

Advanced Structural Geology, Fall 2022

# Orientations of structural features

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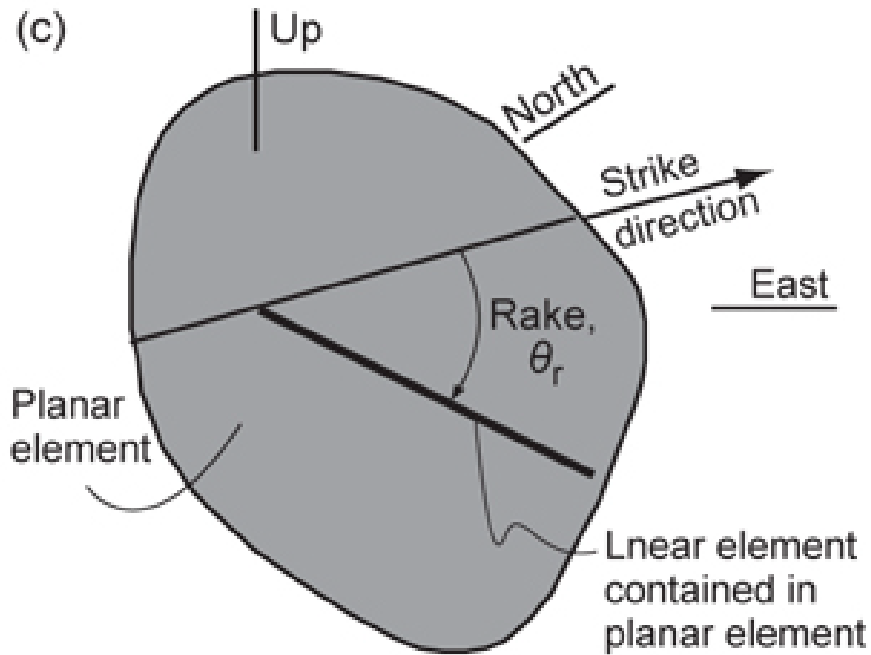
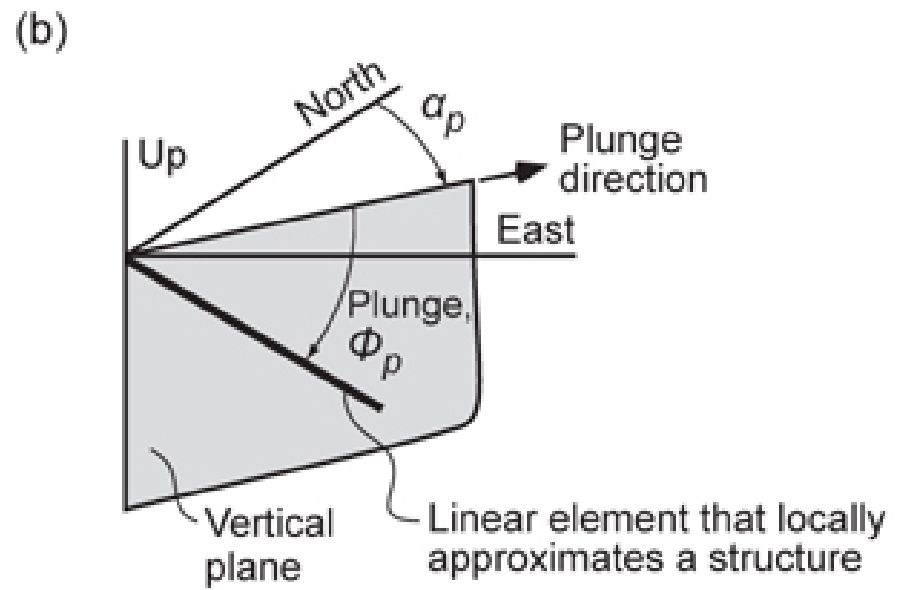
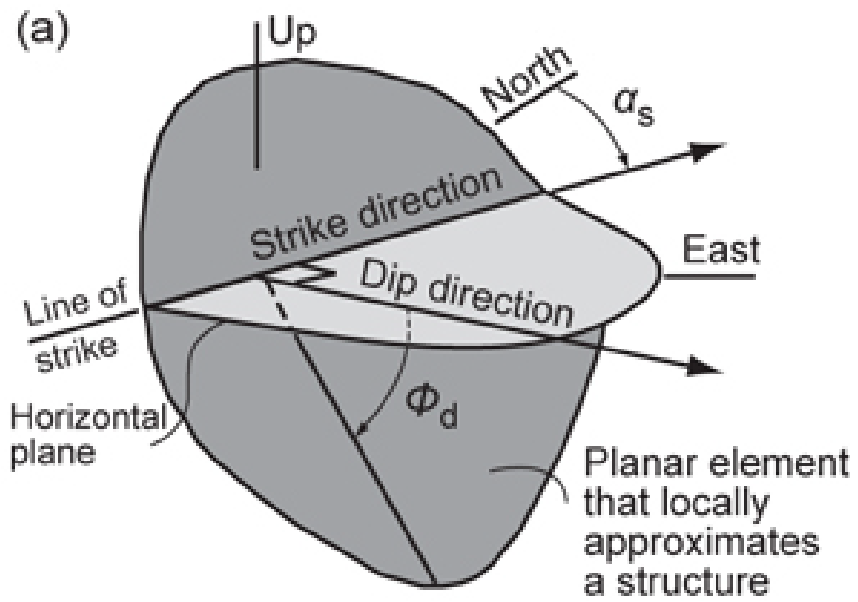
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# Orientations of linear and planar elements



