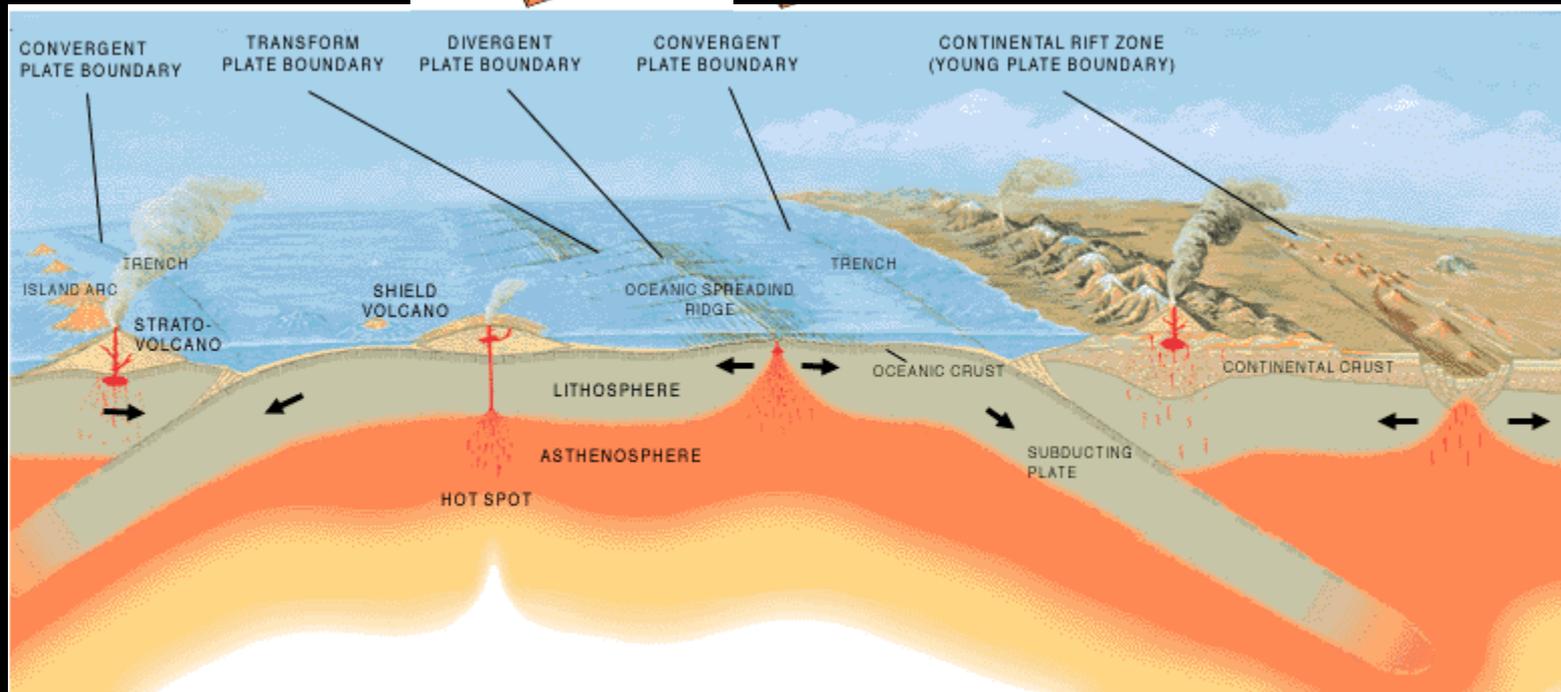
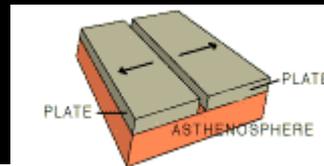


