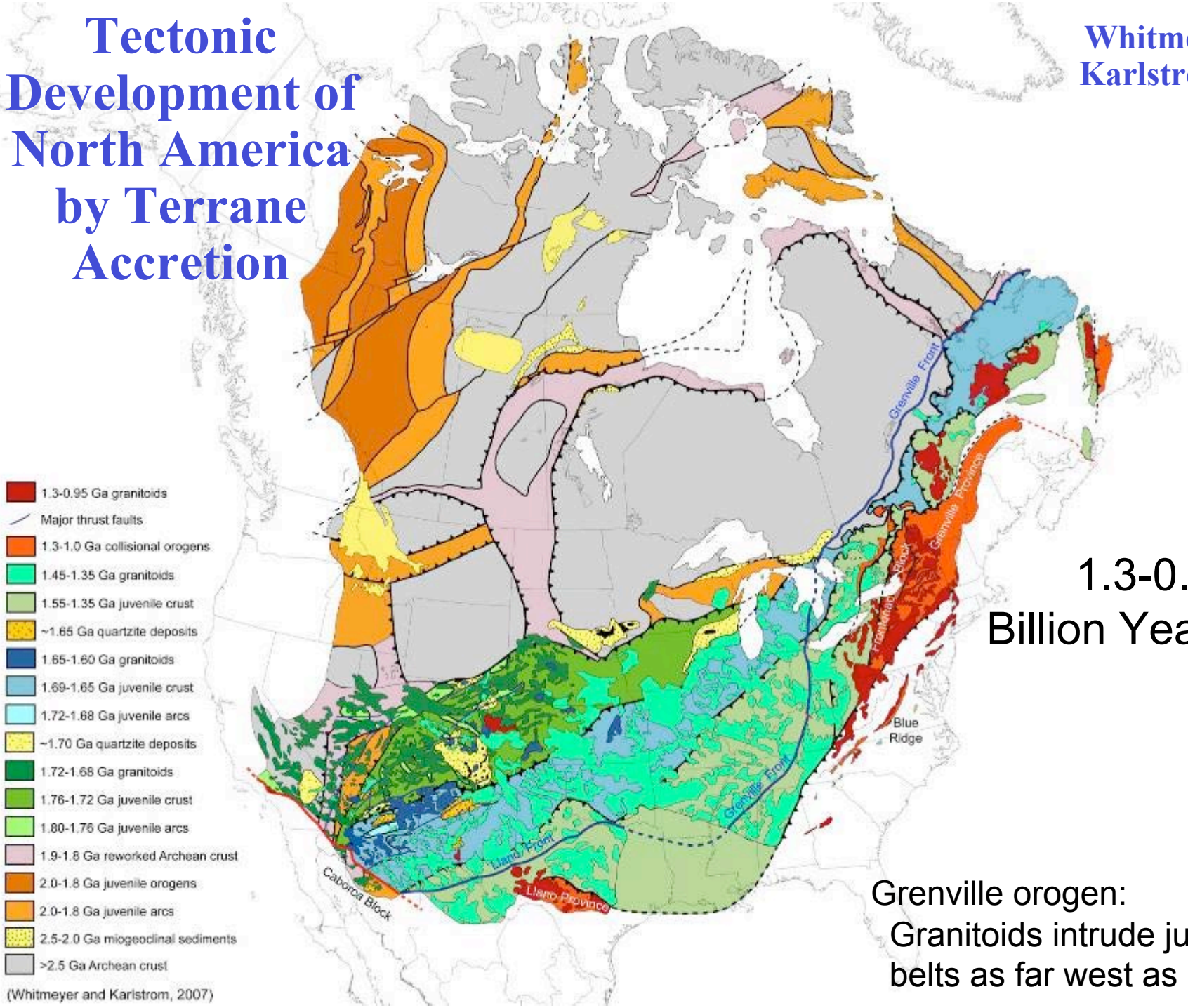


1.48-1.35 Billion Years Ago

Granite-Rhyolite Province: A-type plutons stitch much of southern Laurentia

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007

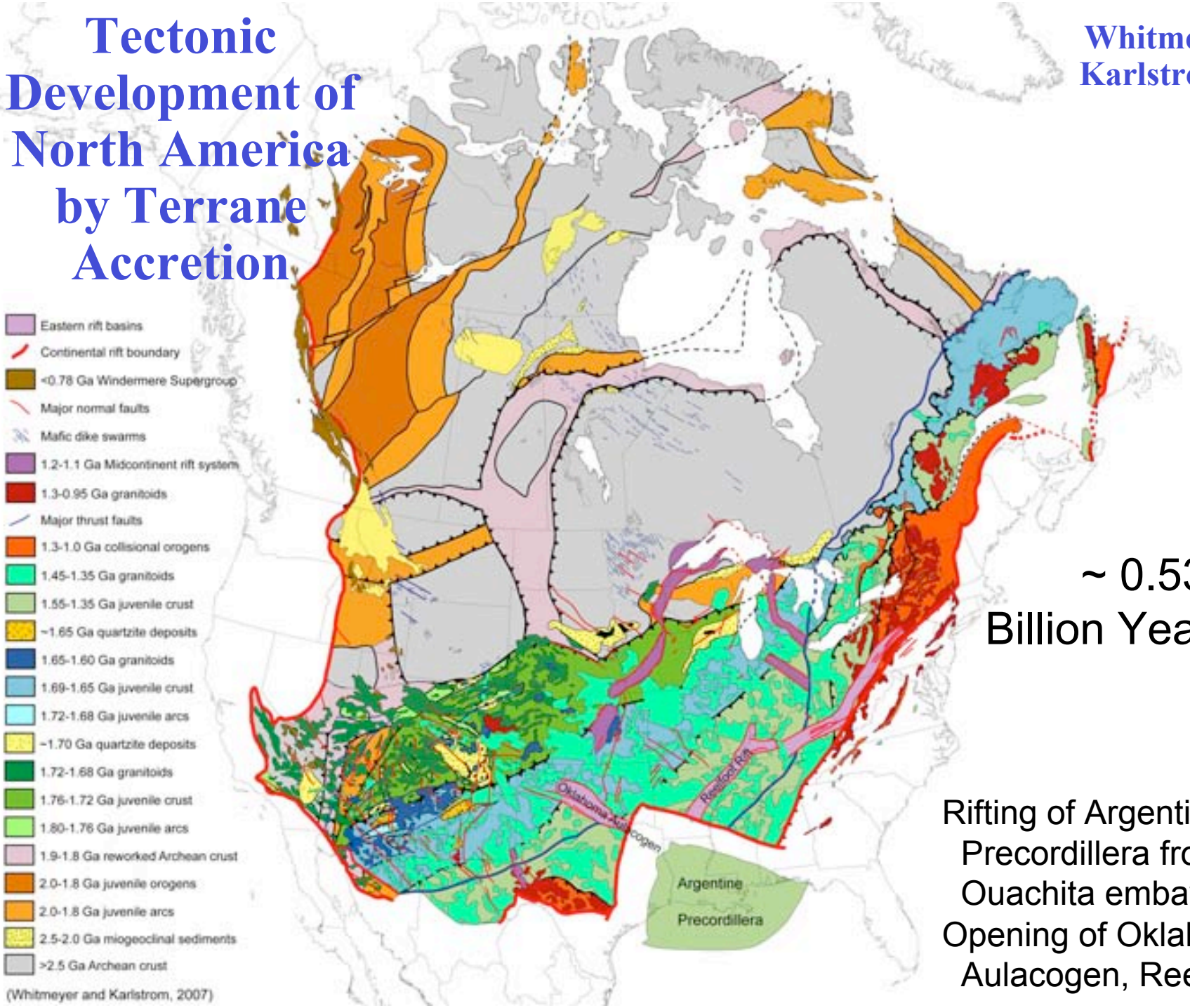


1.3-0.95
Billion Years Ago

Grenville orogen:
Granitoids intrude juvenile belts as far west as Colorado

Tectonic Development of North America by Terrane Accretion

Whitmeyer and Karlstrom, 2007



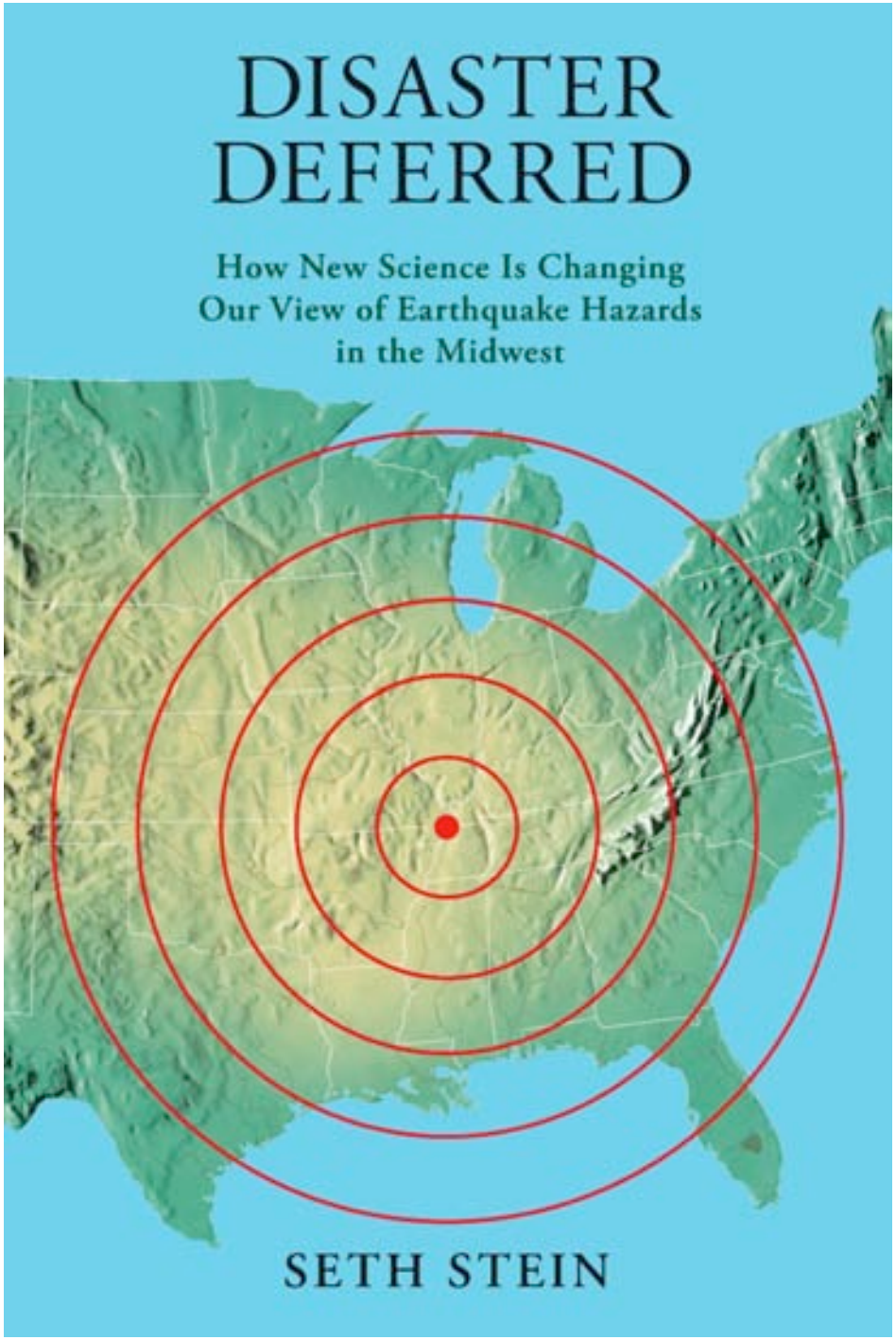
~ 0.535 Billion Years Ago

Rifting of Argentine Precordillera from Ouachita embayment; Opening of Oklahoma Aulacogen, Reelfoot Rift

