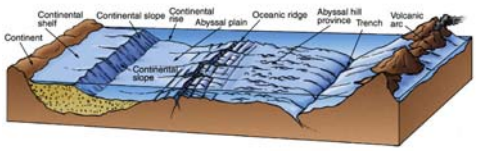
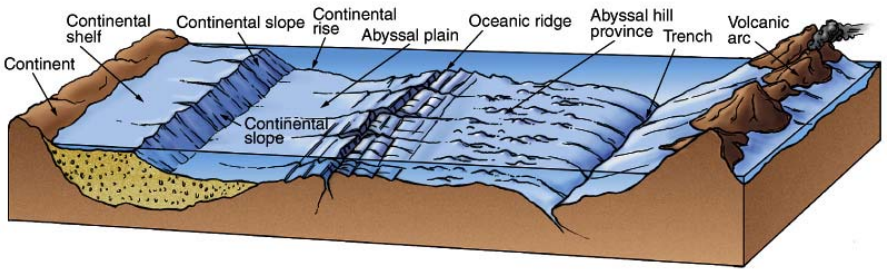
Ch 4: Marine provinces



1. *Continental margin*
2. *Oceanic ridge or rise (sea-floor spreading center)and fracture zones*
3. *Abyssal plain/abyssal hill province and intraplate features*

1. Continental margin

- *boundary between continent and ocean*
- *rift blocks of continental crust that are covered by sediment*
- *passive or active margin*
- *Continental shelves, slope, rise*
- *Submarine canyons*
- *Trenches*

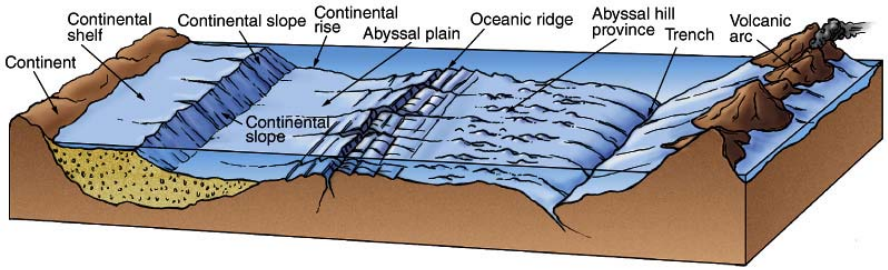


Note vertical exaggeration is 50x!

Passive and active continental margins

Passive margin
= Atlantic type margin
- *no plate boundary
- *no seismic activity
- *sediments accumulate to 10-20km thick layer
- *wide continental margin

Active margin
= Pacific type margin
- *convergent plate boundary
- *trenches mark the boundary of continent and ocean, strong earthquakes
- *sediment accumulation few km
- *narrow continental margin



Note vertical exaggeration is 50x!

Parts of a continental margin

Typical passive continental margin, e.g. off northeastern US coast.

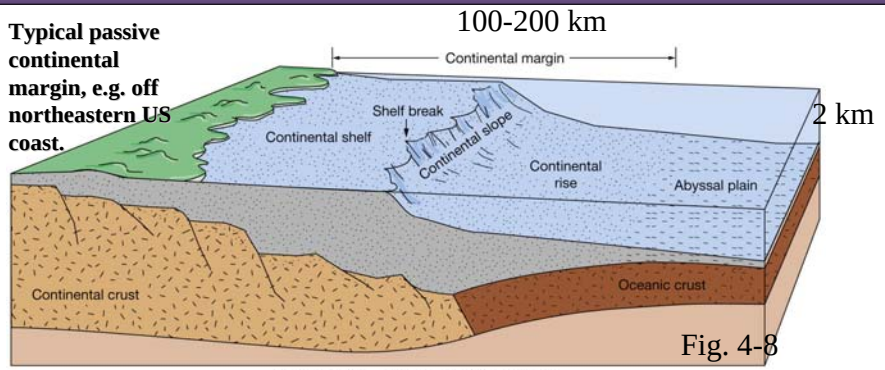


Fig. 4-8

- **Shelf:** Flat, reaches to width 70– 1500km, until **shelf break**
- **Shelf break** occurs at an average depth of 135 m.
- **Continental slope** begins at break, has an inclination of about 4 (range 1 – 25) degrees. It is often intersected by submarine canyons.
- **Continental rise** marks the transition between slope and deep ocean.

