

Mendip Earthquakes

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Mendip
ROCKS!



Mendip Earthquakes

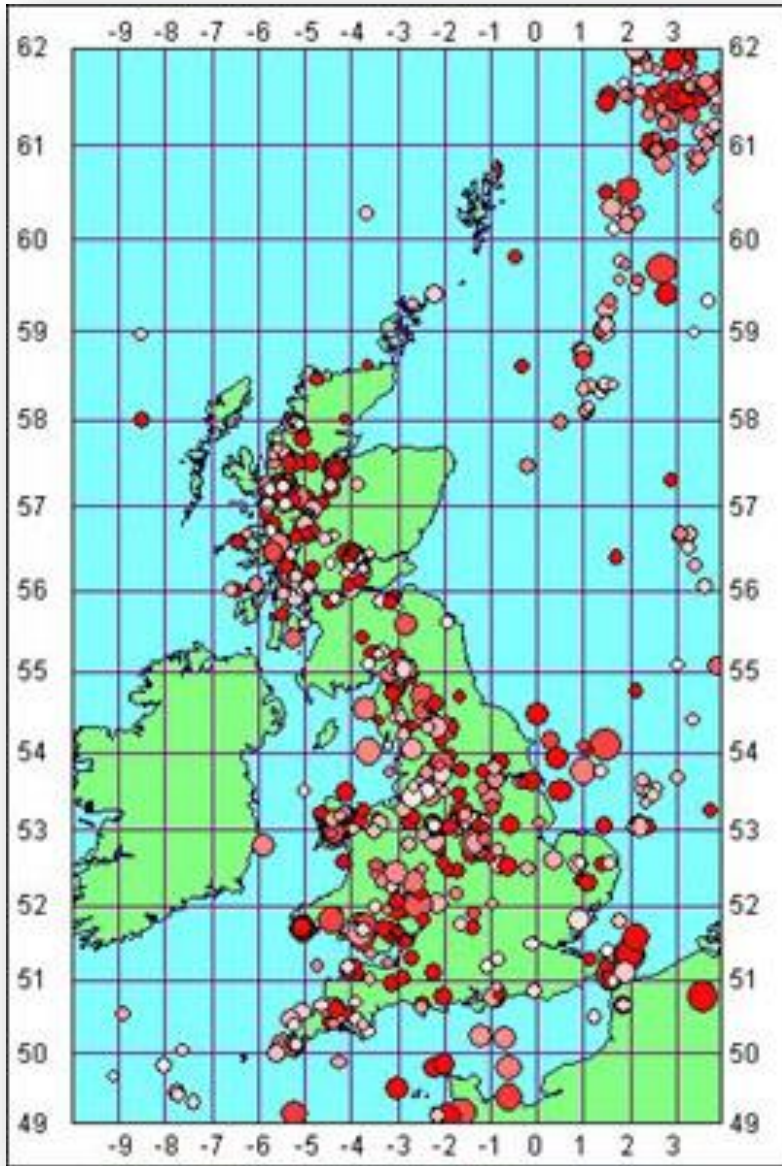
- THE GLOBAL PICTURE
- THE WELLS AREA & UK
- MEASURING EARTHQUAKES
DAMAGE
ENERGY
SEISMIC WAVES
- MOUNTAIN BUILDING
- EVIDENCE FOR 'QUAKES
- SEISMOMETERS &
SEISMOGRAMS

Mendip
ROCKS!



Earthquakes in the UK

The UK is a long way from any plate boundary (1800km to the Mid Atlantic Ridge), but we do have small earthquakes.



EARTHQUAKES OF UNKNOWN EPICENTRES IN SOMERSET

1. **1122** JULY 25. Cat. No. 15 (*Anglo-Saxon Chron.* vol. 2, p. 217; *Annal. Monast.* vol. 1, p. 10).

“And the eighth night before the calends of August was a very violent **earthquake** all over Somersetshire and in Gloucestershire” (*Anglo-Saxon Chron.*).

WELLS EARTHQUAKES

1. **1248** DEC. 21. Cat. No. 32; Intensity 8 (Matthew Paris, vol. 3, pp. 42, 305; *Annal. Monast.* vol. 4, p. 439; Stow, p. 285; etc.).

“In the same year, on the day of our Lord’s Advent, which was the fourth day before Christmas, an earthquake occurred in England, by which (as was told to the writer of this work by the Bishop of Bath, in whose diocese it occurred) the walls of buildings were burst asunder, the stones were torn from their places, and gaps appeared in the ruined walls. The vaulted roof which had been placed on the top of the church of Wells by the great efforts of the builder, a mass of great size and weight, was hurled from its place, doing much damage, and fell on the church, making a dreadful noise in its fall from such a height, so as to strike great terror into all who heard it... This earthquake was the third which had occurred within three years on this side

Year	Location	Notes
1122	Somerset & Gloucestershire	
1199	Somerset	People thrown from their feet
1248 (21 st Dec)	Wells	Intensity (viii), felt as far away as Syria.
1275 (11 th Sept)	Glastonbury	Felt as far away as London, damaged St Michael's tower
1718 (or 1748?)	Taunton	China and kitchen utensils were thrown about and church bells were heard to ring.
1852	Cheddar & Winscombe	
1893 (31 st December)	One mile N of Wells	Intensity (iv) nearly (v) 4 seconds duration, felt like a heavy wagon passing, heard by 91% of observers
1893	Wells, Priddy, Wookey, Street	Intensity (iii)