Living on the Edge: Divergent Plate Boundaries: Hazards

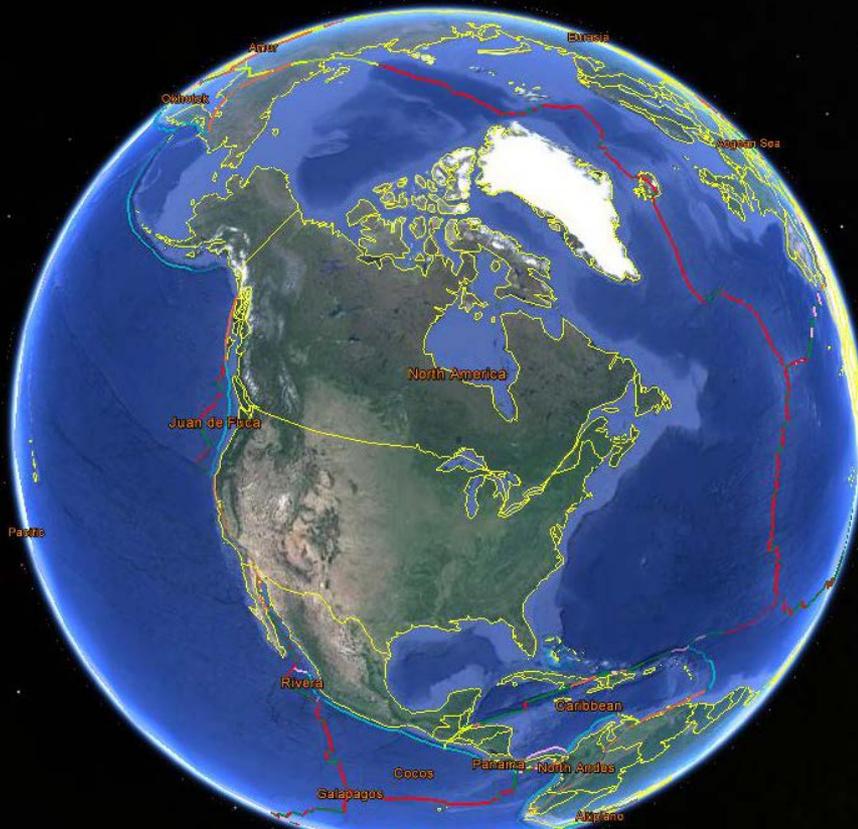
Learning Objectives: By the end of this unit you will be able to:

1. Interpret data to characterize geologic activity associated with divergent plate boundaries
2. Compare and contrast divergent plate boundaries on land and the ocean floor
3. Explain how geologists use multiple types of data to characterize geologic activity associated with volcanic eruptions



Living on the Edge: Divergent Plate Boundaries: Hazards

1. Locations of divergent plate boundaries (red lines, from Google Earth)



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 GeoBasis-DE/BKG
US Dept of State Geographer
© 2013 Google



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
US Dept of State Geographer
© 2013 Google

Living on the Edge: Divergent Plate Boundaries: Hazards

1. Characteristics of Submarine Divergent PB- share info from pre-work with partner/small groups

Table 1: as a debrief from pre-work, fill in Submarine Divergent Plate Boundary column

Data/PB type	Submarine Divergent PB	Terrestrial Divergent PB
Earthquake (EQ) characteristics (size/depth)		
Volcanism characteristics (erupted products, distance affected)		
Hazards to Humans (how are humans affected- at what scale?)		



Share with your group

Living on the Edge: Divergent Plate Boundaries: Hazards

1b. Debrief: SUGGESTED RESPONSES:

Characteristics and Hazards of Submarine Divergent Plate Boundaries:

Table 1: as a debrief from pre-work, Submarine Divergent Plate Boundary column

Data/PB type	Submarine Divergent PB (example responses)	Terrestrial Divergent PB
Earthquake (EQ) characteristics (size/depth)	<i>Few, relatively small and difficult to detect from land based seismometers</i>	
Volcanism characteristics (erupted products, distance affected)	<i>Frequent at Axial Seamount (about every 15 years)</i>	
Hazards to Humans (how are humans affected- at what scale?)	<i>No hazards to humans, possibly to monitoring instruments, no real tsunami hazards from small EQ</i>	

Keep in mind, while all this data is useful, you may not always have access to complete data sets to characterize a site.

Any questions from pre-work?

Living on the Edge: Divergent Plate Boundaries: Hazards

2. GoogleEarth image of divergent plate boundaries, note divergent plate boundaries on land: EAR, Iceland



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 GeoBasis-DE/BKG
US Dept of State Geographer
© 2013 Google

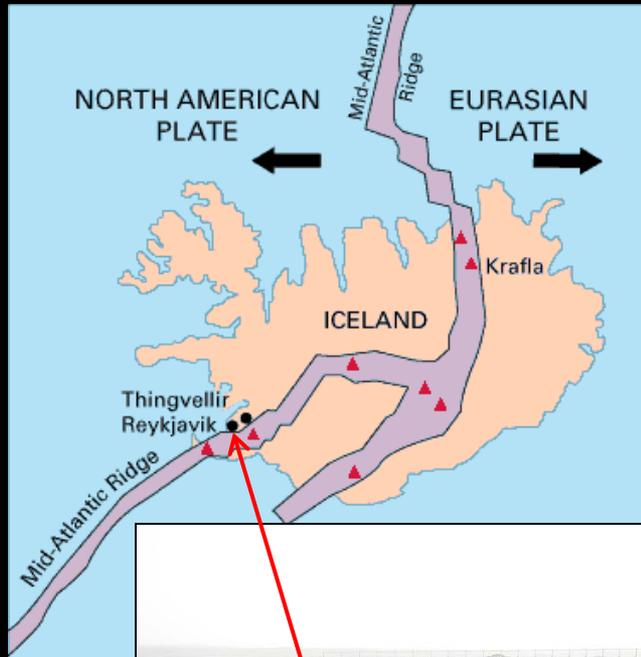


Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
US Dept of State Geographer
© 2013 Google

