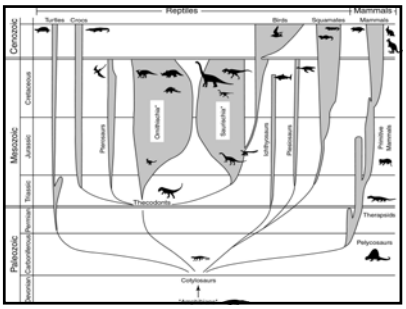
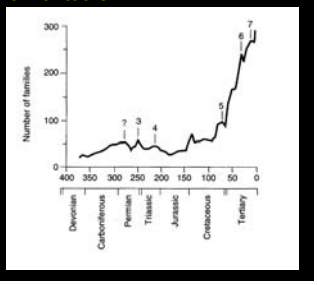
MASS EXTINCTIONS

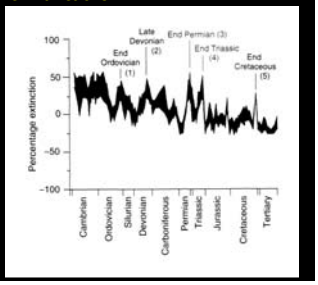
- Wide spread, striking different taxa
- Large numbers
- Relatively short time span



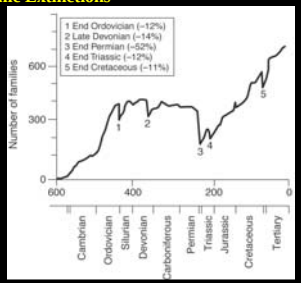
Catastrophic Extinctions



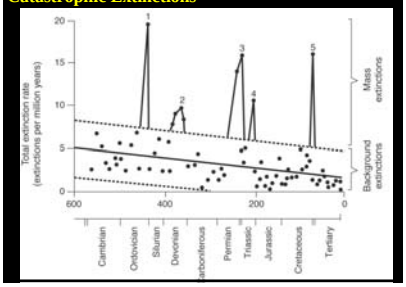
Catastrophic Extinctions



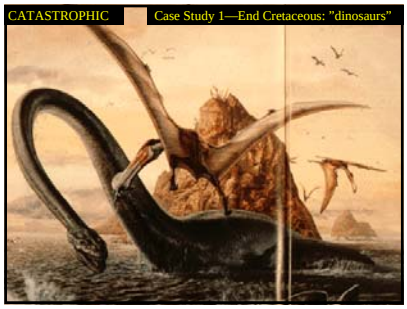
Catastrophic Extinctions



Catastrophic Extinctions



CATASTROPHIC Case Study 1—End Cretaceous: "dinosaurs"



CATASTROPHIC Case Study 2— Permo-Triassic

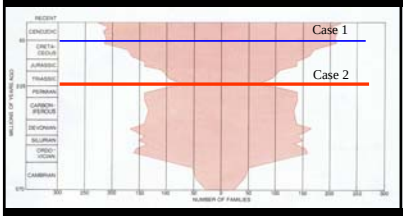
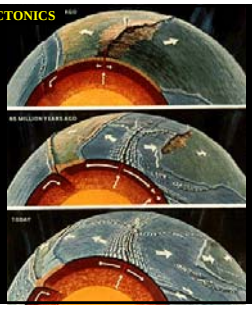


PLATE TECTONICS



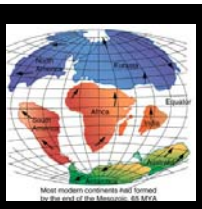
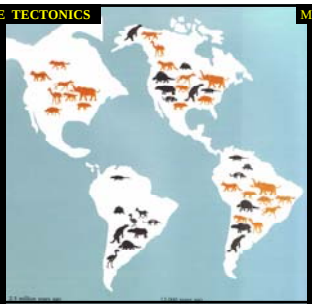
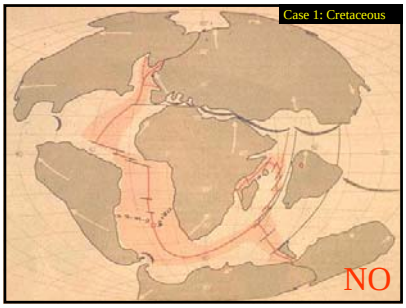


PLATE TECTONICS

Mingling

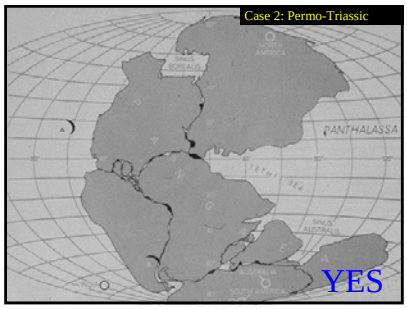


Case 1: Cretaceous



NO

Case 2: Permo-Triassic



YES

Latitudinal Gradients

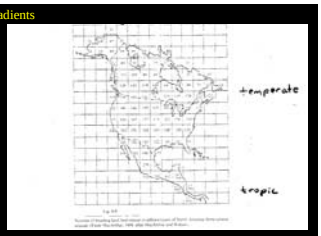


PLATE TECTONICS

Trophic Stability

Single, Large land mass → unstable, low sps number

Several, Small land masses → stable, high sps numbers
moderating ocean, more area