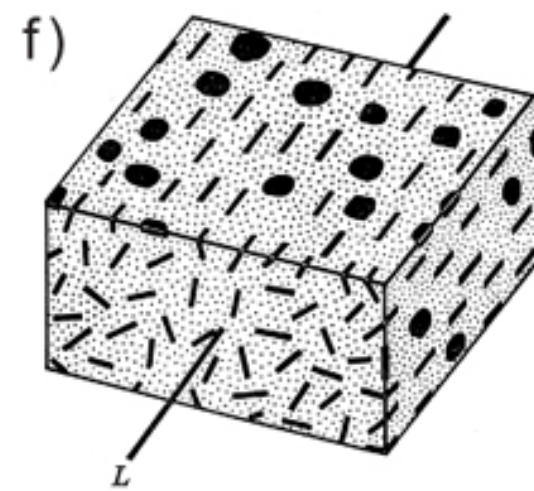
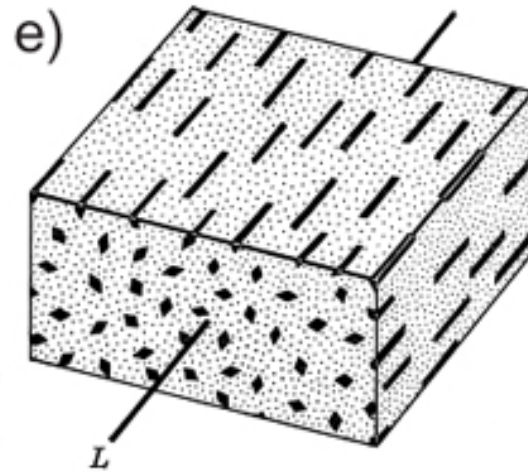
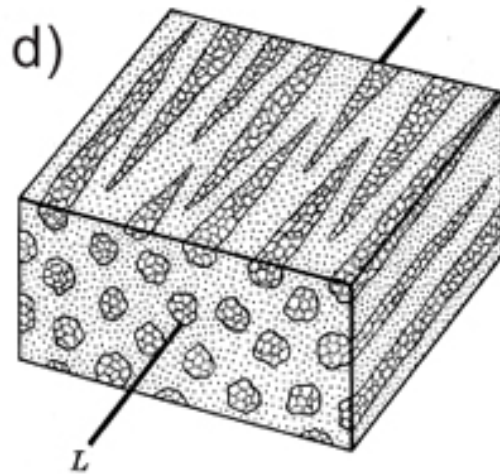
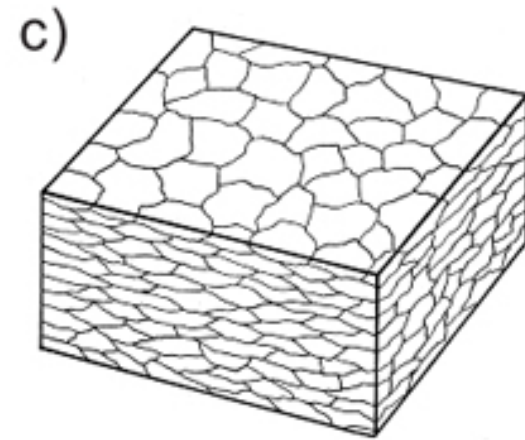
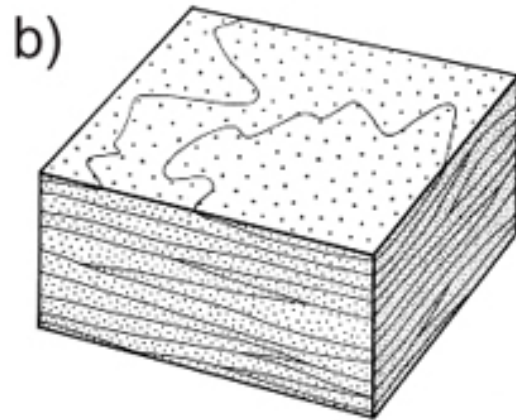
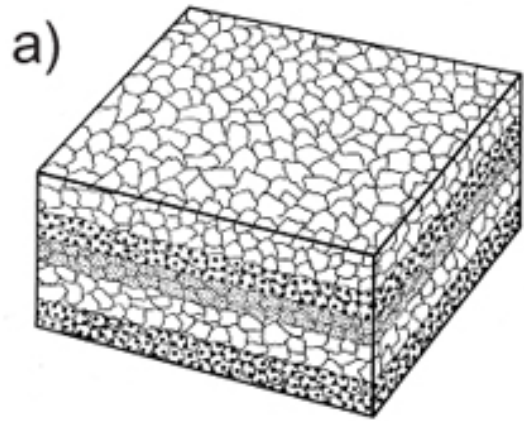
Landers, CA earthquake 1992