Teaching about New Madrid Earthquakes: Science and Hazard

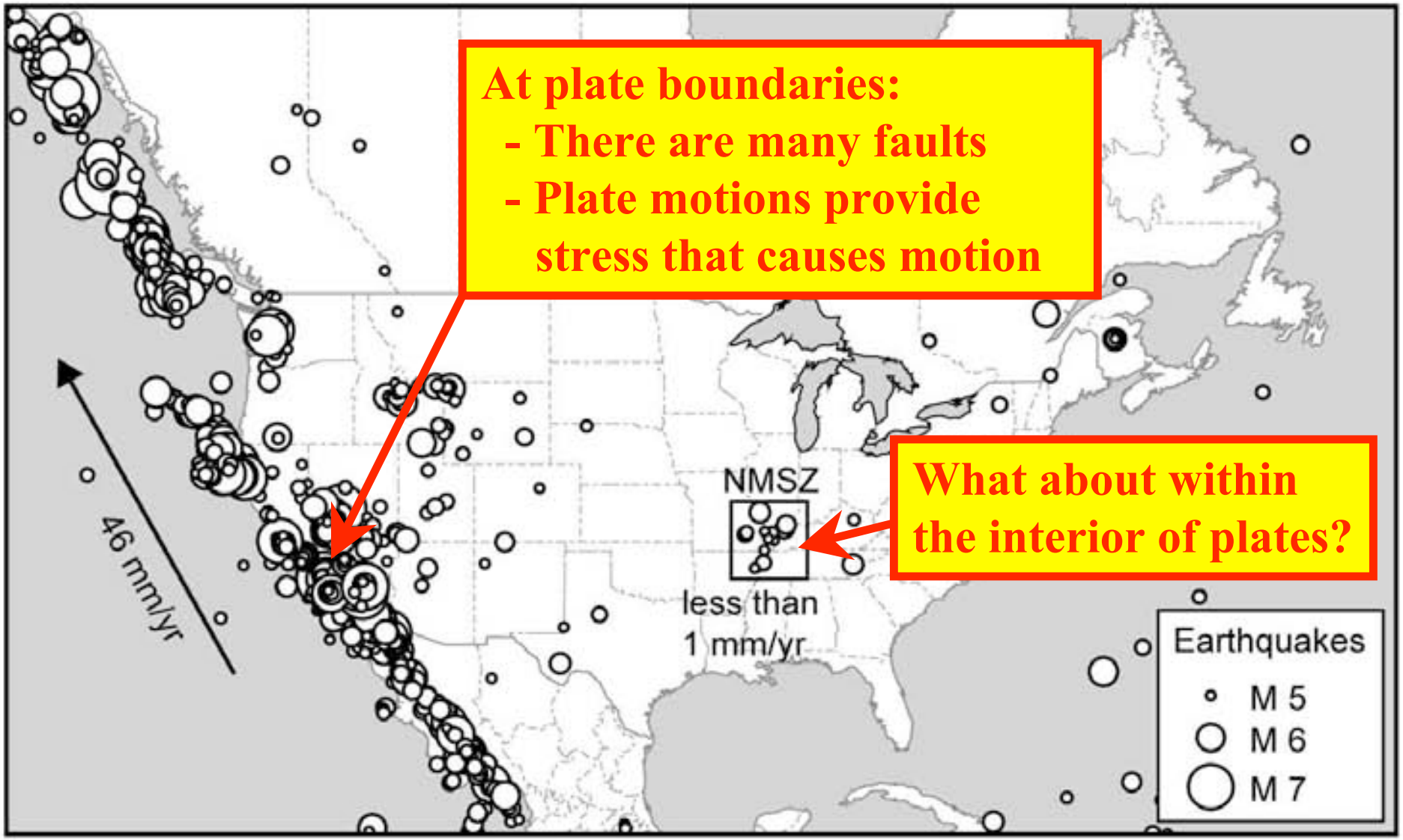
Illinois EarthScope Teachers' Workshop

Some slides from:
Seth Stein
Northwestern University



To generate earthquakes, there must be:

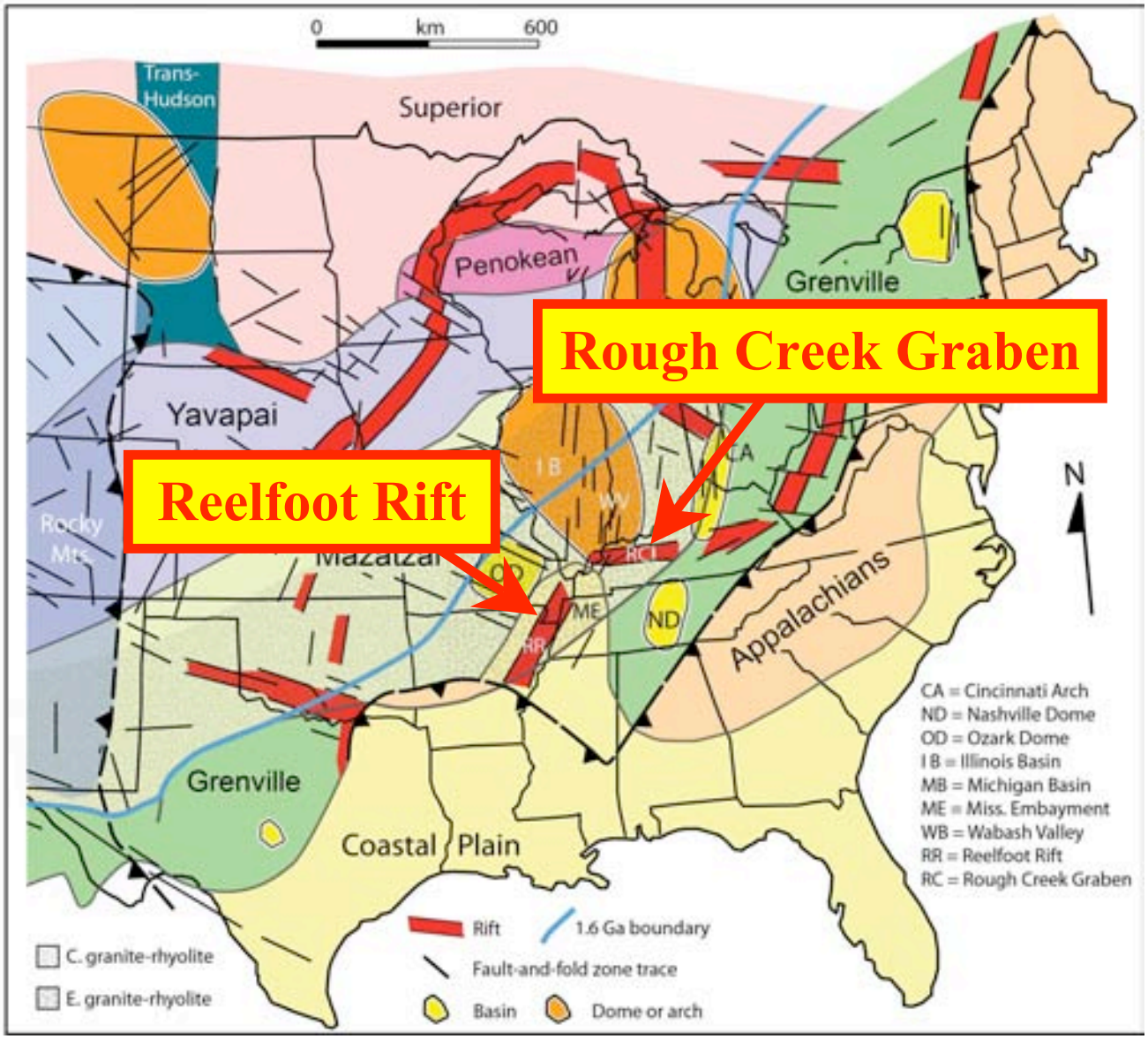
- Faults that slip suddenly
- Force (stress) to cause motion along the faults



