

General Geology 1: the basics. Part 1

12 October 2016

1. Sedimentary rocks

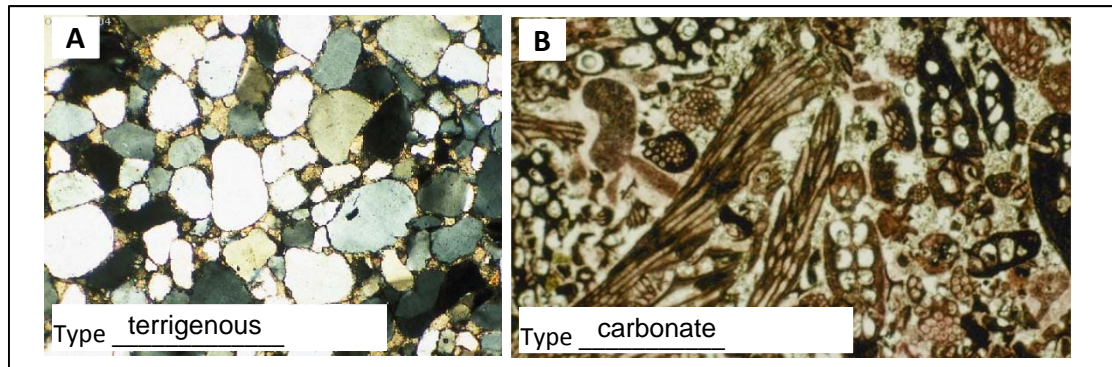
On the basis of their origin we have subdivided sedimentary rocks in two main, fundamentally different groups

1.1 Give a name two the two groups and define how are they formed

Name type 1: terrigenous rock
 Origin: erosion of mountains

Name type 1: carbonates
 Origin: derive from living organisms

1.2 the two pictures show thin sections of two rocks. Assign them to type 1 or to type 2



1.3 Two rock properties are indicated. Choose their appropriate definition

Sorting

maximum grain size

distribution of grain size

sort (type) of grains

Porosity

$\frac{volume_{clasts}}{volume_{pores}}$

$\frac{volume_{rock}}{volume_{matrix}}$

$\frac{volume_{pores}}{volume_{rock}}$

1.4 Which one of the two rocks above has

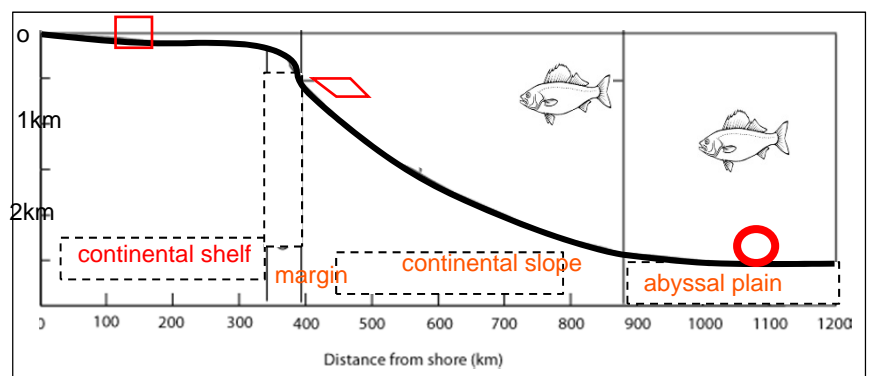
better sorting: left right

higher porosity: left right

2. Deposition environment

Knowledge of the environment in which rocks were deposited is a powerful tool to predict the subsurface of rocks in.

To the side you see a bathymetric profile (water depths) along a **passive continental margin** from the continent to the deep ocean.



2.1 complete the picture indicating the values (and their dimensions) on the vertical axis and putting the names of the various domains in the four empty boxes marked with dashed lines

2.2 Using the symbols shown below, mark in the section the domains where specific sedimentary processes take place

- ★ domain with no sedimentation
- domain interested by tidal activity
- domain where turbidites are expected

2.3 Consider again the rocks shown in the pictures above. Put the letters **A** and **B** in the part of the bathymetric section where they might have been deposited

3. Plate tectonics

The bathymetric profile shown in the figure above applies to *Passive continental margins*.