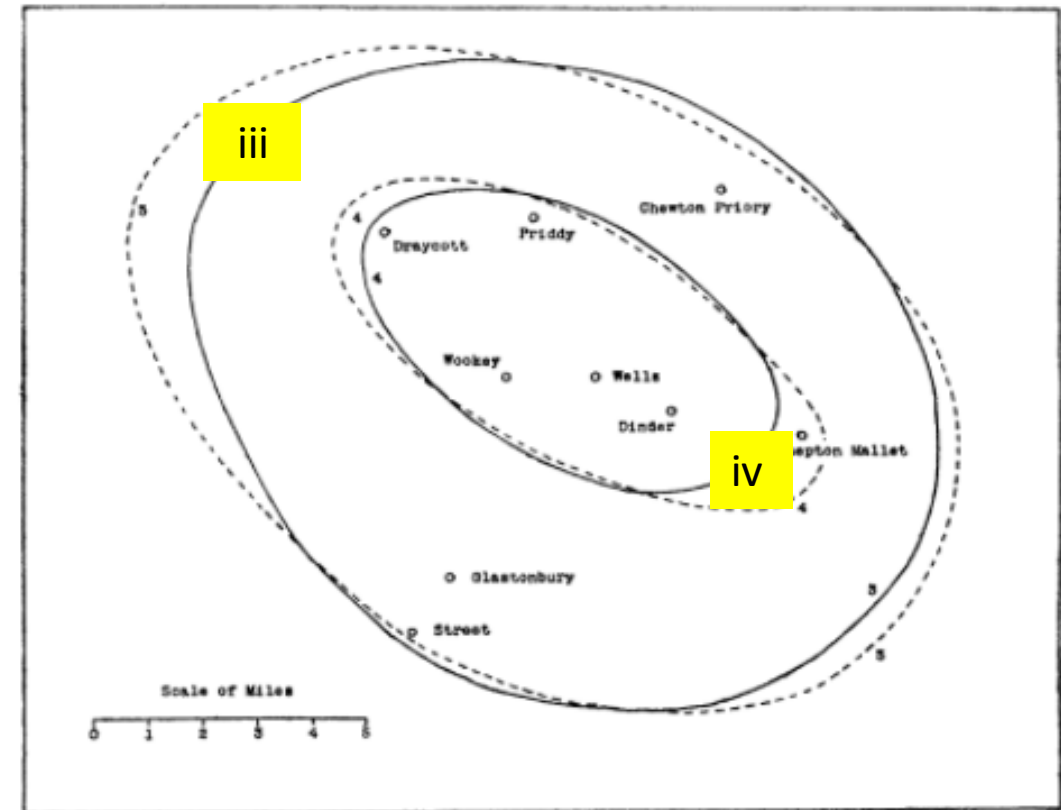


Fig. 81. Wells Earthquakes of 1893 Dec. 30 and 31.

Isoseismal lines for the 1893 Wells 'quakes

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sound was heard by all the observers. Taking the two earthquakes together, the sound was compared to passing waggons, etc., in 26 per cent. of the records, thunder in 11, wind in 5, loads of stones falling in 13, the fall of a heavy body in 11, explosions in 26, and miscellaneous sounds in 8, per cent.

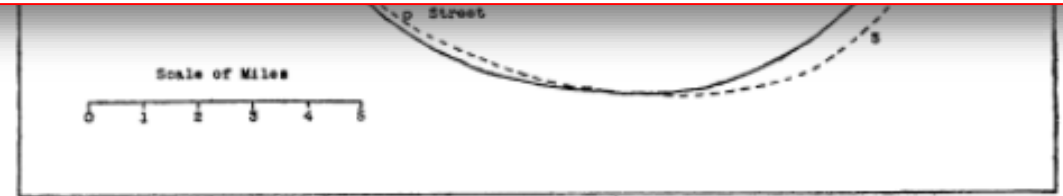
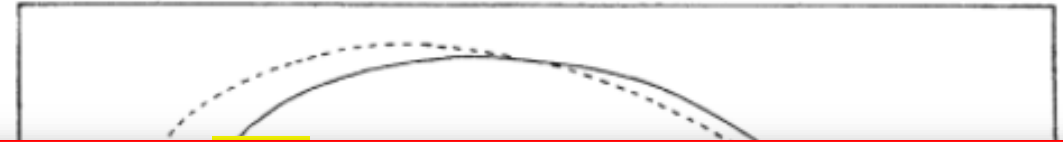


Fig. 81. Wells Earthquakes of 1893 Dec. 30 and 31.

Isoseismal lines for the 1893 Wells 'quakes

Measuring Earthquakes 1

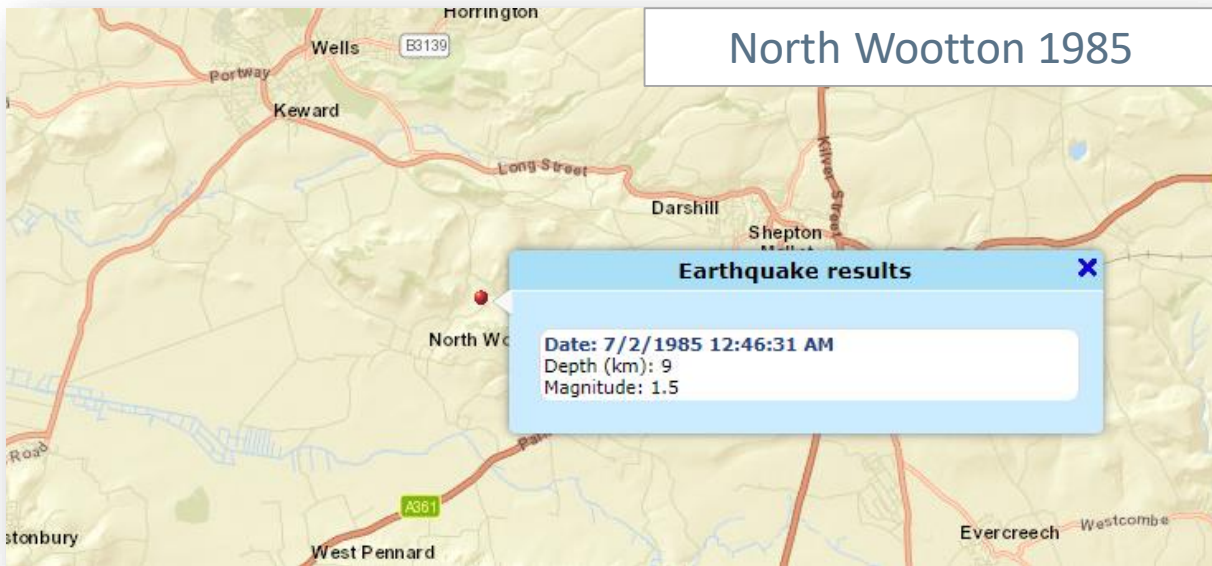
The Mercalli Scale – Measures the damage caused