Seth Stein, Northwestern University

Intra-Continental Tectonics

- Over billions of years, continents retain structures formed by rifting, collisions, failed rifts, basin formation, faulting, etc.
- Stresses within the plate—from various sources—can reactivate these features and cause intraplate earthquakes.
- A set of failed rifts are associated with the New Madrid and Wabash Valley seismic zones.



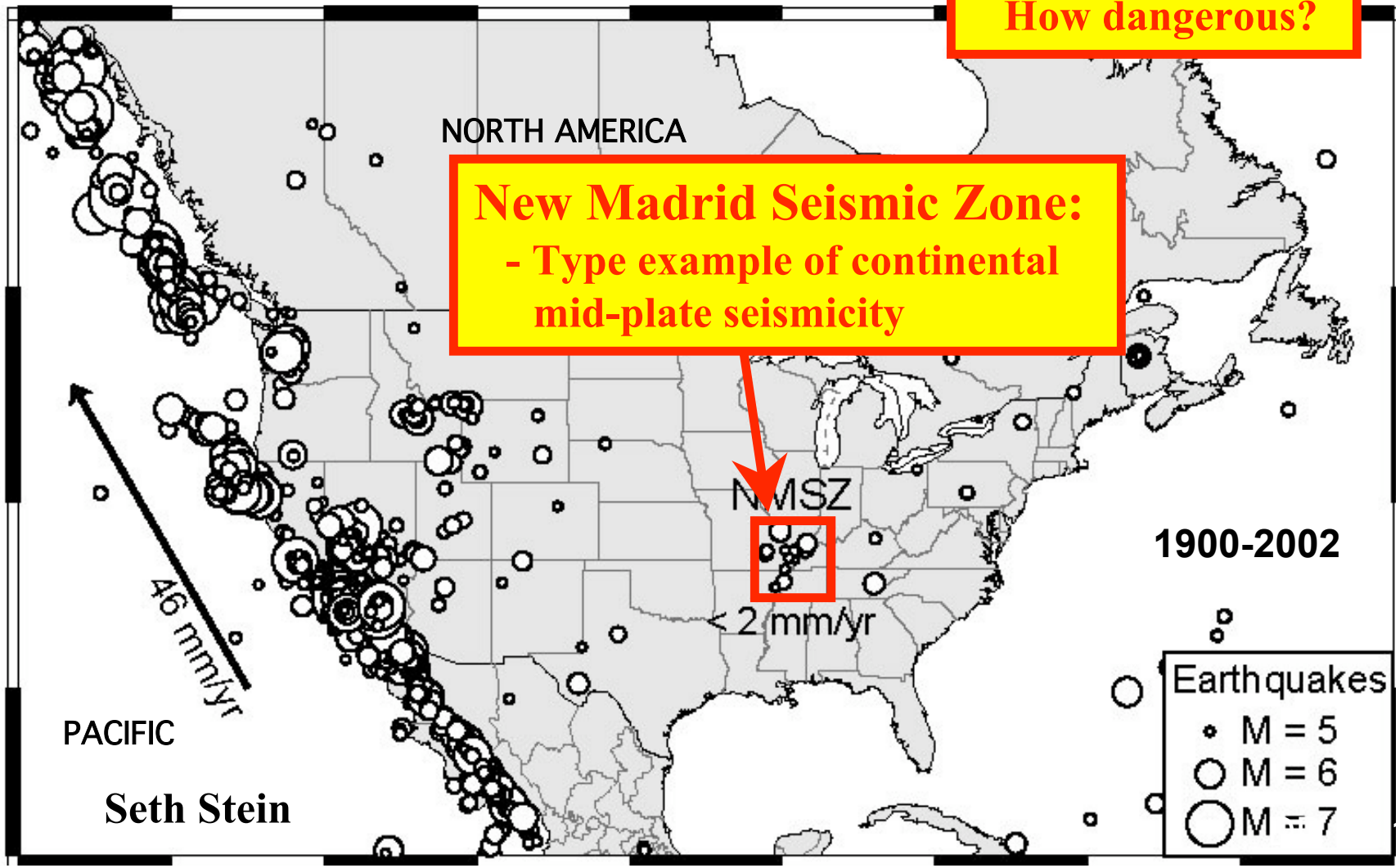
Map from Steve Marshak

Seth Stein, Northwestern University

Midwest Earthquakes

- Magnitude 7+ earthquakes in 1811-12
- Small quakes continue

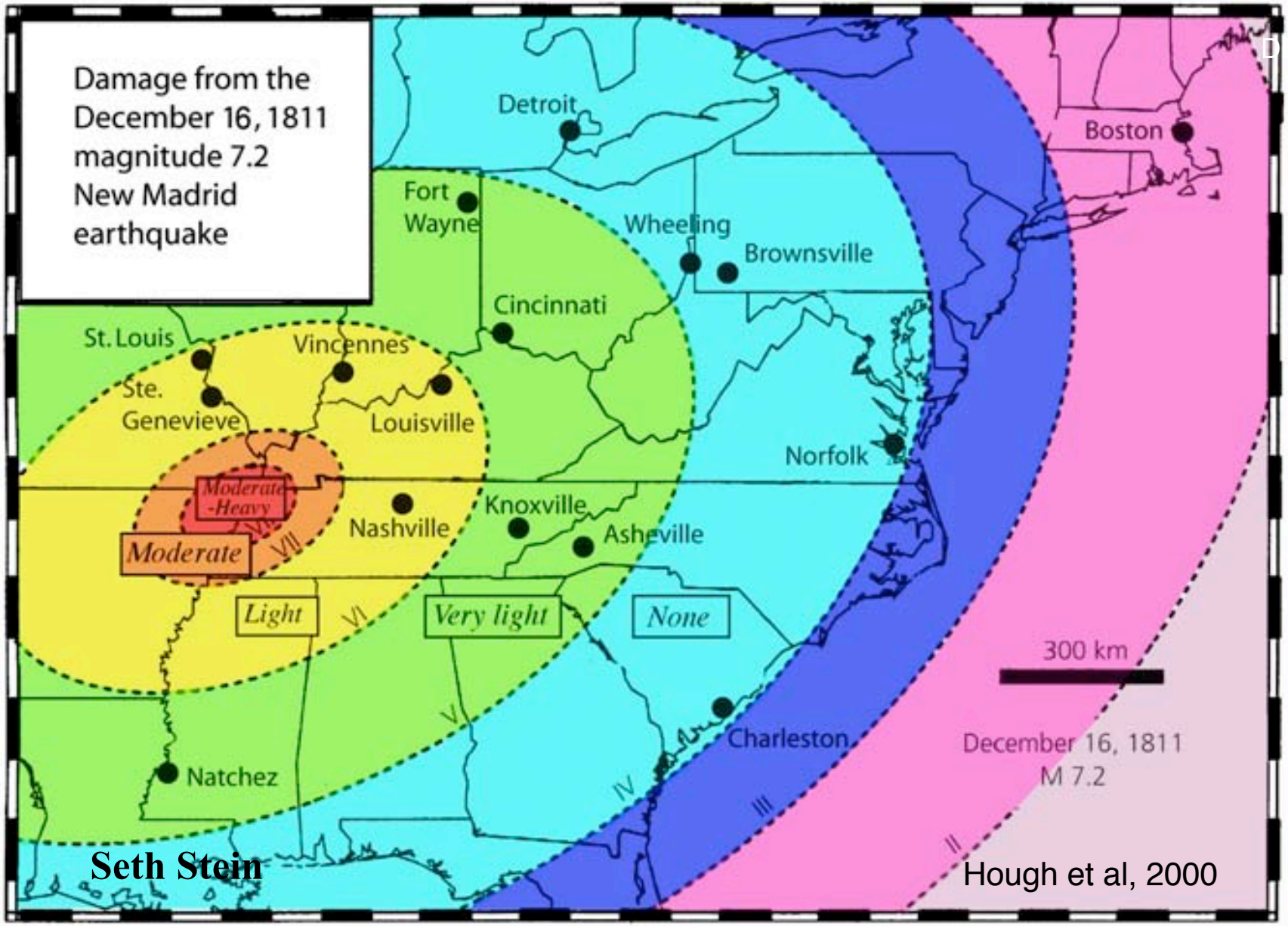
Questions:
- Why?
- When?
- How dangerous?



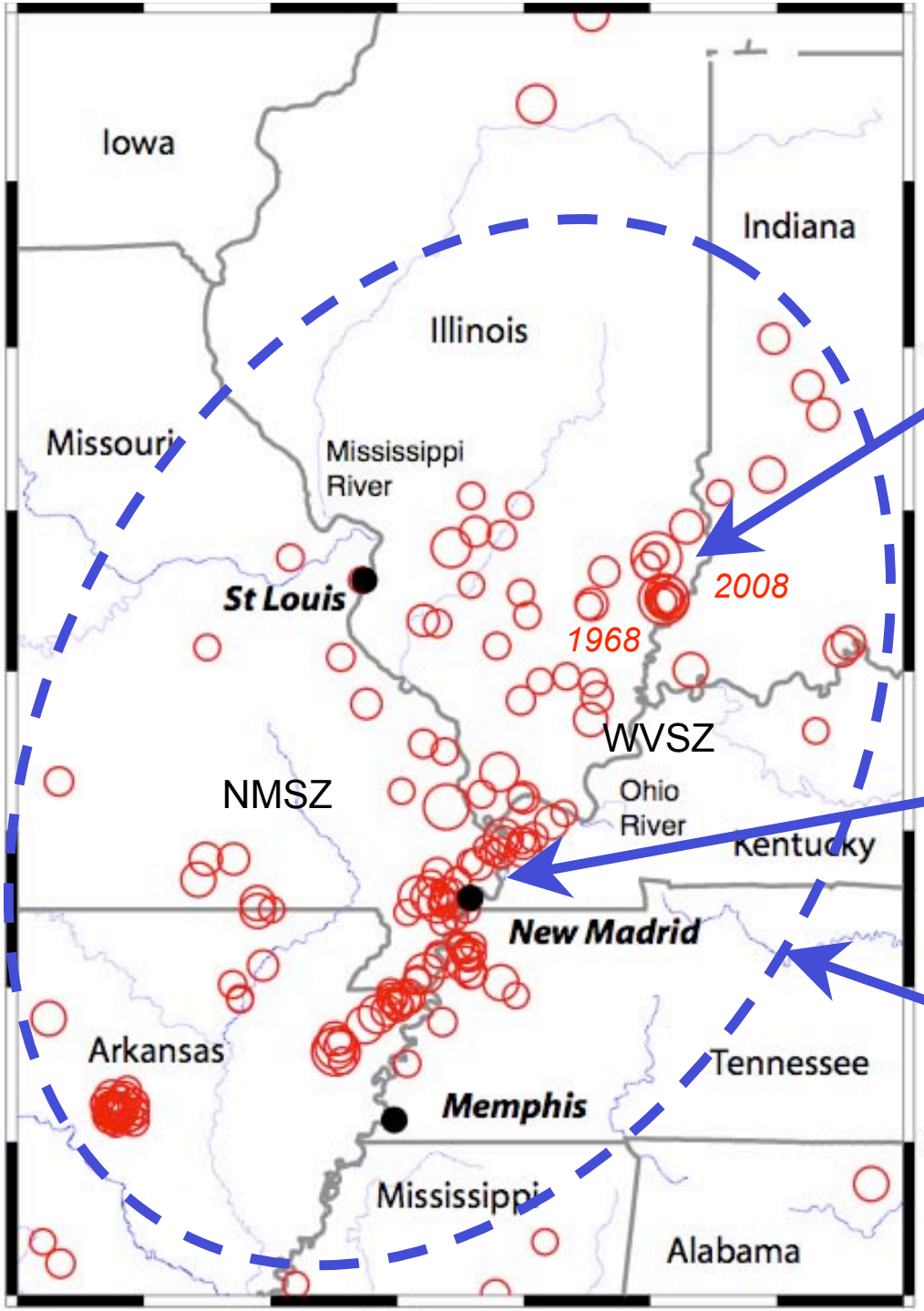
Seth Stein

Shaking Intensity:

Refers to the observed surface effects at a given location.



