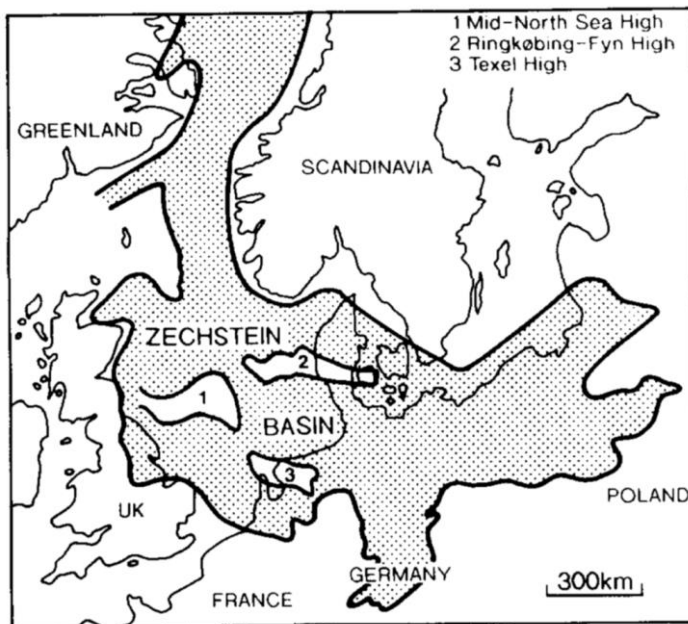
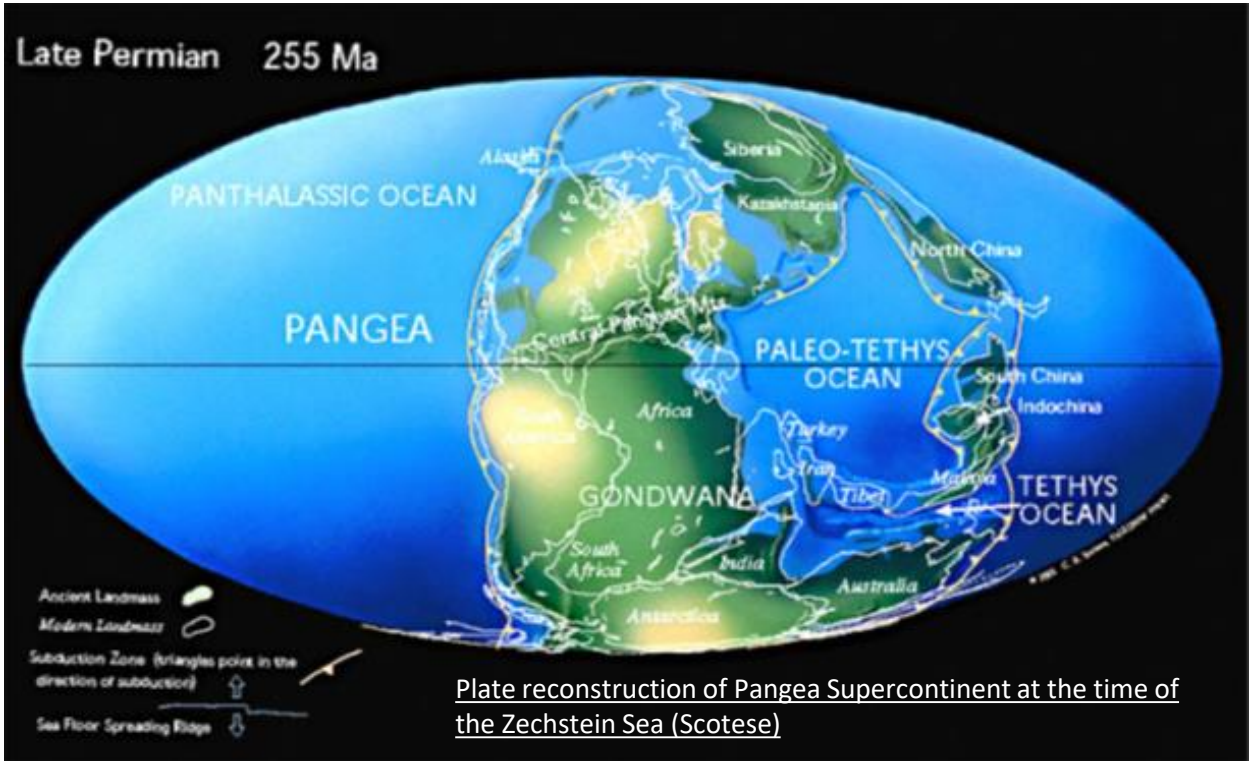