3.1 What is a passive continental margin?

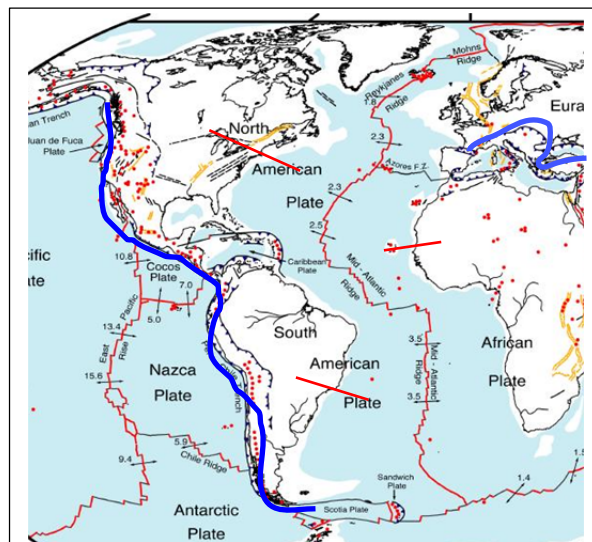
a passive continental margin is the transition between stable continental crust and oceanic crust. In a PCM, the crustal thickness decreases towards the ocean; the continental crust is traversed by normal faults. the lithospheric mantle is continuous

3.2 In the box below draw a section across the **entire crust** of a **passive continental margin** from the continent to the mid-oceanic ridge. Remember to provide indicative values (inclusive of dimensions) for the vertical and horizontal axes. Indicate all major elements

we have made many drawings of this, you can find them in ppt and book

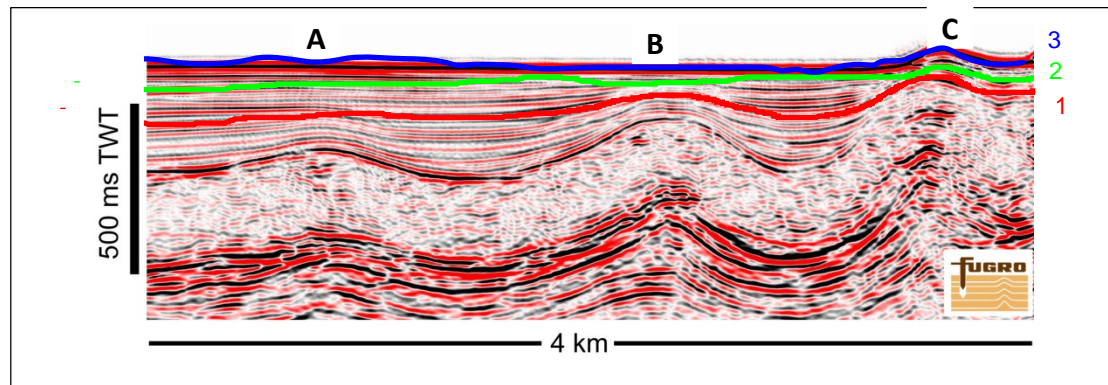
3.3. In the map mark with a colour pencil three transects across three different passive continental margins

3.4 With a colour pencil, indicate on the map the position of an important subduction zone



4. Deformations

The seismic section below shows a series of **folds** in the subsurface.



4.1 What type of folds are these?

buckle (active) ☐ or **fault-bend (passive)** ☐

4.2 what is the **change in length** accommodated by the structure? Use a positive value for **extension** and a negative one for **shortening**

$\Delta L =$ _____

4.3 Draw on the seismic section the horizons marking 1) the end of the development of fold A, 2) the end of fold B, 3) the end of fold C

4.4 which fold ended first? A

5 Climate

5.1 Define climate

you can find the definition everywhere

5.2 Climate has substantially changed in the past. We have seen that climate can change because of a variety of reasons. Mention two processes leading to climate change

1) glaciations

2) human intervention

5.3 The sediments shown in the picture show recurrent patterns, such as regular alternations of dark and light colours. We call this, **cyclicity**. Geologists working in the area have concluded that these alternations are related to changing climatic conditions. Which climate changes processes would you propose?



name _____ student number _____

for instance changes in the proportion of carbonates vs shales

5.4 How could the climate change processes you mentioned above cause modifications in the sediment characteristics? What could be the difference between sediments in the different layers associated with?

changes in temperatures: less organic activity during cold period (and therefore more shales), more activity during warm periods (= more carbonates)