Note: Continental rise is absent in active margins, and a trench marks that boundary.

Parts of a continental margin

Continental slope is often intersected by submarine canyons.

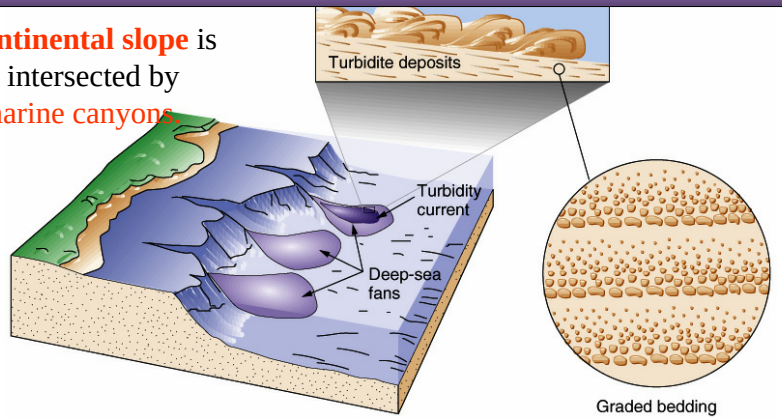
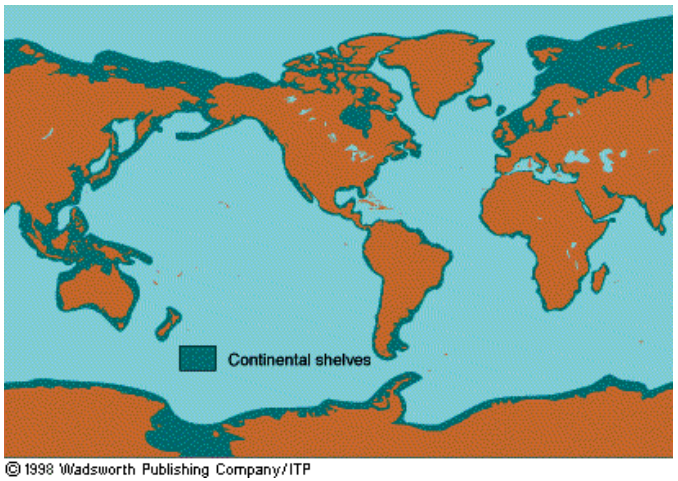


Fig. 4-9. **Turbidity currents** move downslope and erode submarine canyons in the **continental slope**.
Deep sea fans are created by **turbidite deposits** at the mouths of the canyons, merge at the base of the continental slope and make up most of the sediments of the **continental rise**. These turbidity deposits exhibit **graded bedding**.

Fig. 4D Grand Banks Earthquake

Continetal shelves



The broadest shelf occurs north of Siberia, and from Alaska to Australia. North Sea, Baltic and Hudson Bay are **shelf seas.**
Passive margins usually have broader shelves than active margins.

Oceanic trenches

Oceanic trenches of the world. Trenches occur where oceanic plates are subducted. They are the dominant bathymetric feature of the Pacific Ocean.

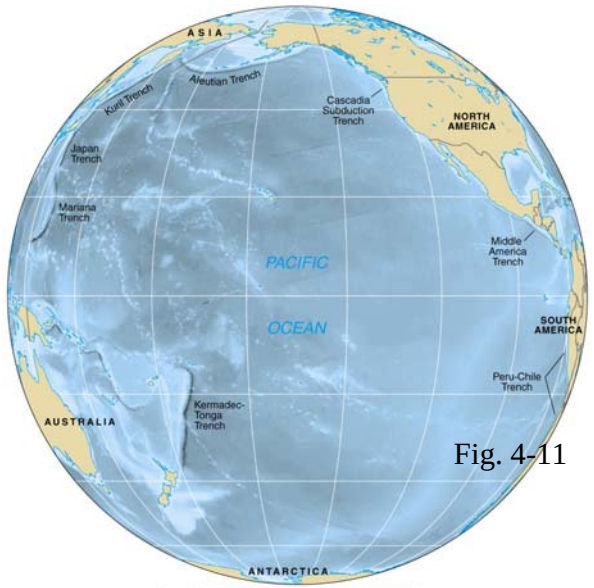
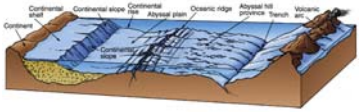