Reading the Rocks: Walk 2 Marsden and The Zechstein Sea

OBJECTIVES

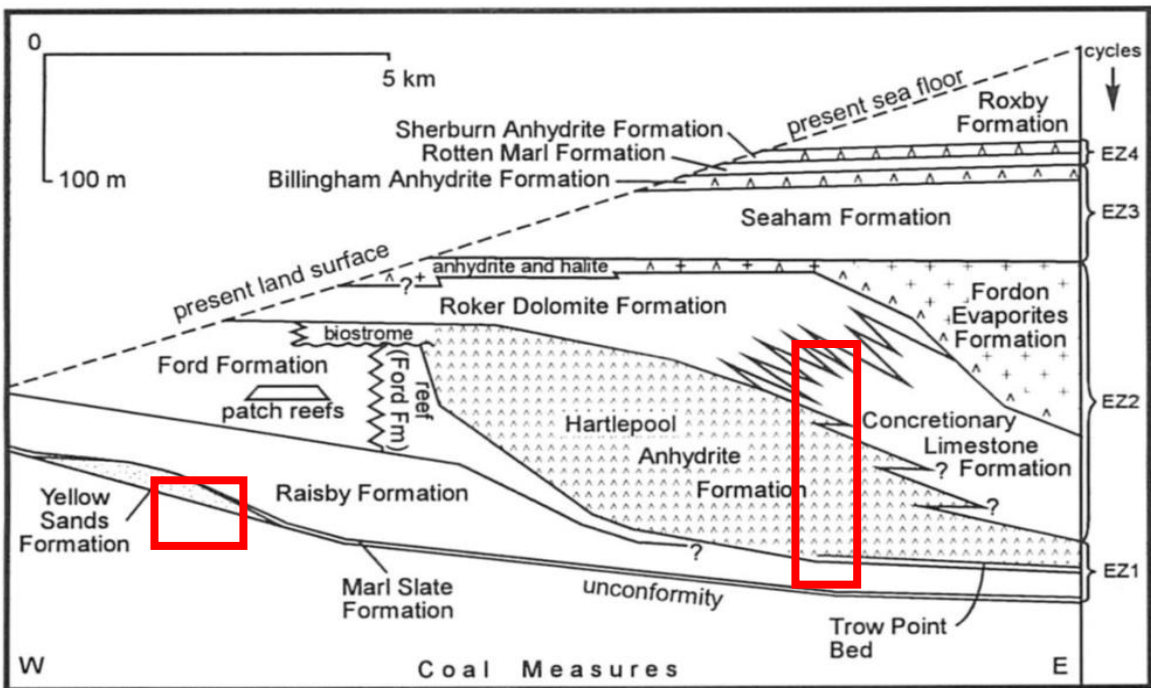
- Provide an overview of Earth's geological history and the events that shaped our Region
- Introduce fundamental geologic (Stratigraphic) principles that will allow you to 'Read the Rocks'
- Use the Marsden coastal section to describe the rocks that formed on the western edge of the Zechstein Sea over 250 million years ago



SUMMARY GEOLOGIC HISTORY

- Caledonian orogeny (~490-390mya)** closure of Iapetus Ocean and formation of Scottish Highlands
- Variscan orogeny (~380-280mya)** closure of Rheic Ocean, last major structures to affect NE England. Whin Sill formed. NE England at equatorial latitudes, coal swamps formed in Carboniferous
- Pangea Supercontinent formed 290mya** NE England covered by desert at beginning of Permian. Yellow Sands formed.
- Zechstein Sea formed & dried up 260mya** after a rapid flood, the sea dries up and floods 6 more times in 6-7 million years
- The Great Dying 250mya** at the end of the Permian 95% of known species died out across the globe
- North Sea Rifts formed and failed** during Jurassic & Cretaceous created conditions for formation of oil and gas
- Ice Sheets advance across Europe 2.6mya** During the Quaternary Period, ice advanced and retreated across NE England

Reading the Rocks: Walk 2 Marsden and The Zechstein Sea



Permian stratigraphy along the NE England Coast formed on the Western Margin of the Zechstein Sea. Marsden sections outlined in Red (after Smith 1994).

FUNDAMENTAL STRATIGRAPHIC PRINCIPLES

- **Law of Superposition** - the oldest rocks will be at the bottom and overlain by younger rocks.
- **Principle of Original Horizontality** - states that layers of sediment are originally deposited horizontally under the action of gravity
- **Principle of Lateral Continuity** -states that, within the limits of a basin, that layers of sediment initially extended laterally in all directions
- **Principle of Cross Cutting Relationships**-states that the geologic feature which cuts another is the younger of the two features
- **Principle of Faunal Succession**-states that rocks contain the fossilised remains of plants & animals that, based on evolutionary principles, succeed each other in a specific and predictable vertical order that allows correlation over large distances and relative dating of rocks
- **Absolute Age Dating of Rocks** - the techniques above help us identify the relative age of rocks/relationship. To determine the absolute age of a rock or fossil we need to take them back to the lab and use **Radiometric Dating Techniques** (like Potassium/Argon or Uranium/Lead). These use the predictable decay of radioactive isotopes over time to determine a date from 10,000 years to billions of years ago.

KEYWORDS

Magnesian Limestone - old terminology to describe the rocks now within the Zechstein Group

Zechstein Group - rocks deposited in NW Europe in the Late Permian Period

Dolomite - a mineral formed of Calcium Magnesium Carbonate commonly found in limestone

Breccia - a type of rock made up of fragments of other rock within a fine grained matrix

Anhydrite - a mineral of Calcium Sulphate formed through evaporation

REFERENCES

http://earthwise.bgs.ac.uk/index.php/Magnesian_Limestone_between_South_Shields_and_Seaham_-_an_excursion;

<http://www.scotese.com> or 'Assembly of Pangea' and "Break Up of Pangea' apps on Apple Store for iPad/iPhone; Tucker, M.E. (1991) Sequence stratigraphy of carbonate-evaporite basins: models and application to the Upper Permian (Zechstein) of northeast England and adjoining North Sea - *Journal of the Geological Society, London*, Vol. 148,1991,pp.1019-1036; BGS British Regional Geology Guide Northern England (Fifth Edition) (2010)