Midwest Earthquakes: 1975-2008



Lesser concentration in Wabash Valley seismic zone

Concentration around New Madrid:
- **Define faults that broke in the 1811-12 events**

Surrounded by diffuse "cloud" of seismicity

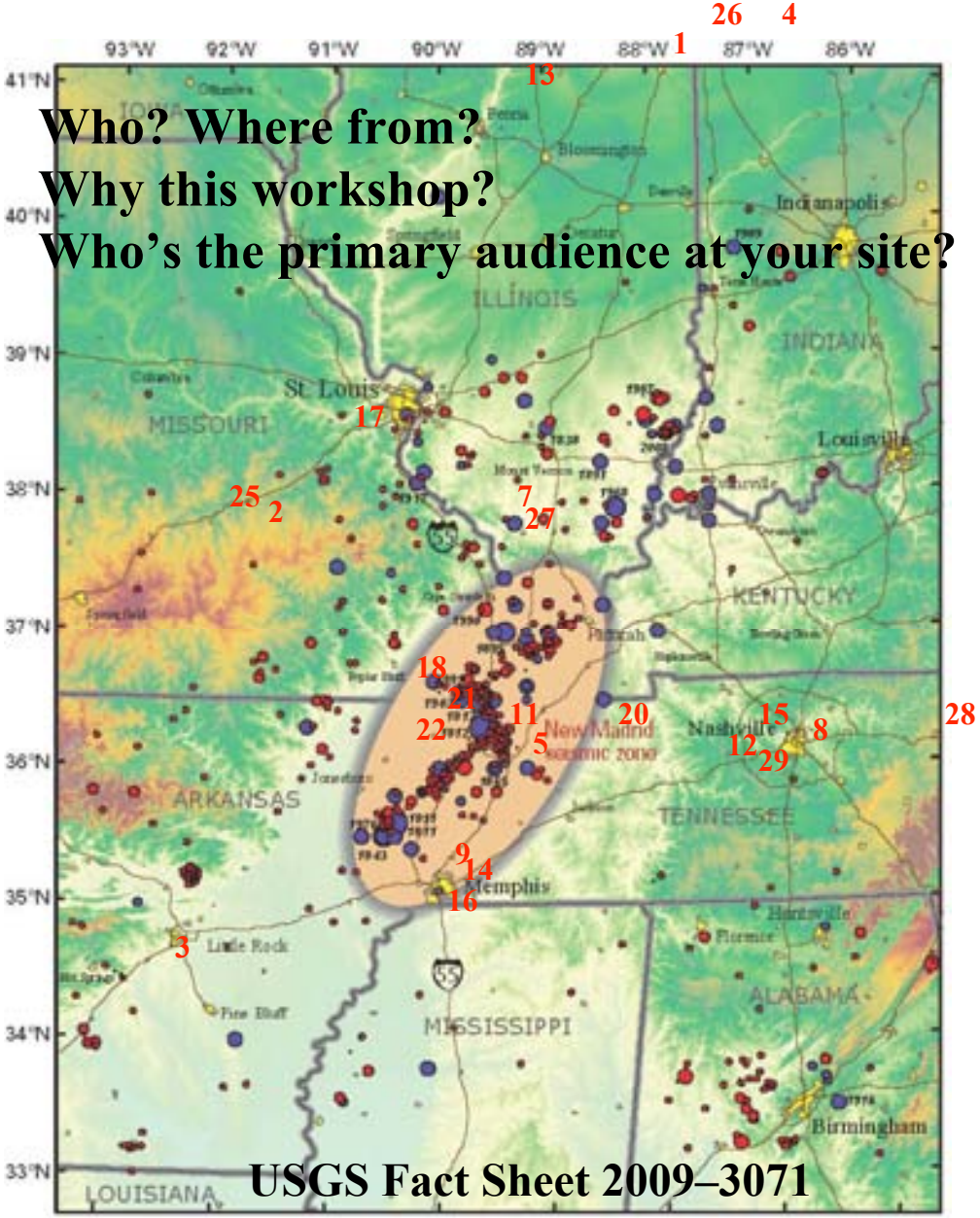
Seth Stein, Northwestern University

Introductions

Participants

1. Aida Awad	Maine East High School	Park Ridge, IL
2. Lauren Begley	Newburg Children's Mus	Newberg ,MO
3. Susan Bennett	Museum of Discovery	Little Rock, AR
4. Laurie Bone	Longway Planetarium	Flint, MI
5. Kimberly Crew	Reelfoot Lake Res/Teach Cen	Hornbeak, TN
6. Vince Cronin	Baylor University	Waco, TX
7. Holly Dunderdale	Sesser-Valier School	Herrin, IL
8. Larry Dunlap-Berg	Adventure Science Center	Nashville, TN
9. Alice Eilers	Pink Palace Museum	Memphis, TN
10. Carol Engelmann	EarthScope Ed/Out Subcom	Omaha, NE
11. David Haggard	Reelfoot Lake State Park	Tiptonville, TN
12. Craig Hanrahan	Tenn Emergy Manag Agency	Kingston Springs, TN
13. Joe Jakupcak	Starved Rock State Park	Marseilles, IL
14. David Maness	Pink Pal Mus-Sharpe Plan	Memphis, TN
15. Kris McCall	Adventure Sci. Center	Nashville, TN
16. Mary McFarlen	Pink Palace Museum	Memphis, TN
17. Therese McKee	Signature Design	St. Louis, MO
18. Tammy Morgan	Bootheel Youth Museum	Dexter, MO
19. Debra Noel	Public Lands Inter Assocc	Parks, AZ
20. Kelsea Reagan	Paris Landing State Park	Paris, TN
21. Patsy Reublin	Bootheel Youth Museum	Malden, MO
22. Heather Runyan	Crowley's Ridge State Park	Paragould, AR
23. Eugene Singer	Geology Writer	Palm Desert, CA
24. Ramesh Singh	Chapman University	Tustin, CA
25. Elizabeth te Groen	Newburg Children's Museum	Newburg, MO
26. Erika Vye	Michigan Tech University	Hancock, MI
27. Tammy Waters	Fr of Crab Orchard Pub Libr	Marion, IL
28. April Welch	Norris Dam State Park	Lake City, TN
29. Joshua Wickham	TEMA Hazard Mitig Plan	Nashville, TN

1. Who? Where from?
2. Why this workshop?
3. Who's the primary audience at your site?



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Thursday, March 17, 2011

Afternoon:

1:00–5:30 Room check-in at the Holiday Inn (shared rooms) and Fogelman Center (private rooms).