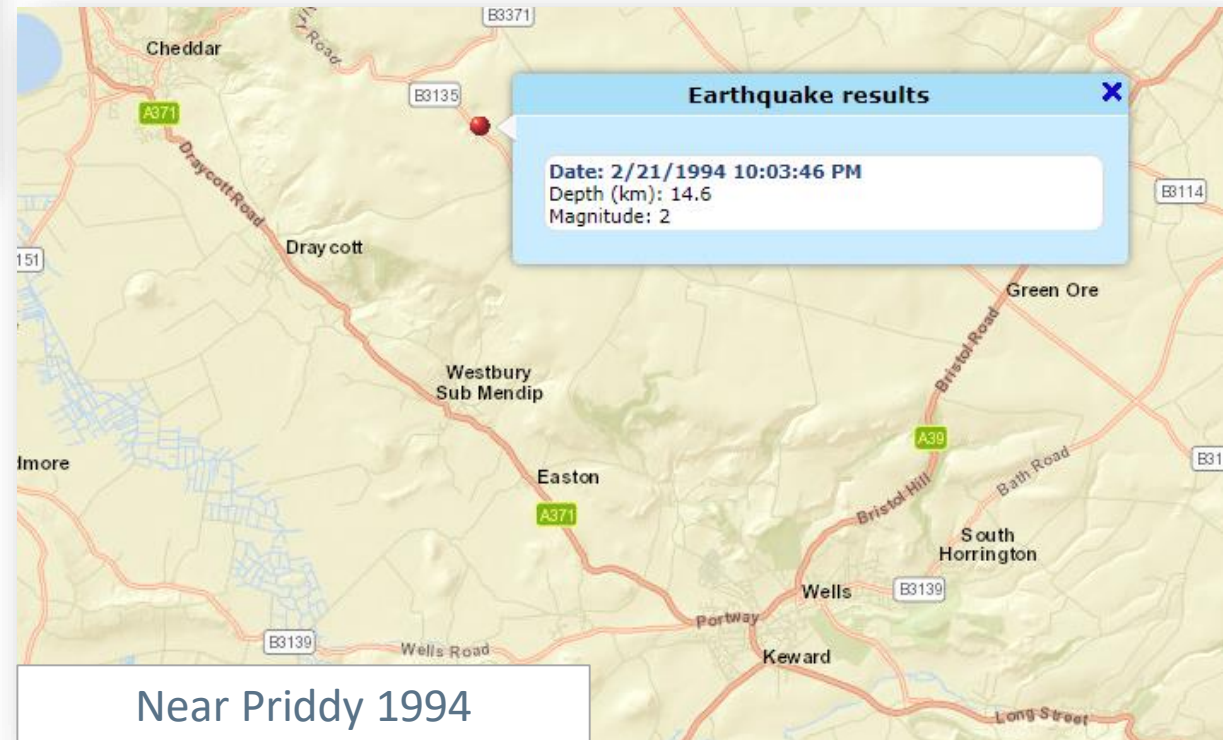
Giuseppe Mercalli
1931

The reports of earthquakes mean that damage can be matched with the Mercalli scale.

Usually between i and iv, though the scale goes up to xii.



20th Century Earthquakes
 in the Mendip area
 Note the depth and Magnitude.



Measuring Earthquakes 2

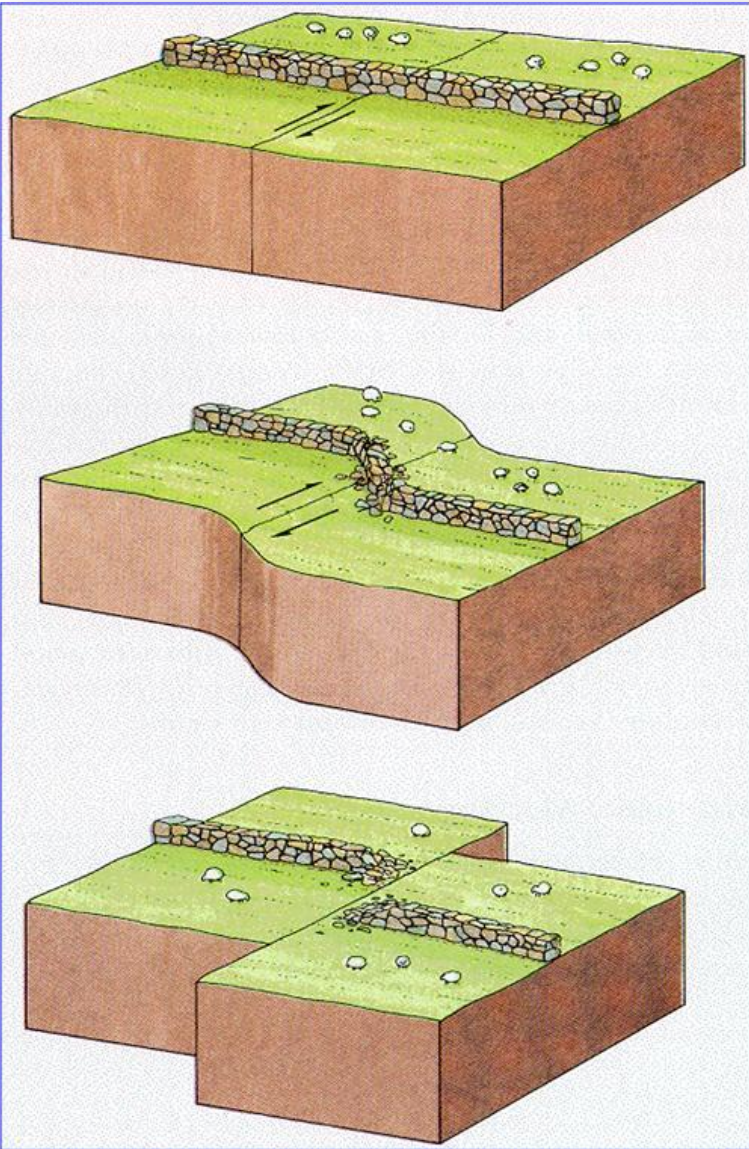
The Richter Scale – Energy released



Charles Richter

Magnitude measures energy released in an earthquake using the amplitude of the vibrations measured on a seismometer.

The energy is released when a fault moves.



Undeformed rocks

Rocks deform due to build up of stress

Rocks fracture and stress is released as seismic waves

Spaghetti Earthquake Magnitude



Each level on the Magnitude scale is an increase of x32 in energy released.