Fig. 4-11

Ch 4: Marine provinces



1. ***Continental margin***
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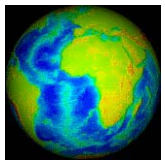
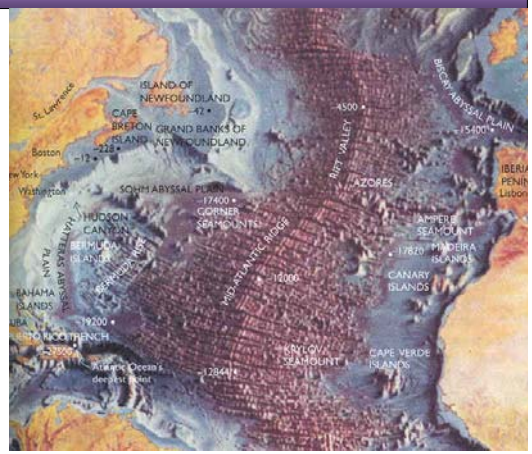
Mid-ocean ridges

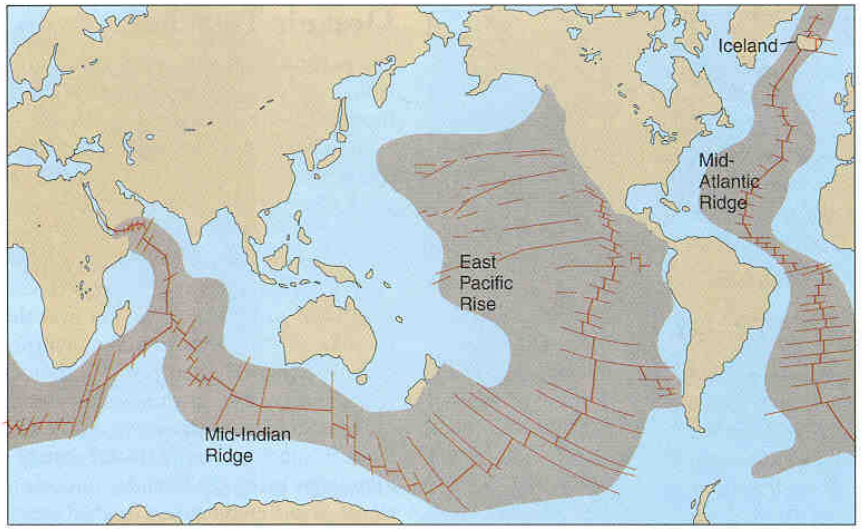




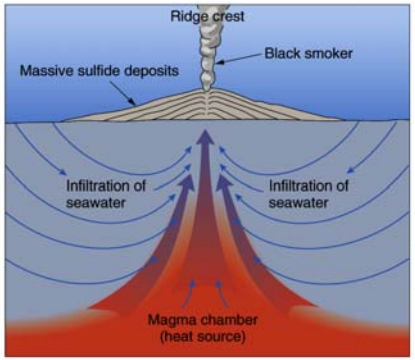
❑Mid-ocean ridges and rises

Longest mountain chain on earth 70,000km, avg. elevation 2.5 km

Mid-ocean ridges



Mid-ocean ridges



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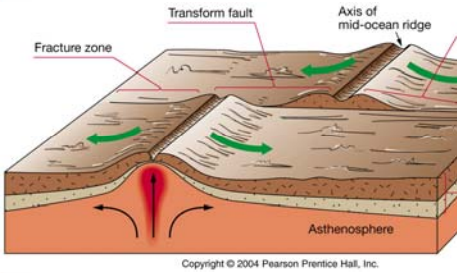

