Lab 9 alternative: Introduction to stereonets
EPSC 240, Geology in the Field
Oct 31, 2018

Due date: Monday Nov 5

Meet: 1:35 pm in FDA 348

Bring: Stereonets, thumbtack from last class. Tracing paper will be provided.

Introduction: The aim of this lab is to introduce stereographic projection techniques. The various tasks involve plotting the orientation of planes and lines, and they also provide examples of how stereographic techniques are used to analyze and interpret geological structures.

Problems

1. Plot the orientation of the following bedding surfaces (planes) as great circles:

   042/55 NW 023/09 W 160/32 NE 123/80 SW 080/62 S

2. Plot the orientation of the following mineral lineations (lines) as points:

   54➔090 54➔114 13➔032 71➔322 39➔225

3. On successive limbs of the fold sequence shown in Fig. 1, the following strikes and dips were recorded:

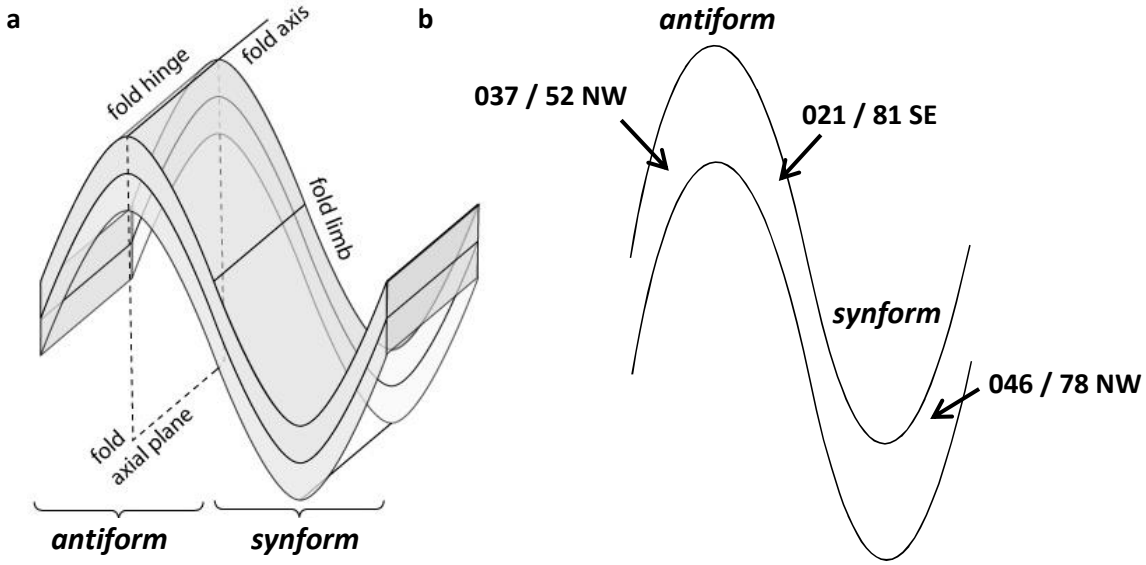

Figure 1. (a) *Schematic illustration of the limbs, fold hinge (fold axis) and axial plane of antiformal and synformal folds. Image source: showcase.uhi.ac.uk/resources/GSP_T14_structures5/.* ***(b)*** *Schematic showing the strike and dip measurements for the limbs of an antiform-synform sequence.*

Plot the limbs as **planes**. Using the intersection points between the planes, establish the orientations of the *antiformal* and *synformal* **hinge lines**. Are the **hinge lines** parallel?