5:00–6:00 Instructors meet at Fogelman Conference Center to review workshop goals, agenda, and evaluation plan

5:00–6:00 Participant workshop check-in (Room 308 of Fogelman Center)

Evening:

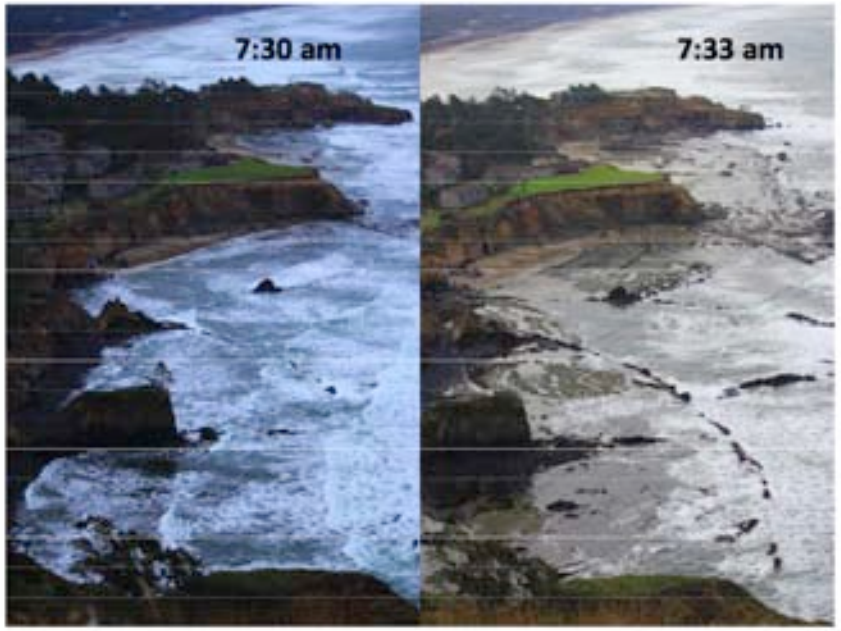
6:00 Participants and instructors meet in the Private Dining Room at Fogelman Center for dinner

7:00 **Room 308 at the Fogelman Center.** Workshop Overview. "Beauty and the Beast: Plate tectonics, landscape development, and geological hazards of the United States" (Bob Lillie)

7:45 ***Personal Introductions***

8:30 Adjourn

March 11, 2011. Houses were washed away by tsunami in Sendai, Miyagi Prefecture in eastern Japan, after Japan was struck by a magnitude 8.9 earthquake off the northeastern coast. ***New York Times***



Cape Fowlweather, Oregon Coast, March 11, 2011. ***Jenny Green***

Friday, March 18, 2011

Morning:

7:00 Meet in Private Dining Room of the Fogelman Center for hot breakfast
8:00 Room 308 at the Fogelman Center. Welcoming (Bob Lillie, Skip Nelson, and Chuck Langston)
8:10 "Tectonic development of the central United States" (Roy Van Arsdale)
8:35 "Earthquake hazards of the central United States" (Beatrice Magnani)
9:00 "New Madrid earthquakes of 1811-12—historical perspective" (Kent Moran)
9:25 "Future New Madrid earthquakes—scientific controversy" (Chuck Langston)
9:50 Break.
10:05 "Overview of EarthScope: USArray, SAFOD, and the Plate Boundary Observatory" (Bob Lillie)
10:20 "Using USArray and other seismic networks to image the deep structure of North America" (Suzan van der Lee)
10:45 "Imaging the central U.S. with regional and local seismic networks" (Chris Powell)
11:10 "Earthquake science and monitoring in the New Madrid region and Central U.S." (Jer Ming Chiu)
11:35 "Earthquake education and outreach—the Southern California and Central U.S. Shakeouts" (Bob de Groot)
12:00 Lunch (Private Dining Room of the Fogelman Center)

Afternoon:

1:00 "Involving K-12 teachers and students in EarthScope in the central U.S." (Skip Nelson)
1:25 "IRIS Education and Outreach: Web resources and the Active Earth Display for parks, museums, and science centers" (Patrick McQuillan)
1:50 "UNAVCO resources for formal and informal educators" (Shelly Olds)
2:15 "Presenting EarthScope to the public in parks and museums: Interpretive themes and strategies for the Central U.S." (Bob Lillie)
2:40 ***Brainstorming – Developing site-specific interpretive themes based on today's presentations***
- Participants divide into five groups (each group has 4 to 6 participants and one scientist)
- Discuss central U.S. topics and EarthScope materials to incorporate into programs and exhibits
- Each group begins to develop an outline with content needs and a theme statement for their program
3:00 Break
3:15 ***Participants present their posters, exhibits, and other materials on geology related to the New Madrid–Central U.S. region***
4:15 ***Groups continue to develop interpretive programs***
5:00 Announcements and adjourn

Evening:

6:30 Dinner (Private Dining Room of the Fogelman Center)

Saturday, March 19, 2011

Morning:

6:30 Meet in Private Dining Room of the Fogelman Center for hot breakfast

7:30 *Field excursion by bus.* Depart from Fogelman Center. *(Led by Skip Nelson and Roy Van Arsdale)*

- ***Visit EarthScope seismic and GPS instruments at Portageville, Missouri and Reelfoot Lake, Tennessee***
- ***Observe geologic and other landscape features in the New Madrid, Missouri region that experienced large earthquakes in 1811-12***
- ***Visit new interpretive displays about the 1811-12 earthquakes developed by IRIS for rest area along Interstate 55 in southeast Missouri***
- ***Discuss landscape features and processes that can be presented to the public***
- ***Relate each group's interpretive theme to EarthScope and geological processes***

