Competitive Exams: Structural Geology

Introduction

Structural geology is the study of the features formed by geological processes. Features include faults, folds and dipping strata. Geologists can work out the order of events and see which events are related by taking fairly simple measurements and using simple methods.

Measurements and Techniques

The most obvious thing to do when trying to decipher the structural history of a formation is to describe it. One way of doing this is to measure the dip and strike. The dip is the amount a bed of rock is tipped from the horizontal. The strike is the direction which is ninety degrees from the dip, i.e.. . Along the horizontal line on the bed.

The strike can be in two directions, hence the dip could be in one of two directions also. There is a convention for the strike to be the in the direction you are facing if the rocks are dipping to your right. Some geologists prefer to measure the dip direction, rather than strike, as it is slightly simpler. However, all maps use dip and strike, not dip direction.

This is complicated slightly by apparent dip. This is due to the fact that you are not always looking edge on (perpendicular) to the bed you are measuring. If you are looking at a bed at a slight angle, then you see the apparent dip. The true dip will be greater than the apparent dip, as it is the maximum amount of dip, so the apparent dip can appear to be anything from 0° to the maximum (true) dip.

In this diagram, the dip is 30° with a strike north/south (0° /180°) , the dip direction is 270°

On a geological map, symbols are used for the dip and strike. The strike is represented by a bar, and the dip by a mark on the strike bar on the downdip direction with the dip written alongside, as shown on the map below left. A geological cross section can be drawn from the map showing the subsurface structure. Obviously, only features which can be seen on the surface can be represented. The cross-section below right is drawn using the values in the map alongside.

A technique which is used often is to plot values of dip and dip direction on a stereogram. A stereogram (or stereonet or hemispherical projection) is a way of representing 3-dimensional directions on a 2-dimensional surface. The net is a projection from the point onto the equator.

The points are placed all around the sphere representing 3D space. The points are projected down onto the equatorial plane on a line which meets up at the south pole

Folds

Folding of rocks is caused by the compression of rocks. This occurs slowly, over a long period of time. If this happened quickly, the rocks would break, and fault. This is due to the mechanical properties of rocks, namely it's plastic nature. If a rock is stretched slowly, then it will behave in a ductile fashion. If stretched quickly, the rock behaves in a brittle fashion.

Nomenclature Used when Describing Folds

Folds are classified by shape and the chronological order of rocks in them. The shape of a fold is described by the angle between the limbs, which are given the terms: Gentle (120 – 180°) , open (70 – 120°) , close (30 – 70°) , tight (5 – 30°) or isoclinal (0 – 5°) .

- Hinge: Where curvature of the fold is at a maximum
- Crest & Trough: Where fold surface reaches a minimum and maximum respectively
- Limb: Beds between two hinges
- Antiform & Synform: Convex upwards or convex downward folds respectively
- Anticline & Syncline: Older or younger beds at the core respectively. Can be used in conjunction with antiform and synform, i.e.. . An antiformal syncline