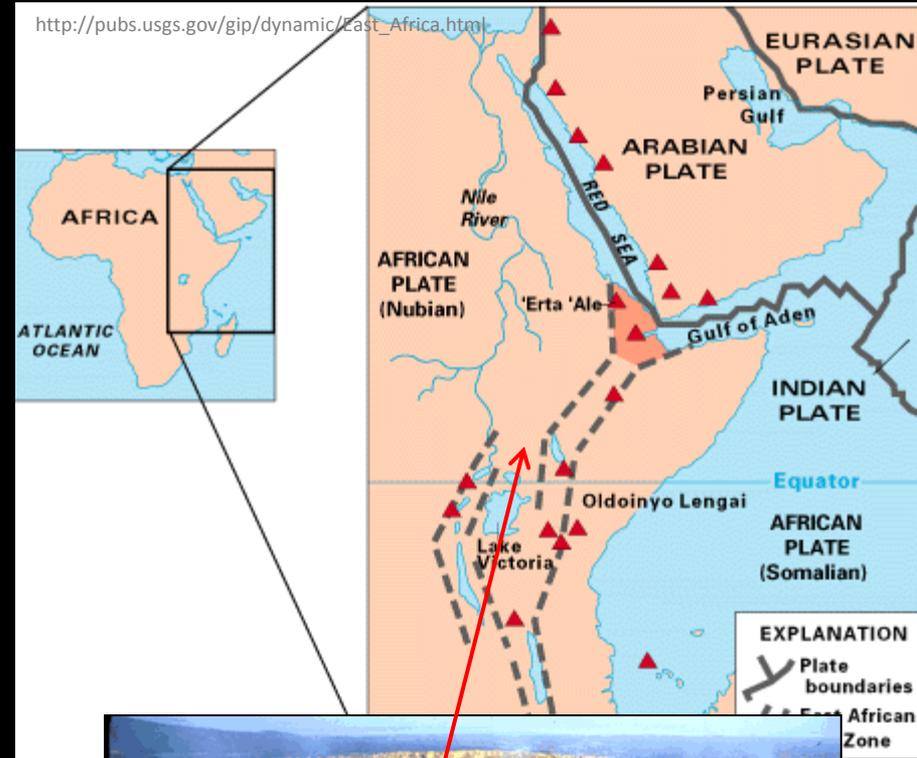
Living on the Edge: Divergent Plate Boundaries: Hazards

2. Divergent plate boundaries on land

<http://pubs.usgs.gov/gip/dynamic/understanding.html>



http://en.wikipedia.org/wiki/Divergent_boundary#media_viewer/File:Bridge_across_continents_iceland.jpg



http://pubs.usgs.gov/gip/dynamic/Erta_Ale.html

Also see a graphic showing the East African Rift Plate Boundary and Nyiragongo Volcano at:
<http://ngm.nationalgeographic.com/2011/04/nyiragongo-volcano/volcano-interactive>

Living on the Edge: Divergent Plate Boundaries: Hazards

3. Group Activity

Instructions: Examine data for one of the divergent plate boundaries below and fill in the characteristics in the appropriate column of table 2:

Table 2: Use data provided to describe the activity and hazards associated with the following divergent PB located on land

Data/Location	Mid Atlantic Ridge: Iceland (Grimsvotn) Nov 2004	East African Rift: Dabbahu Volcano, Afar Region Sept 2005	East African Rift- Nyriragongo Volcano Jan 2002	Explain how this type of data related to activity at Divergent Plate Boundaries
Earthquake (EQ) Hazards Specific spatial patterns/depth/size				
Volcanic Hazards Erupted products, distance affected				
Other associated activity/hazards				
What additional data would you like to have?				

Recall: Learning Objective: By the end of this unit you will be able to:

1. Interpret data to characterize geologic activity associated with divergent plate boundaries



Fill in table

Living on the Edge: Divergent Plate Boundaries: Hazards

4: Report out on Group Activity

Suggested Responses

Table 2: Use data provided to describe the activity and hazards associated with the following divergent PB located on land (*example responses*)