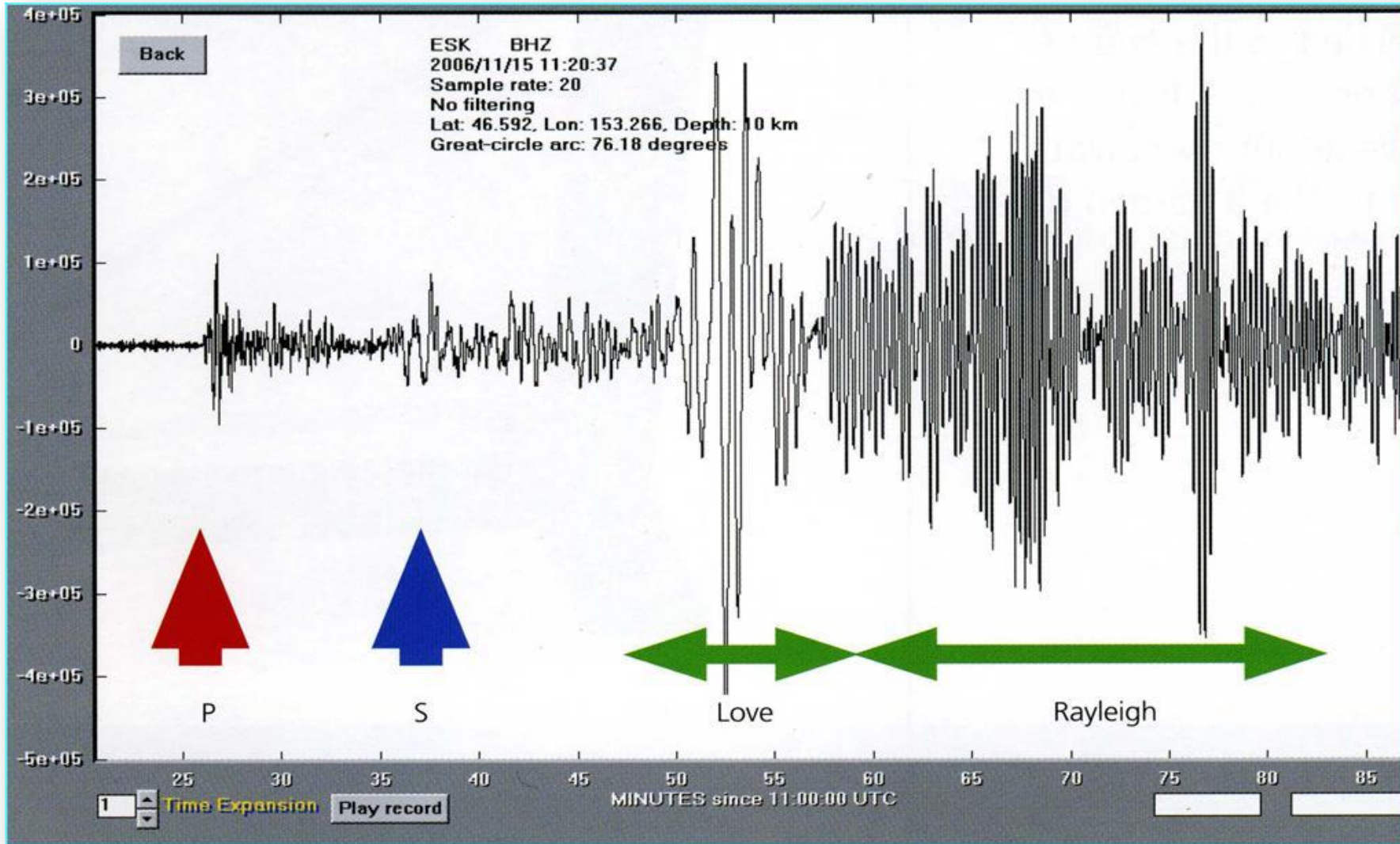
So if M5 = 1 piece of spaghetti

M6 = 32

M7 = 1064

www.iris.edu/hq/inclass/video/201

Types of Seismic Waves



P & S are Body Waves which travel through the earth

L & R are Surface Waves with the largest amplitude, travel around the surface of the earth and cause most damage



PORSCHE

P WAVES

- PRIMARY
- PUSH/PULL
- PORSCHE

S WAVES

- SECONDARY
- SLOWER
- SHAKE
- SIDE TO SIDE
- SKODA



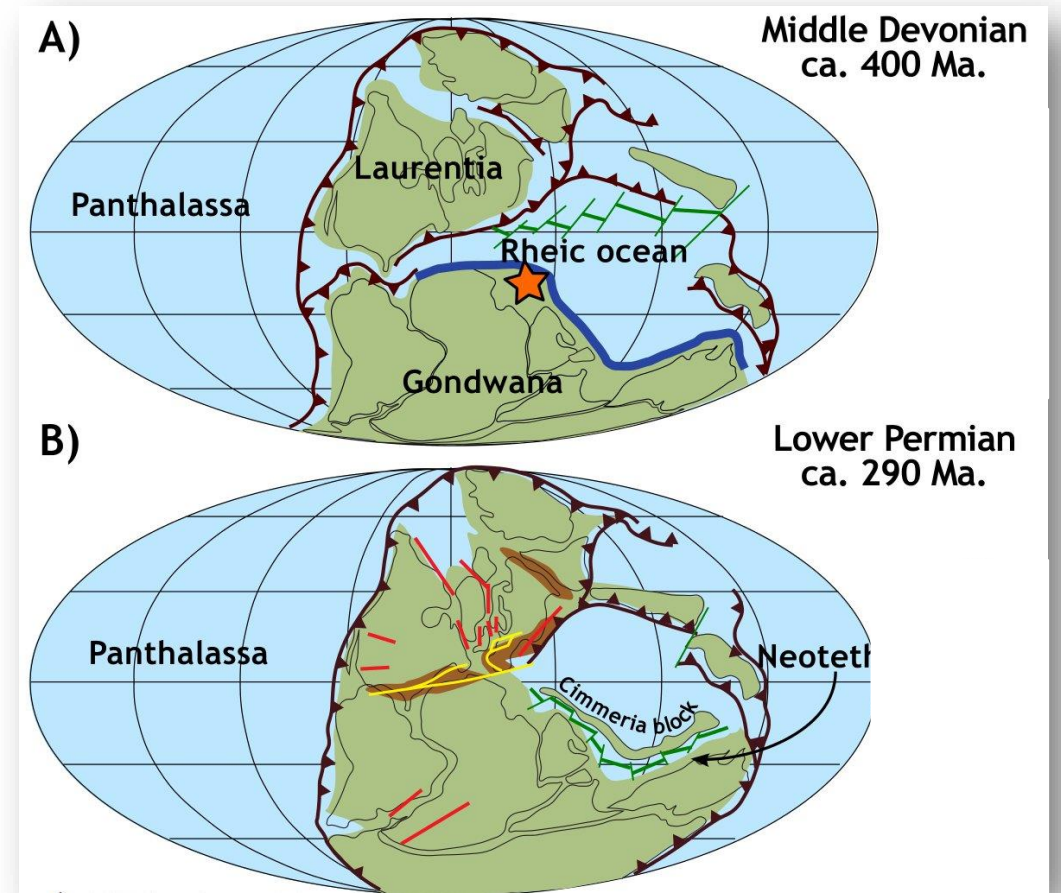
SKODA

Mountain Building

The Hercynian/Variscan Orogeny

Is the period in time that the Mendip anticline formed and when large earthquakes would have affected the area.