4. In a region of poorly exposed, folded limestones and shales, the following readings of bedding and cleavage were taken with a compass-clinometer at one locality:

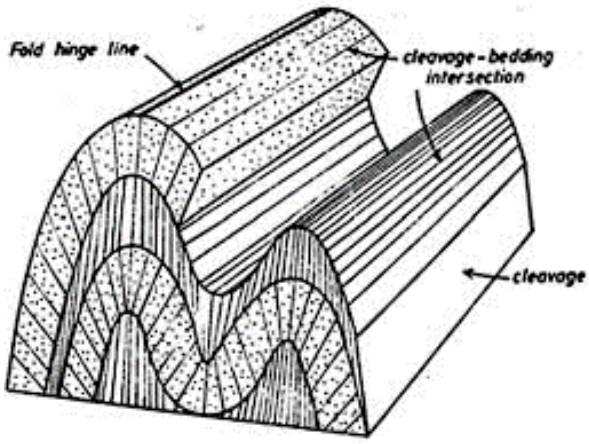

Figure 2. *Example of a fold sequence showing bedding planes, cleavages, and a bedding-cleavage intersection. From Park (1997), Foundations of Structural Geology.*

Bedding 024/72 NW Cleavage 237/38 SE

What is the orientation of the **regional fold axis** indicated by the **bedding-cleavage intersection lineation** (see example in Fig. 2)?

At a nearby locality, the orientation of a **hinge line** was recorded as 28➔202. Plot the orientation of the hinge line.

Is this small-scale fold related to the large-scale fold?

5. In a vertical borehole, a *mineralized dyke* of economic grade has been located beneath an *unconformity* surface, as shown in Fig. 3. The unconformity dips at 38 N with a strike of 244. The orientation of the dyke is 353/56 E.

   What is the **plunge** and **plunge direction** of the intersection of the dyke with the unconformity?

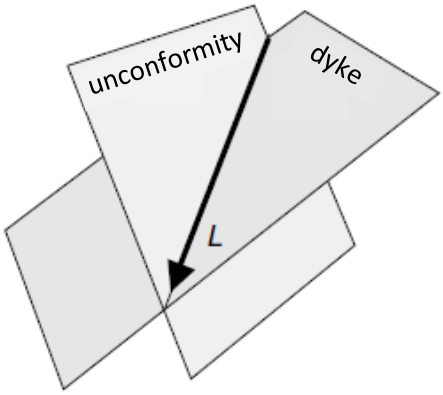

Figure 3. *Schematic of the intersection lineation (L) between a planar unconformity and a planar dyke. Orientations of the planes are not specific to this problem. After Lisle and Leyshon, 2004.*

6. In a series of folded limestones, the following bedding readings were taken: 031/22 SE & 109/59 NE. The fold limbs have an interlimb angle of <90°.

   Find the **interlimb angle** of the fold, which is measured along a plane perpendicular to the two fold limbs (Fig. 4). Determine the orientation of the **fold axis** and **profile plane**.

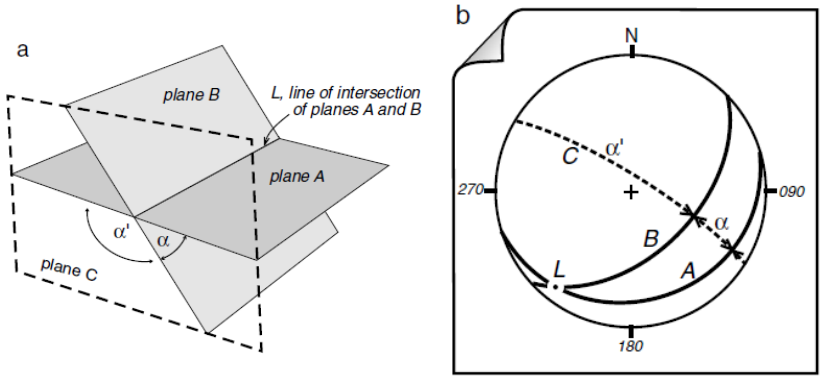

Figure 4. *a) Interlimb angles can be measured along the plane normal to the line of intersection between fold limbs (planes A and B). b) Interlimb angles may be acute (α, 90°) or obtuse (α', >90°). From Lisle and Leyshon, 2004.*