12:00 Lunch in the field

3:00-5:00 Return to Fogelman Center in Memphis

Late Afternoon:

3:00-6:00 ***Groups continue to develop 15-minute interpretive programs based on themes involving EarthScope and the New Madrid–Central U.S. region***

Evening:

6:30 Dinner (Private Dining Room of the Fogelman Center)

Sunday, March 20, 2011

Morning:

7:00 Meet in Private Dining Room of the Fogelman Center for hot breakfast

8:00 **Room 308 at the Fogelman Center.** ***Group presentations, each involving:***

- ***Theme statement, setting, audience – followed by 10-15 minute program presentation***
- ***Brainstorming about Geology/EarthScope content and interpretive methods employed***

11:45 ***Workshop evaluation.***

12:00 Lunch and adjourn (Private Dining Room of the Fogelman Center)

- Participants depart after lunch.
- Organizers and instructors meet briefly to discuss workshop and follow-up activities.

Communications Center, New Madrid, Missouri

Immaculate Conception Elementary School, New Madrid, Missouri

Immaculate Conception Elementary School, New Madrid, Missouri

Immaculate Conception Elementary School

New Madrid, Missouri

Robert J. Lillie

Immaculate Conception Elementary School, New Madrid, Missouri
Principal Mary Shy

Immaculate Conception Elementary School, New Madrid, Missouri
Principal Mary Shy

Introductions

Participants

1. Aida Awad	Maine East High School	Park Ridge, IL
2. Lauren Begley	Newburg Children's Mus	Newberg ,MO
3. Susan Bennett	Museum of Discovery	Little Rock, AR
4. Laurie Bone	Longway Planetarium	Flint, MI
5. Kimberly Crew	Reelfoot Lake Res/Teach Cen	Hornbeak, TN
6. Vince Cronin	Baylor University	Waco, TX
7. Holly Dunderdale	Sesser-Valier School	Herrin, IL
8. Larry Dunlap-Berg	Adventure Science Center	Nashville, TN
9. Alice Eilers	Pink Palace Museum	Memphis, TN
10. Carol Engelmann	EarthScope Ed/Out Subcom	Omaha, NE
11. David Haggard	Reelfoot Lake State Park	Tiptonville, TN
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24. Ramesh Singh	Chapman University	Tustin, CA
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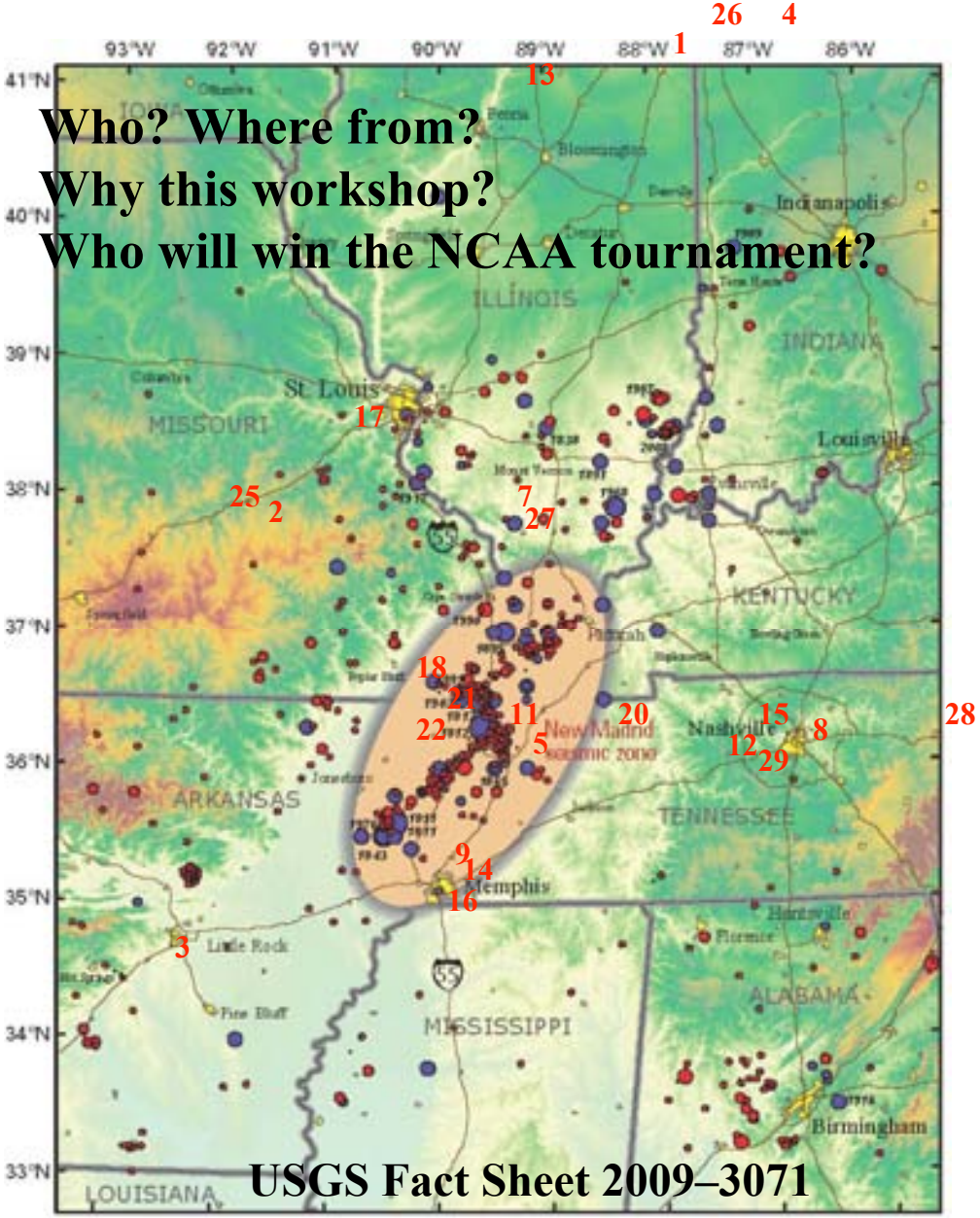
29. Joshua Wickham	TEMA Hazard Mitig Plan	Nashville, TN

1. Who? Where from?
2. Why this workshop?
3. Who will win the NCAA tournament?



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