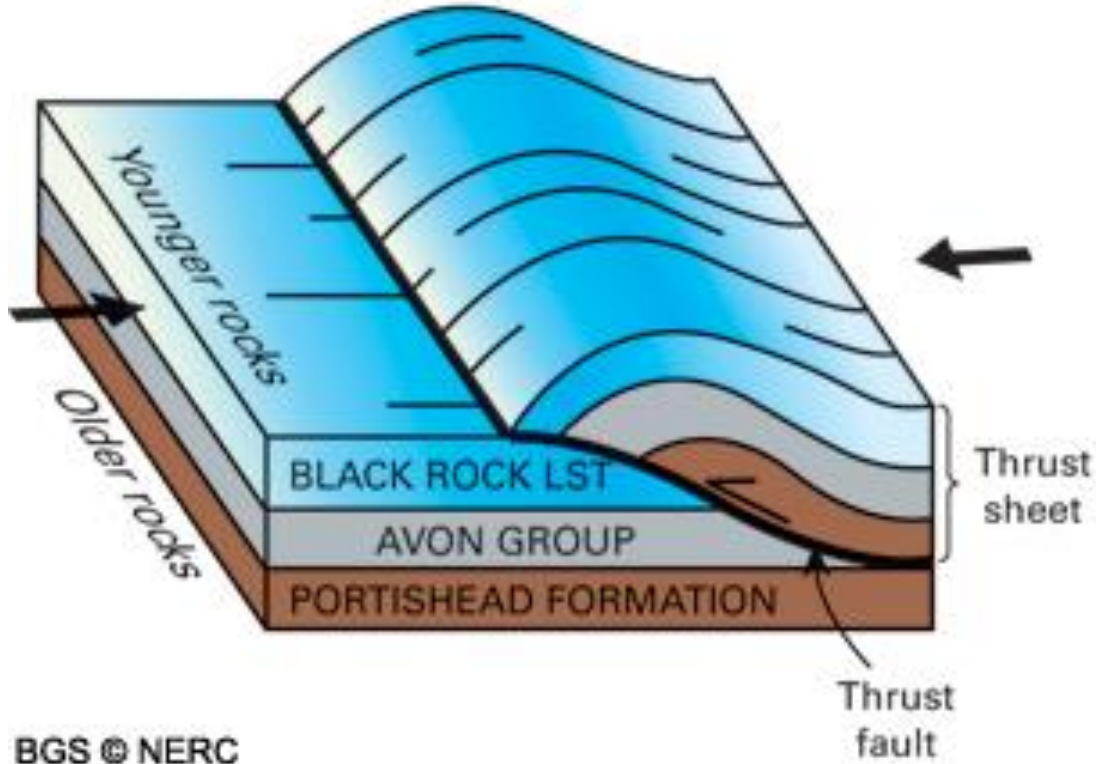
The Hercynian trend is approximately East/West due to continents colliding from North & South.



North

South

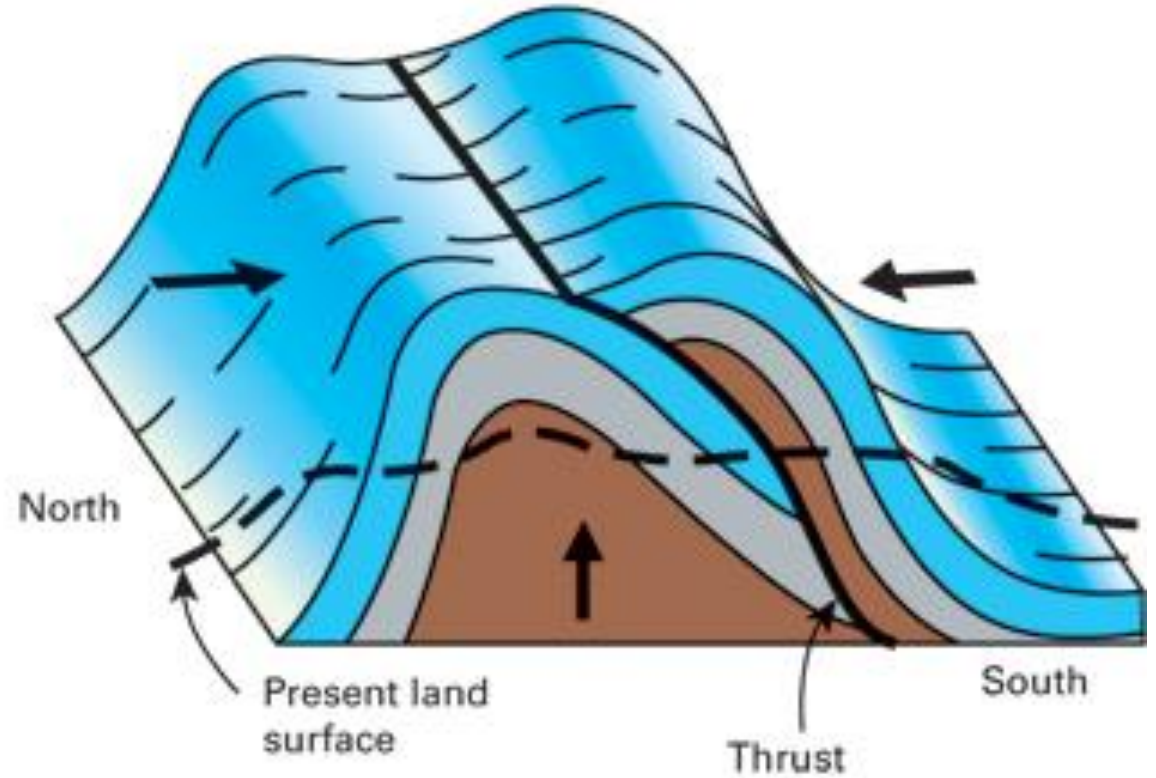
Compression causes thrusting of older rocks over younger rocks



North

South

Further compression causes the rocks (and thrust fault) to be folded into an anticline (upfold)