Data/Location	Mid Atlantic Ridge: Iceland (Grímsvötn) Nov 2004	East African Rift: Dabbahu Volcano, Afar Region Sept 2005	East African Rift- Nyiragongo Volcano Jan 2002	Explain how this type of data related to activity at Divergent Plate Boundaries
Earthquake (EQ) Hazards Specific spatial patterns/depth/size	<i>EQ precursors from 2003 to time of eruption; swarms just before eruption; Locations around vent (10-20km)</i>	<i>Sept 26 1pm strong EQ EQ Sept 14-24 in north, by Dabbahu volcano EQ Sep25-Oct4 more south, in rift zone and parallel to rift zone (extensional area)</i>	<i>Jan 17 5AM EQs 100's EQ of M>3.5 through Jan 23 Peak of EQ on Jan 22/23</i>	<i>EQ (precursor and during eruptions) are aligned with the plate boundary</i>
Volcanic Hazards Erupted products, distance affected	<i>Ash plume 8-14km height Air traffic diverted Ash fall 150 km away</i>	<i>Ash about 500 m from vent; 3m boulders ejected 20 m Degassing and S smell, emissions, fumaroles</i>	<i>Long basalt lava flows (17km) and thick, buried roads, farms, airport runway, buildings destroyed etc.</i>	<i>Volcanoes aligned with plate boundary, which is perpendicular to extension of the PB magma near the surface, erupts, can be basaltic lava</i>
Other associated activity/hazards	<i>Ice melt caused huge flood (jökulhlaup) Uplift of volcano beyond that of 1998 eruption</i>	<i>Dark smoke (probably ash) Large rifts opened on Dabbahu and to south; probably opened from dike injection of magma</i>	<i>Fires/explosion from lavas in contact with gas station; Fissures opened Pos overturn of Lake Kivu & gas release</i>	<i>Ground fractures/rifts are parallel to the PB being pulled apart by extension</i>
What additional data would you like to have?				

Recall: Learning Objective: By the end of this unit you will be able to:

1. Interpret data to characterize geologic activity associated with divergent plate boundaries

Living on the Edge: Divergent Plate Boundaries: Hazards

5. **Predictions:** What are the characteristics and hazards associated with terrestrial Divergent Plate Boundaries? Fill in the table:

Table 1		
Data/PB type	Submarine Divergent PB	Terrestrial Divergent PB
Earthquake (EQ) characteristics (size/depth)	<i>Few, relatively small and difficult to detect from land based seismometers</i>	
Volcanism characteristics (erupted products, distance affected)	<i>Frequent at Axial Seamount (about every 15 years)</i>	
Hazards to Humans (how are humans affected- at what scale?)	<i>No hazards to humans, possibly to monitoring instruments, no real tsunami hazards from small EQ</i>	

Recall: Learning Objective: By the end of this unit you will be able to:

2. Compare and contrast divergent plate boundaries on land and the ocean floor



Fill in table

Living on the Edge: Divergent Plate Boundaries: Hazards

5. Suggested Responses: Characteristics and hazards associated with terrestrial Divergent Plate Boundaries:

Data/PB type	Submarine Divergent PB	Terrestrial Divergent PB
Earthquake (EQ) characteristics (size/depth)	<i>Few, relatively small and difficult to detect from land based seismometers</i>	<i>Few, relatively small as magma moves; can be detected by seismometers</i>
Volcanism characteristics (erupted products, distance affected)	<i>Frequent at Axial Seamount (about every 15 years), but depends on specific site</i>	<i>Depends on specific site, but probably in linear chains along divergent PB</i>
Hazards to Humans (how are humans affected- at what scale?)	<i>No hazards to humans, possibly to monitoring instruments, no real tsunami hazards from small EQ</i>	<i>Hazards to humans living nearby (lava, pyroclastic flows), possible aviation hazards from airborne tephra), flooding/debris flows associated with melting snow/ice</i>

Recall: Learning Objective: By the end of this unit you will be able to:

2. Compare and contrast divergent plate boundaries on land and the ocean floor

Living on the Edge: Divergent Plate Boundaries: Hazards

6. Discussion: What are some reasons that all types of data might not be available (recall the site specific data)?

Data/PB type	Submarine Divergent PB	Terrestrial Divergent PB
Earthquake (EQ) characteristics (size/depth)	<i>Few, relatively small and difficult to detect from land based seismometers</i>	<i>Few, relatively small as magma moves; can be detected by seismometers</i>
Volcanism characteristics (erupted products, distance affected)	<i>Frequent at Axial Seamount (about every 15 years), but depends on specific site</i>	<i>Depends on specific site, but probably in linear chains along divergent PB</i>
Hazards to Humans (how are humans affected- at what scale?)	<i>No hazards to humans, possibly to monitoring instruments, no real tsunami hazards from small EQ</i>	<i>Hazards to humans living nearby (lava, pyroclastic flows), possible aviation hazards from airborne tephra), flooding/debris flows associated with melting snow/ice</i>

Learning Objectives: By the end of this unit you will be able to:

3. Explain how geologists use multiple types of data to characterize geologic activity associated with volcanic eruptions