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Why do earthquakes occur more often in some places than in others?


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The screenshot shows the USGS Earthquake Hazards Program website. On the left, there is a list of recent earthquakes with columns for magnitude, location, and time. The main part of the image is a world map with red dots indicating earthquake locations. The word "Earthquakes" is written in large black text across the map. Below the map, the text "Forces in the Earth's Crust Lesson 1" is overlaid in a large, black, sans-serif font.

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 How does stress change the Earth's crust?

 How do faults form?

 How does plate movement create new landforms?

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How Does Stress Change the Earth's Crust

Movement of the Earth's plates can create strong forces that slowly bend or fold rock

Beyond a certain limit, all rock in the upper crust will break

Forces are created by plate movement are examples of stress

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Stress = a force that acts on rock to change it shape or volume

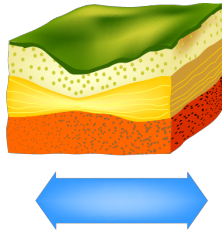
Expressed as a force per unit area

Stress increase as force increases

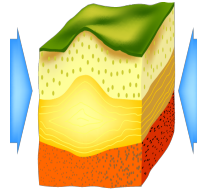
Stress add energy. The energy is stored in the rock until the rock changes shape and breaks

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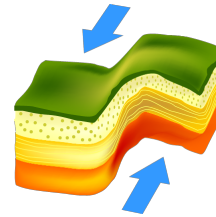
3 kinds of stress occur in the crust



tension



compression



shearing

These changes occur slowly
(million of years)

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Tension

Rocks are stretched so they are thinner in the middle
occurs where 2 plates pull apart
(Divergent Boundary)

Compression

Stress force squeezes rock until it folds or breaks
Occurs where 2 plates come together
(Convergent Boundary)

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Shearing

Stress that pushes the rocks in two opposite directions

Can cause the rock to break, slip apart, or change shape

Occurs where 2 plates slip past each other
(transform boundary)

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How Do Faults Form

A fault is a break in the Earth's crust where rock surfaces slip past each other

most faults occur on plate boundaries

enough stress can cause the crust to break

3 types of faults

normal, reverse and strike-slip fault

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Normal Fault

Fault cuts through at an angle

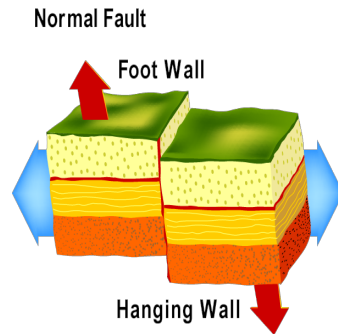
So one block sits over the other

Block on the top = Hanging Wall

Block lies under the fault = Foot Wall

Normal Fault= hanging wall slides down

Occurs where the plate splits/
divergent boundary



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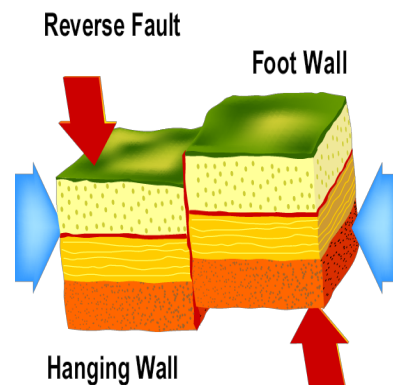
Reverse Fault

Hanging wall is pushed upward

Occurs with compression/ Convergent Boundary



Reverse faults in shale layers, Trail to the Base of the Torres, Parque Nacional Torres de Paine, Chile



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Strike-Slip Fault

Rocks on either side of fault slide past each other

Occurs at transform boundary

San Andreas Fault



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How Does Plate Movement Create New Landforms?

Most changes in the crust occur slowly that they cannot be observed directly

over million of years

a flat plain can be changes into anticlines, synclines, folded mountains, and plateaus

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Folding Earth's Crust

Sometimes plate movements can cause the Earth's crust to fold

stress by compression

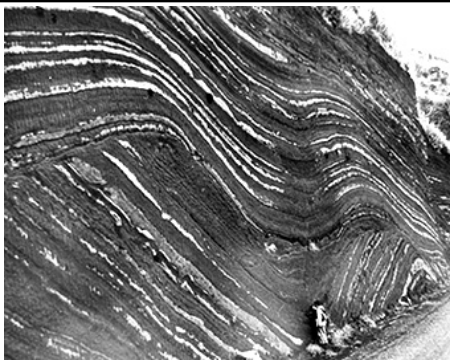
can bend the rock without breaking

Folds

Bends in the crust when compression shortens and thickens the crust

can be centimeters or kilometers in size

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Anticlines and Synclines

upward or downward folds

anticlines= rock bends upward

synclines= rock bends downward

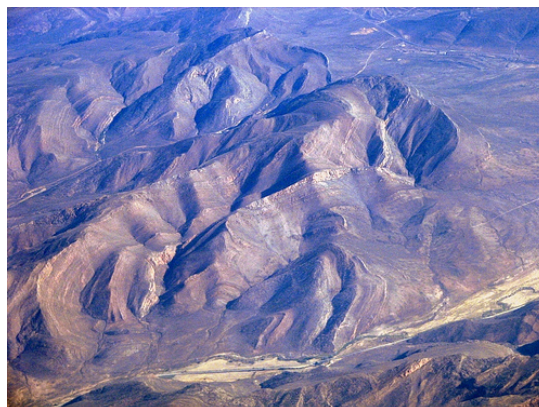
found in many places of compression

central Appalachian mountains

are folded mountains with anticlines and

synclines

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Folded Mountains

Collision of 2 plates can cause compression and folding over wide areas

produces the largest mountains

Himalayas

Alps

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Stretching Earth's Crust

Area between Salt Lake City and Los Angeles is the Great Basin

Region where mountains are separated by broad valleys

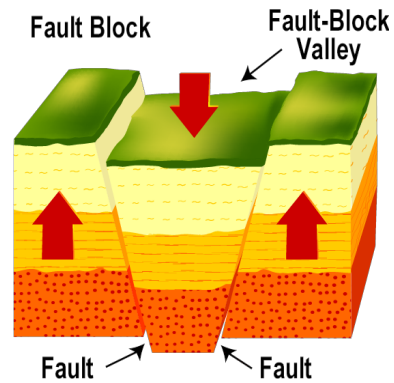
Mountains form from tension that cause faulting.

Fault block mountains

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Fault Block Mountains form when 2 plates move away to create normal faults

Normal faults cause valleys to drop down on either side of the block



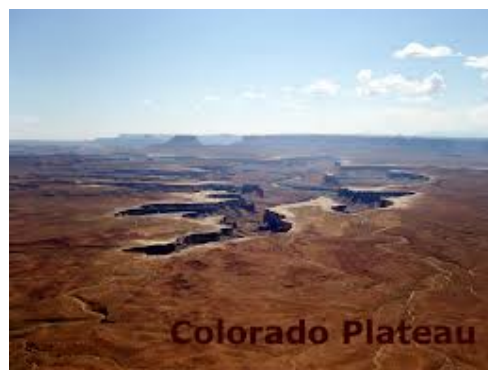
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Uplifting Earth's Crust

Forces that uplift/raise mountains can also uplift plateaus
 Some form when crust pushes up large flat blocks of rock
 Plateaus can contain many different layers of flat rock.

They are wider than tall

ex. Colorado Plateau



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