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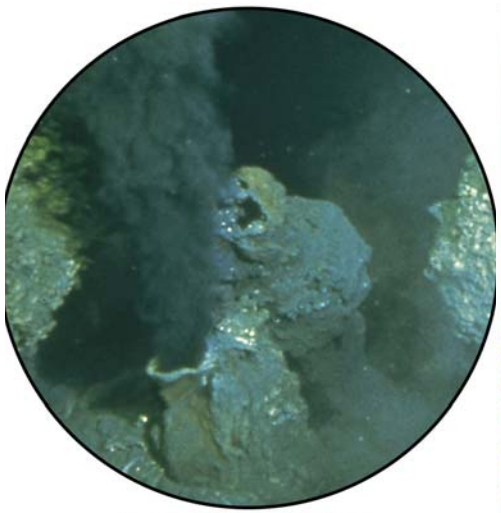
4.18

❑Features associated with mid-ocean ridges

Hydrothermal vents

Transform faults and fracture zones



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4.17 Black smokers

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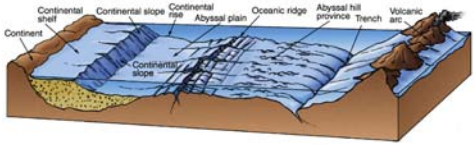
Ch 4: Marine provinces



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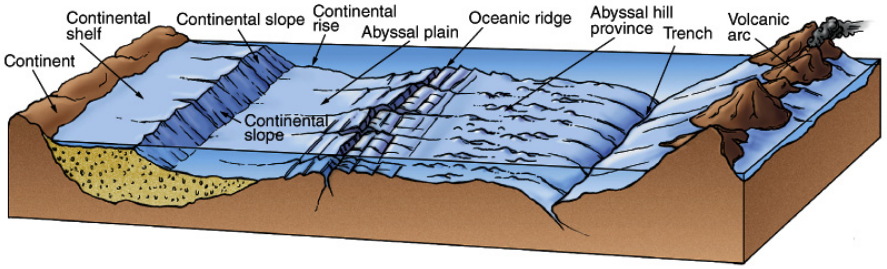
Abyssal plains/abyssal hills

Abyssal plains Abyssal hills



Note vertical exaggeration is 50x!

Abyssal plains/abyssal hills

Associated intraplate features:

- Abyssal hills (< 600 m)
- Seamounts (> 1 km)
- Islands (reach surface)
- Tablemounts (Guyots) = sea mount with a flat top
- Especially abundant in the Pacific, more than 20,000 volcanic peaks!

Why?

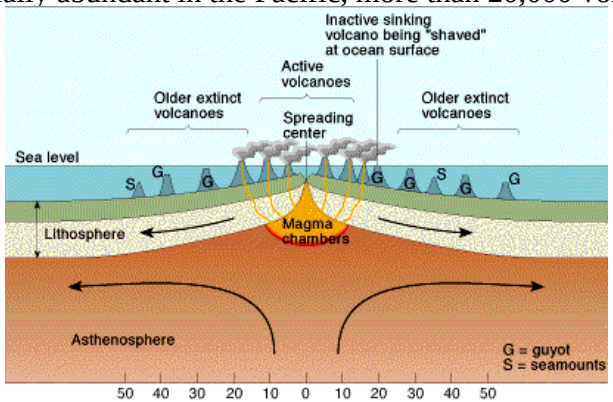
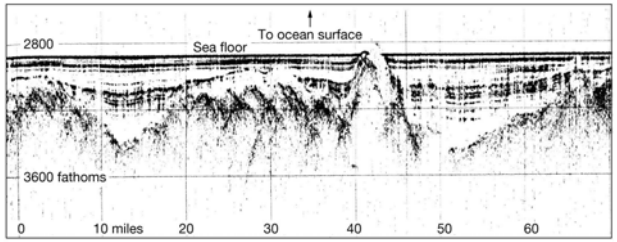
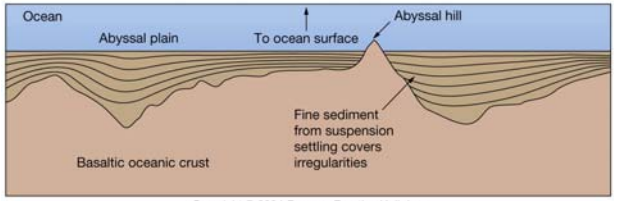


Fig. 3-33

Abyssal plains/abyssal hills

In the Atlantic and Indian Oceans, most of the intraplate features are buried underneath a thick layer of sediment.





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