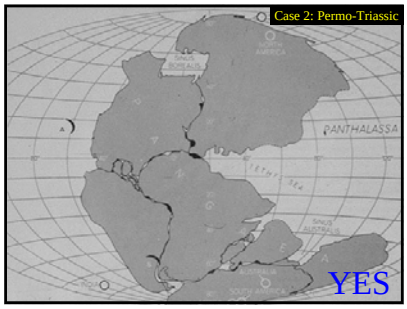
NOT SQUASH

Predict:

If supercontinent then fewer species/mass extinctions.

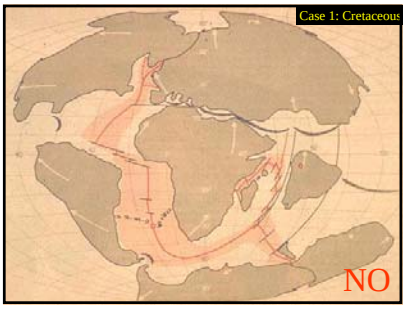
If fragmentation then more species/no mass extinctions.

Case 2: Permo-Triassic



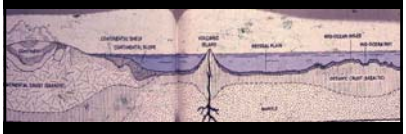
YES

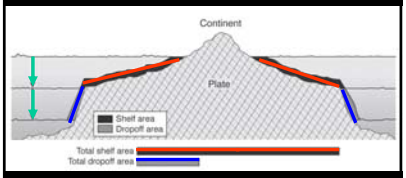
Case 1: Cretaceous



NO

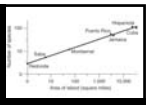
Changes Sea Level





NOT HIGH & DRY

Changes Sea Level



- •Loss shallow marine habitat
  - Species-Area Relationship
- •Indirectly, more severe terrestrial climate
- •Indirectly, drier interior of continent

Predict:

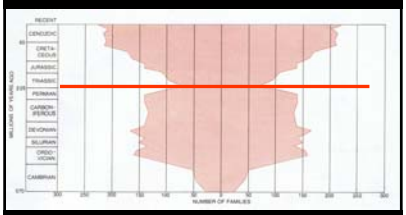
If drop sea level then fewer species / mass extinctions.

Result:

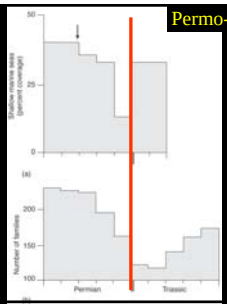
Permo-Triassic ➔ 60% drop in sea level

Cretaceous ➔ ????

CATASTROPHIC — Case 2: Permo-Triassic



Permo-Triassic

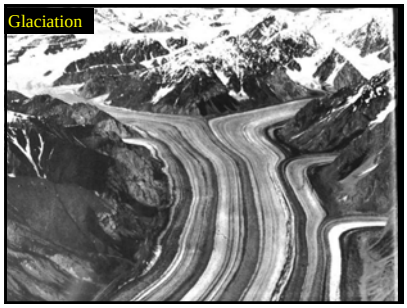


YES

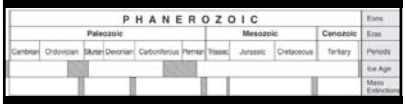
Case 1: Cretaceous

Probably, but ??

Glaciation

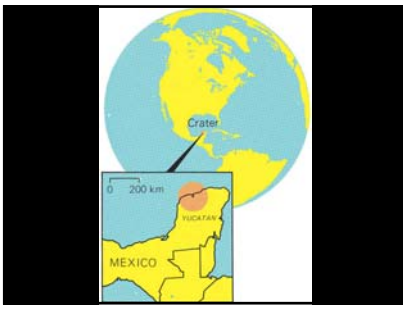


Glaciation



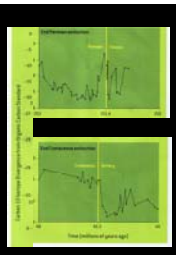
Cosmic Collision

Cosmic Collision



Cosmic Collision

Carbon ^{13}



Permo-Triassic

Cretaceous

VOLCANOES

1) Volcanoes ➡ CO_2

2) Global warming

3) Warm ocean less O_2

4, 5) Anoxia to Hydrogen sulfide (H_2S)

6) Sulfur bacteria thrive

7) H_2S gas kills land plants and animals

8) H_2S gas destroys ozone shield

9) UV radiation kills more life

VOLCANOES

Overall Assessment of Extinctions

- At least, two types:
  - Uniform
  - Catastrophic (Mass)
- Not one, several
- Permo-Triassic—changes in area
  - Fusion continents
  - Drop Sea Level
- Cretaceous Extinctions