

Strike and dip
EPSC 240, Geology in the Field
Sept 10, 2018

Key concepts for Week 2:

Approximating geological features as lines and planes: As you saw last week, sedimentary bedding is kind of planar but not perfectly. Even the sharp contacts of the dykes cutting the sediments were locally planar (over 10-20 cm maybe) but changed orientation over the space of >50 cm. Geologists have developed the practice of approximating geological features as lines and planes. This approximation is very useful, as long as the spatial extent to which the approximation works is also recorded.

Reference frame: We need a reference frame for recording orientations, one that we can locate anywhere in the world, even underwater. Luckily, the earth itself provides two points of reference: since gravity pulls in the direction to the centre of the earth, we can always find the direction 'down'. Bubble levels are very good for this. Second, the earth's magnetic field pulls toward one point on the earth's surface, the north magnetic pole, so we can always find the direction to this magnetic pole using a compass with a free-floating magnetic needle. The earth's centre of mass doesn't move; 'down' is always down. But the magnetic pole does move, and the field lines of the magnetic field move, so we correct our compass measurements to true north (the earth's pole of rotation, which doesn't move on human timescales). To find out the correction for your field location, visit www.magnetic-declination.com. Your Brunton compass will adjust for this, so once you set the compass, you can directly record your compass readings without any further corrections.

Strike and Dip: Using our two reference orientations (down and north) we can uniquely describe the orientation of any plane in space.

- *Strike:* the compass bearing of the horizontal line in the plane.
- *Dip:* the angle between a horizontal line perpendicular to strike, and the steepest line in the plane.

Strike (horizontal) can be defined with the bullseye level and the compass needle. Strike is measured in degrees clockwise of north (000°), so east = 090°, south = 180°, and west = 270°. Dip is determined by measuring the angle from horizontal with the bar level, so it ranges from 0-90°, and it is important to specify the direction of dip.

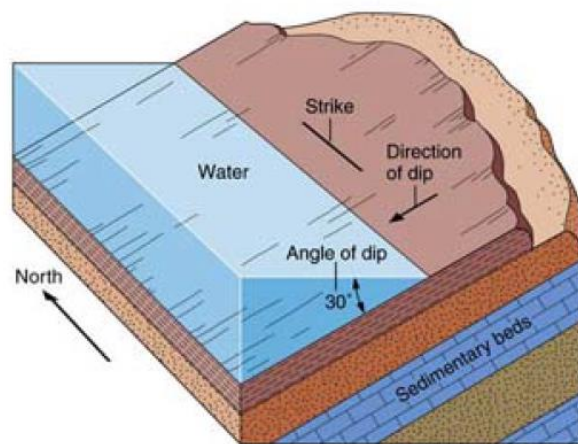


Figure 1: Strike and dip cartoon from Plummer and Carlson (2008), *Physical Geology 12th ed.*, McGraw-Hill.

In this cartoon (Figure 1), the waterline is confirming the horizontal line in the plane. You can pour water down the plane to establish the dip direction (it's the steepest line in the plane, so water will run down it).

Conventions: There are lots of different conventions for reporting these orientation measurements. In this class we will use 3 digits for the strike, since it is measured out of 360°, and two digits for the dip, since it is $\leq 90^\circ$, followed by a letter indicating the cardinal direction of the dip angle.

Example: 085/74N describes a plane striking roughly east-west, dipping steeply toward the north.