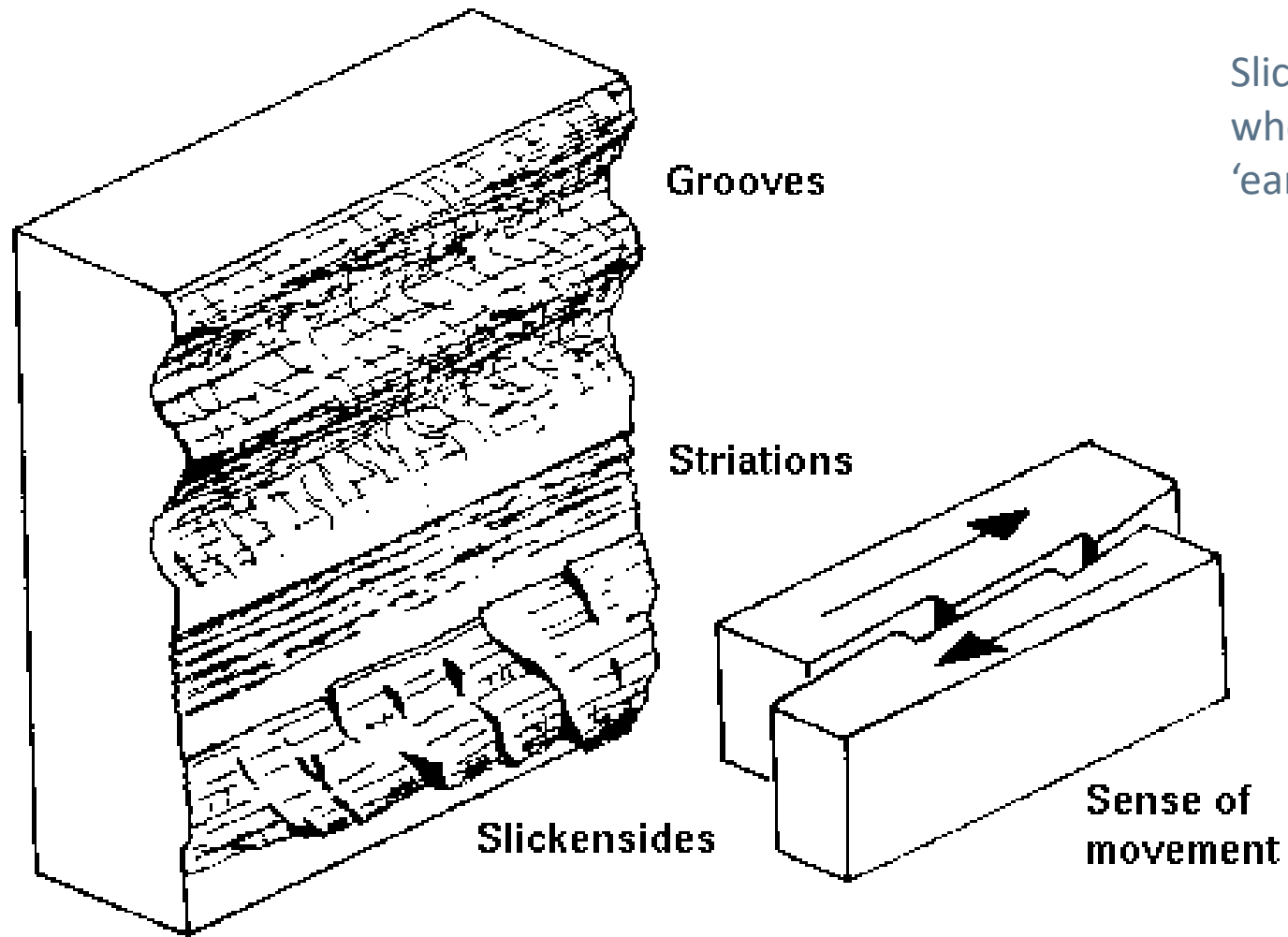
Oldest ↑ Youngest	Devonian	360 Million years ago	Old Red Sandstone
	Carboniferous	299 Million years ago	Carboniferous Limestone
	Permian	251 Million years ago	No local rocks of this age.
	Triassic	201 Million years ago	Dolomitic Conglomerate
	Jurassic		Liassic limestone
			<u>Douling limestone</u>

Hercynian Orogeny

When were these mountains formed?

290 million years ago

Earthquake marks (Slickensides)