Strike, dip  
Trend, plunge  
Rake/pitch



# Orientations of linear and planar elements



# Definitions

Note that there may be different notation for the angles, etc.

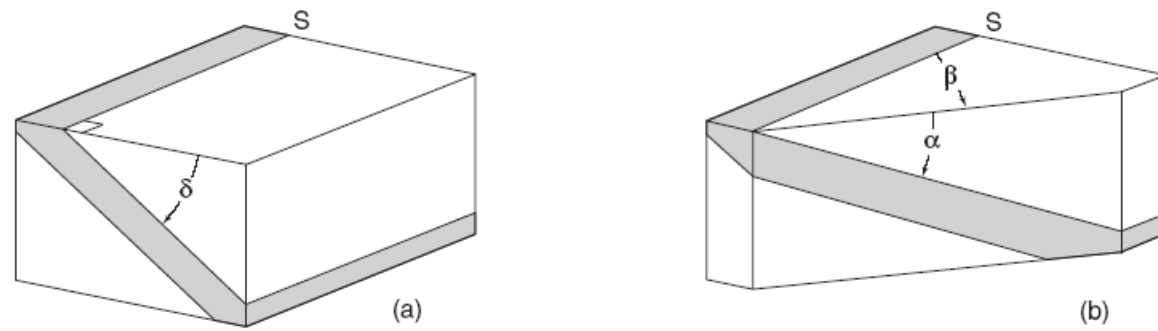


Figure 1.1: Strike  $S$ , true dip  $\delta$  (delta), apparent dip  $\alpha$  (alpha) and structural bearing  $\beta$  (beta).

**Plane:** a flat surface; it has the property that a line joining any two points lies wholly on its surface. Two intersecting lines define a plane.

**Attitude:** the general term for the orientation of a plane or line in space, usually related to geographic coordinates and the horizontal (see Fig. 1.1). Both trend and inclination are components of attitude.