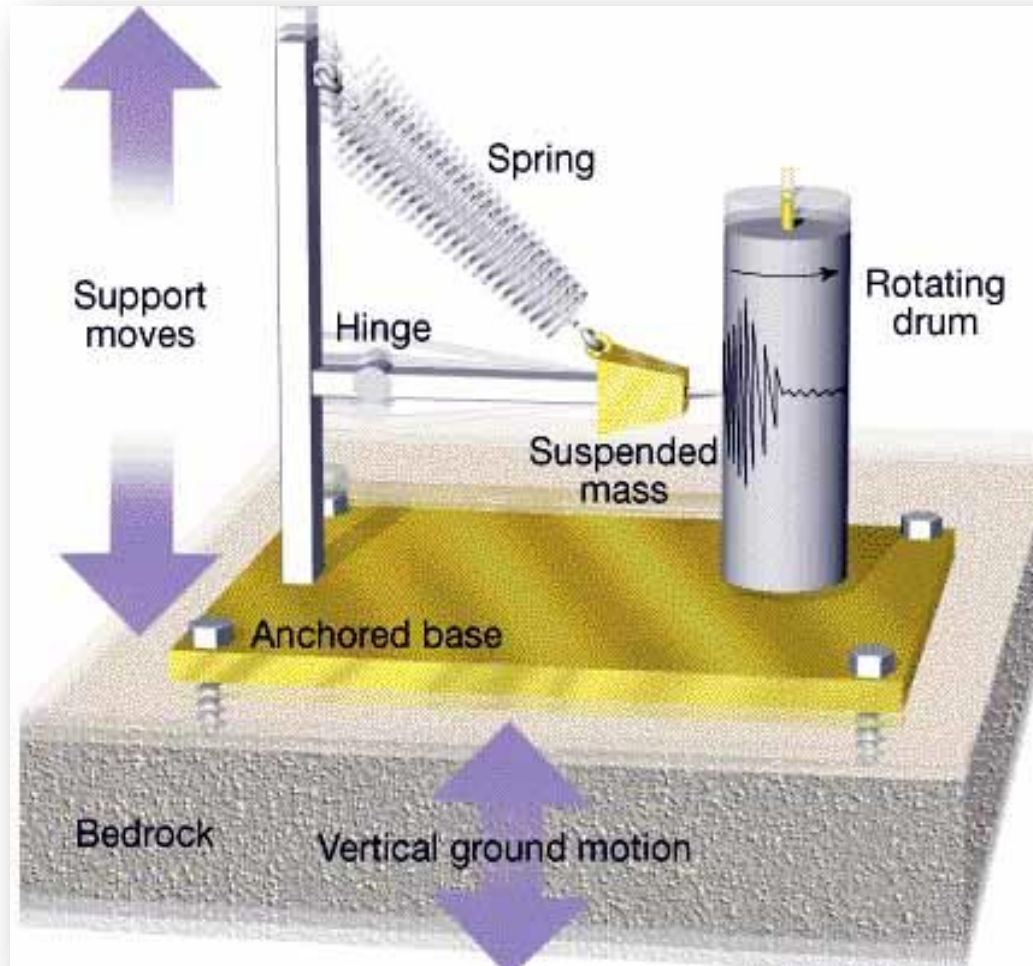


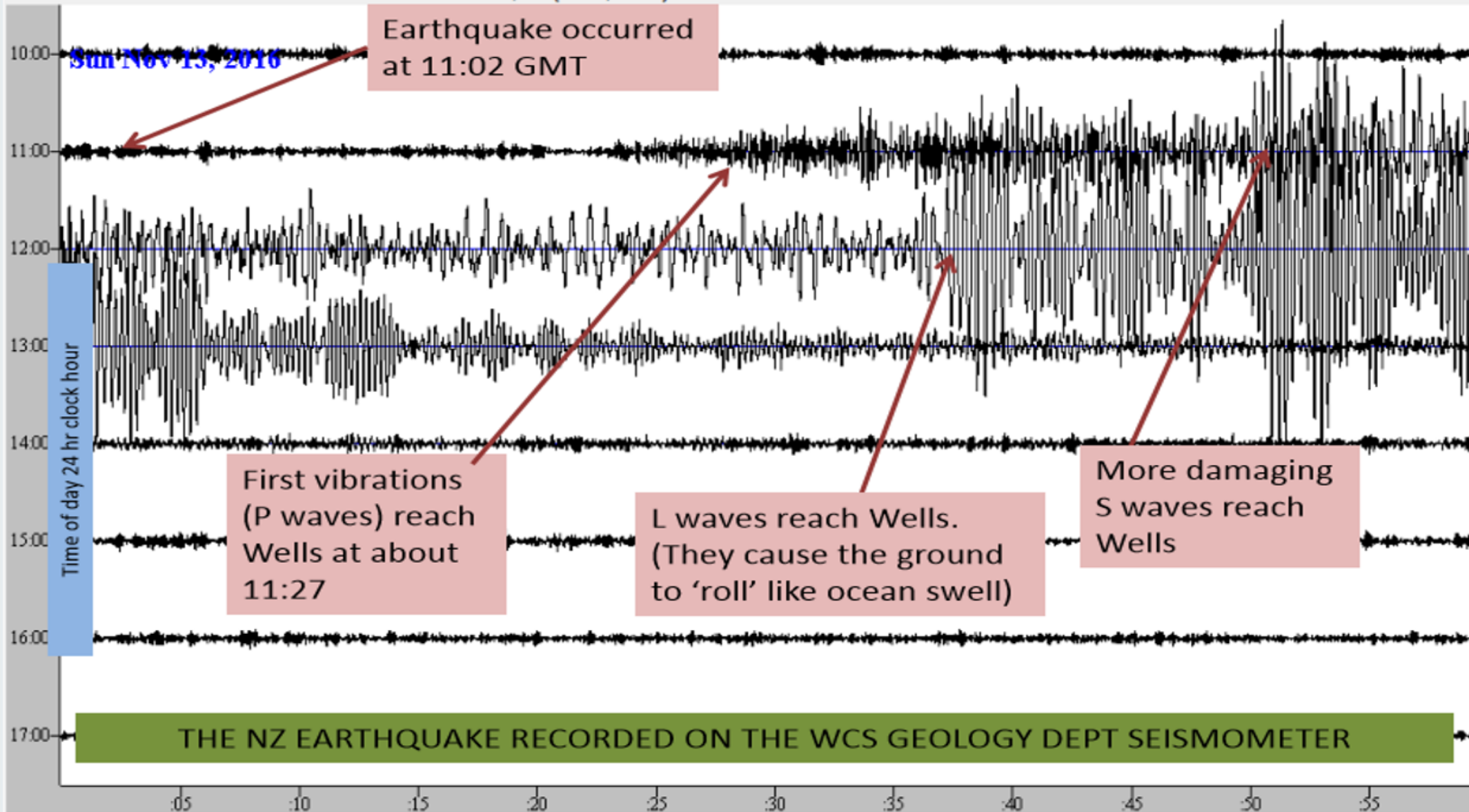
Slickensides are the marks made when faults move, and so are 'earthquake marks'.

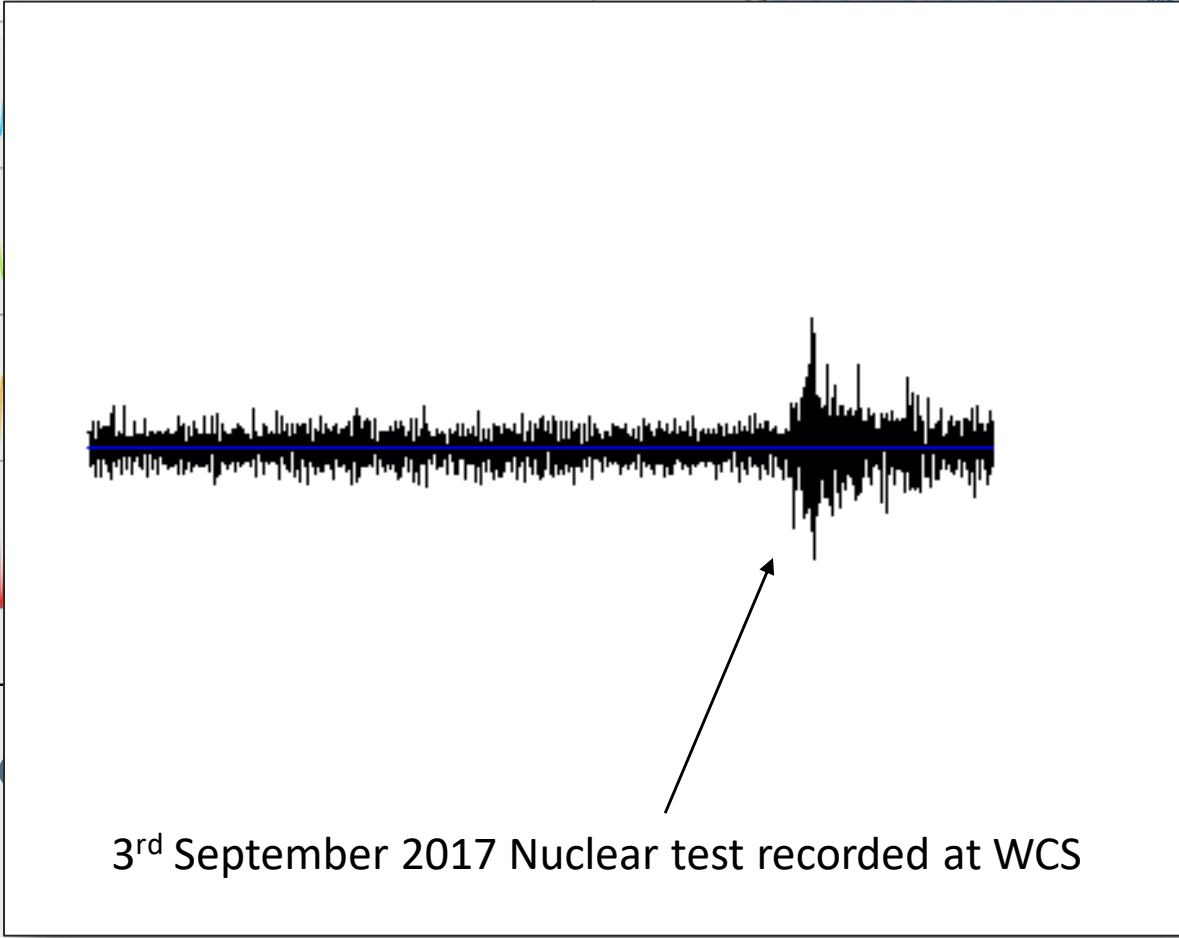
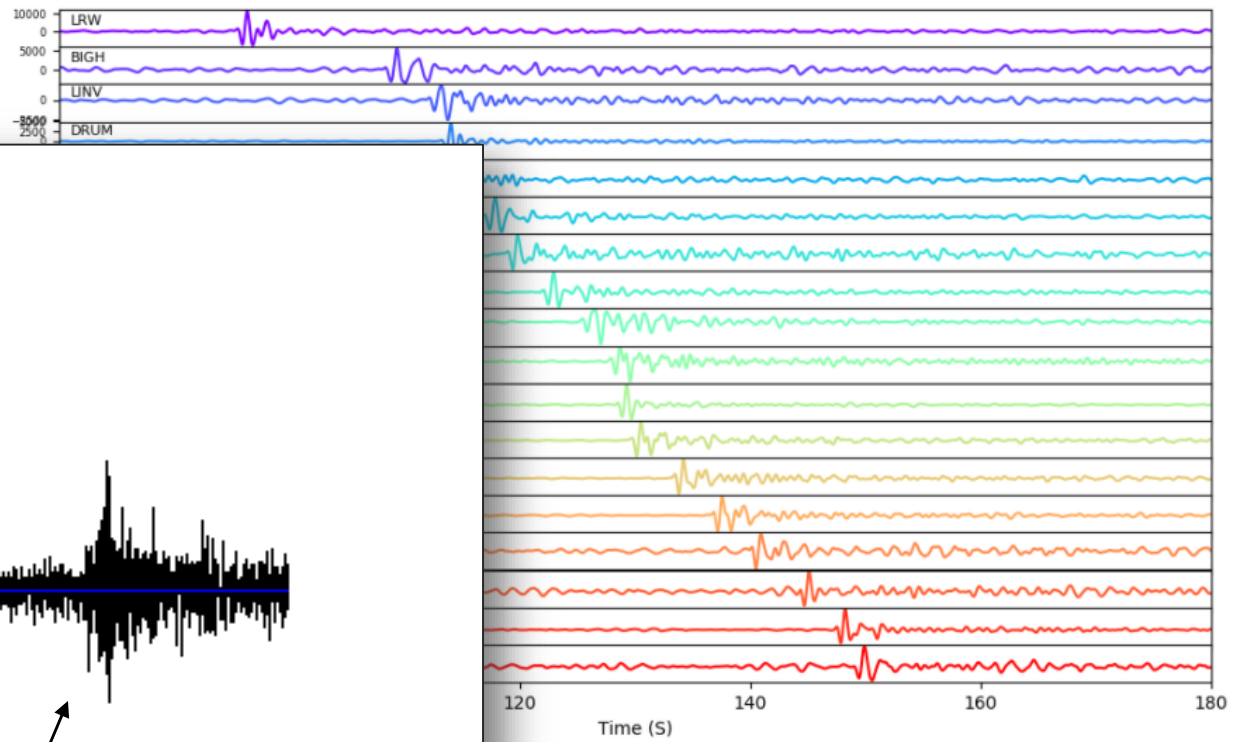
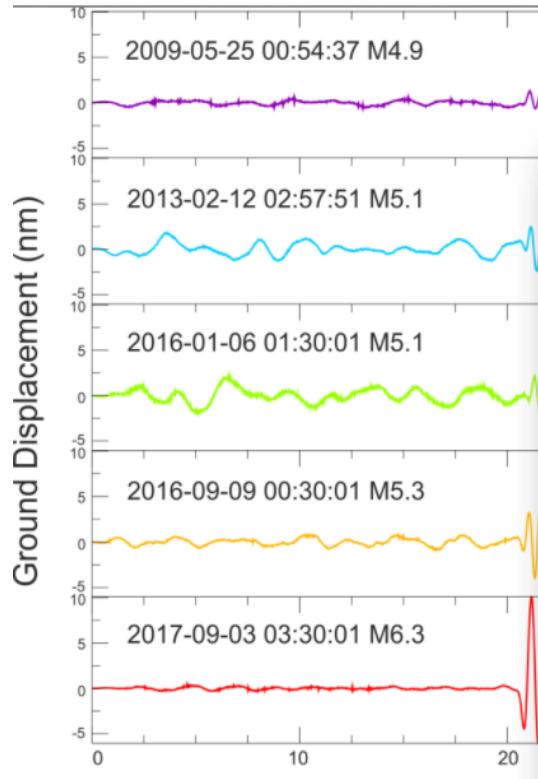