**Trend:** the direction of a horizontal line specified by its bearing or azimuth.

**Bearing:** the horizontal angle measured east or west from true north or south.

**Azimuth:** the horizontal angle measured clockwise from true north.

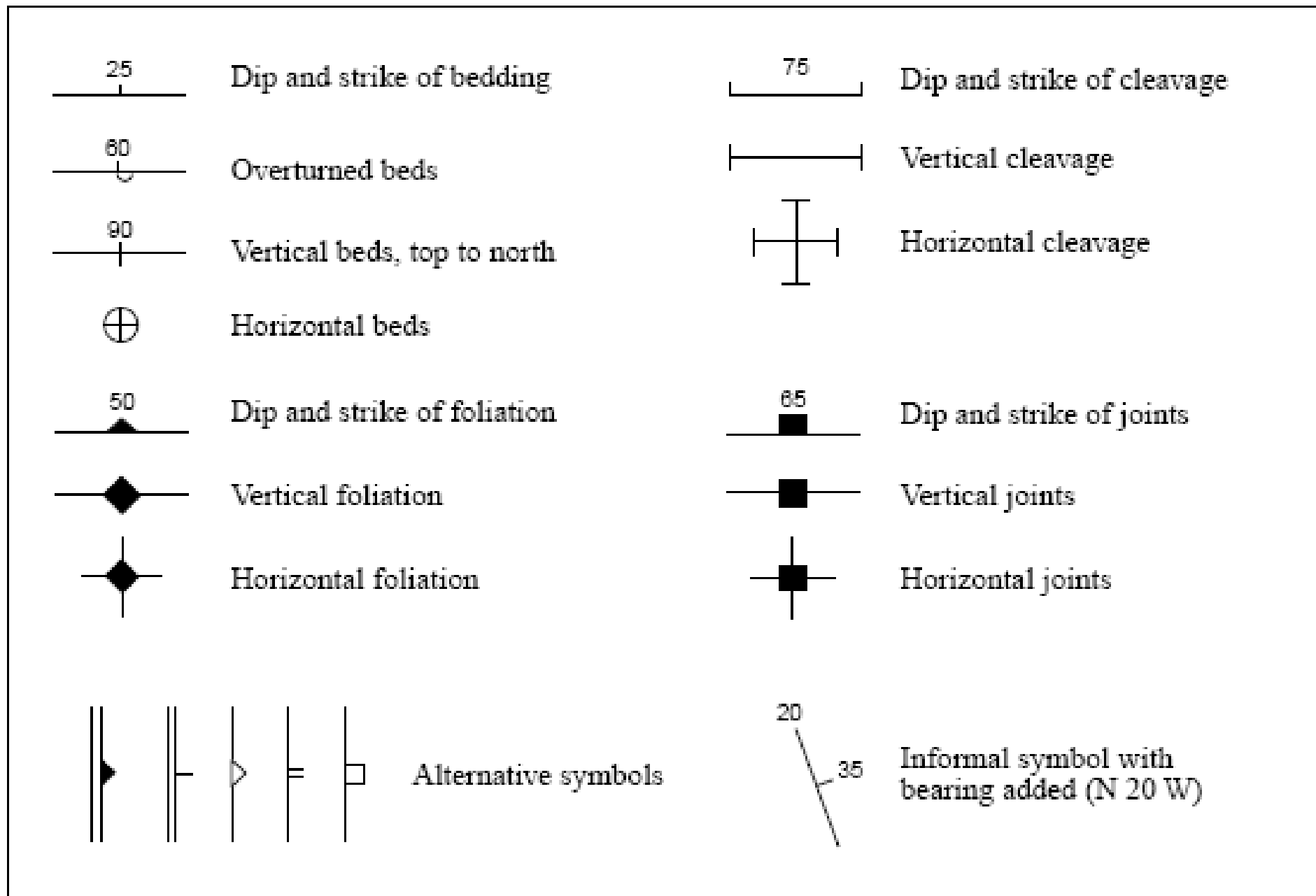
**Strike:** the trend of a horizontal line on an inclined plane. It is marked by the line of intersection with a horizontal plane.

**Structural bearing:** the horizontal angle measured from the strike direction to the line of interest.

**Inclination:** the vertical angle, usually measured downward, from the horizontal to a sloping plane or line.

**True dip:** the inclination of the steepest line on a plane; it is measured perpendicular to the strike direction.

**Apparent dip:** the inclination of an oblique line on a plane; it is always less than true dip.



-Ragan, Chapter 1

Figure 1.2: Map symbols for structural planes.

## 1. Strike notation

- (a) N 65 W, 25 S: the bearing of the strike direction is  $65^\circ$  west of north and the dip is  $25^\circ$  in a southerly direction. For a given strike, there are only two possible dip directions, one on each side of the strike line hence it is necessary only to identify which side by one or two letters. If the strike direction is nearly N-S or E-W then a single letter is appropriate; if the strike direction is close to the  $45^\circ$  directions (NE or NW) then two letters are preferred (see Fig. 1.3 for examples).
- (b) 295, 25 S: the azimuth of the strike direction is  $295^\circ$  measured clockwise from north and the dip is  $25^\circ$  in a southerly direction. Usually the trend of the northernmost end of the strike line is given, but the azimuth of the opposite end of the line may also be used, as in 115, 25 S.

## 2. Dip notation

- (a) 25, S 25 W: the dip is  $25^\circ$  and the trend of the dip direction has a bearing of  $25^\circ$  west of south.
- (b) 25/205: the dip is  $25^\circ$  and the trend of the dip direction has an azimuth of  $205^\circ$  measured clockwise from north. The order of the two angles is sometimes reversed, as in 205/25. To avoid confusion, dip angles should always be given with two digits and the trend with three, even if this requires leading zeros.

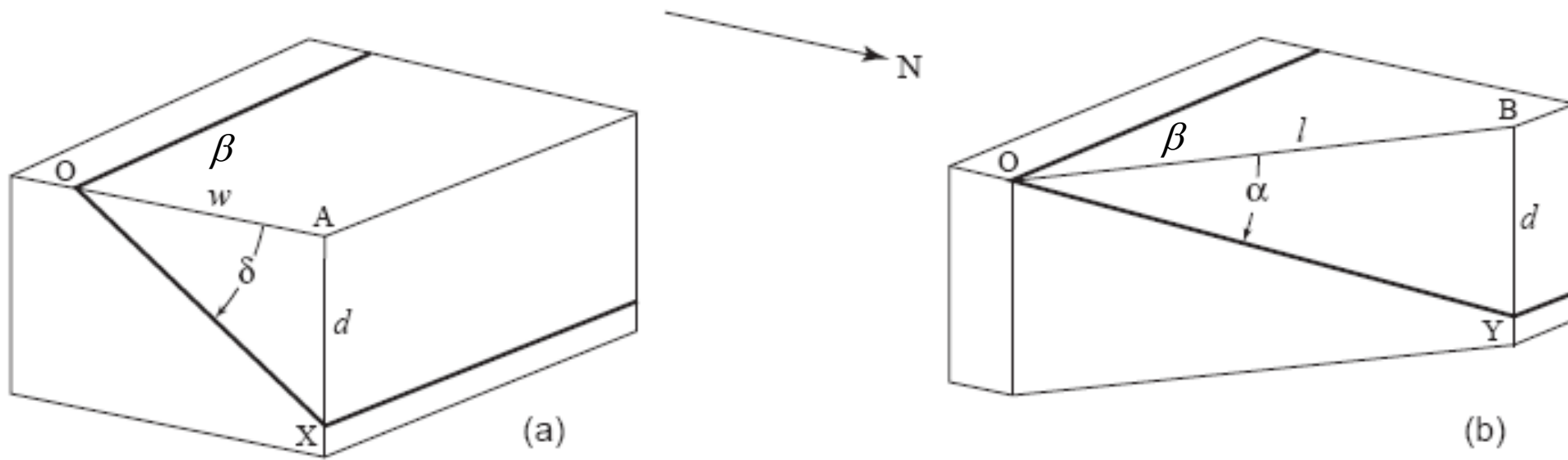


Figure 1.8: Block diagrams: (a) true dip  $\delta$ ; (b) apparent dip  $\alpha$ .

$$\tan \alpha = \tan \delta \sin \beta$$