Measuring Earthquakes

Seismometers & Seismograms







... explosion on 3/9/2017 arriving at sites across the UK. The explosion took about 11 minutes to reach the UK, arriving first at the most northerly site and last to reach the most southerly (CCA1).

North Korean Nuclear

Nuclear Tests (3rd Sept 2017)

Mendip Earthquakes.....

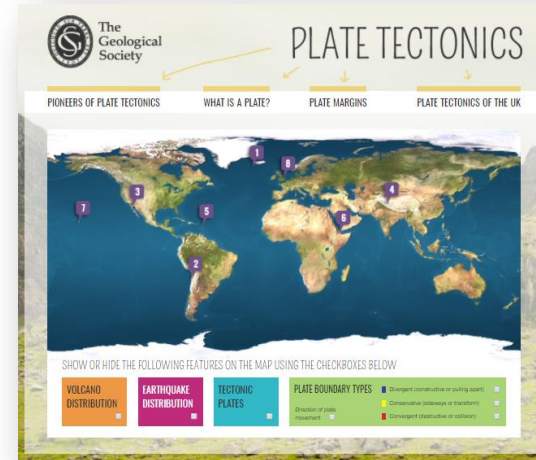
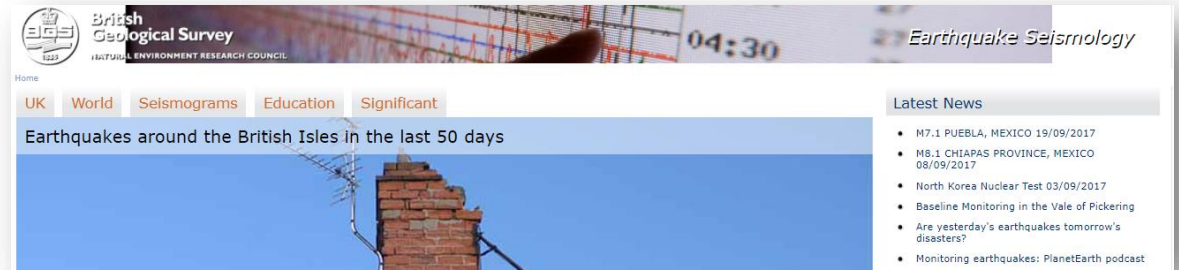
- LARGE EARTHQUAKES OCCURRED IN THE MENDIPS AS CONSEQUENCE OF THE TECTONIC FORCES THAT CREATED THE MENDIPS HUNDREDS OF MILLION YEARS AGO
- SMALL EARTHQUAKES ARE STILL HAPPENING ON THE MENDIPS TODAY, BECAUSE OF THE RELEASE OF STRESS STILL REMAINING IN THE EARTH'S CRUST
- EARTHQUAKES ARE BEING DETECTED IN THE MENDIPS TODAY, FROM THIS COUNTRY AND FROM AROUND THE WORLD

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For more information:

- EARTHQUAKES
 - ✓ British Geological Survey
- PLATE TECTONICS
 - ✓ The Geological Society
- EARTH LEARNING ACTIVITIES
 - ✓ Earth Learning Ideas



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