

Geology: Project Assignment

1. Write a Matlab function that computes the strike and dip of a plane from three points on the plane with coordinates **ENU** (East-North-Up). The function should do something like this:

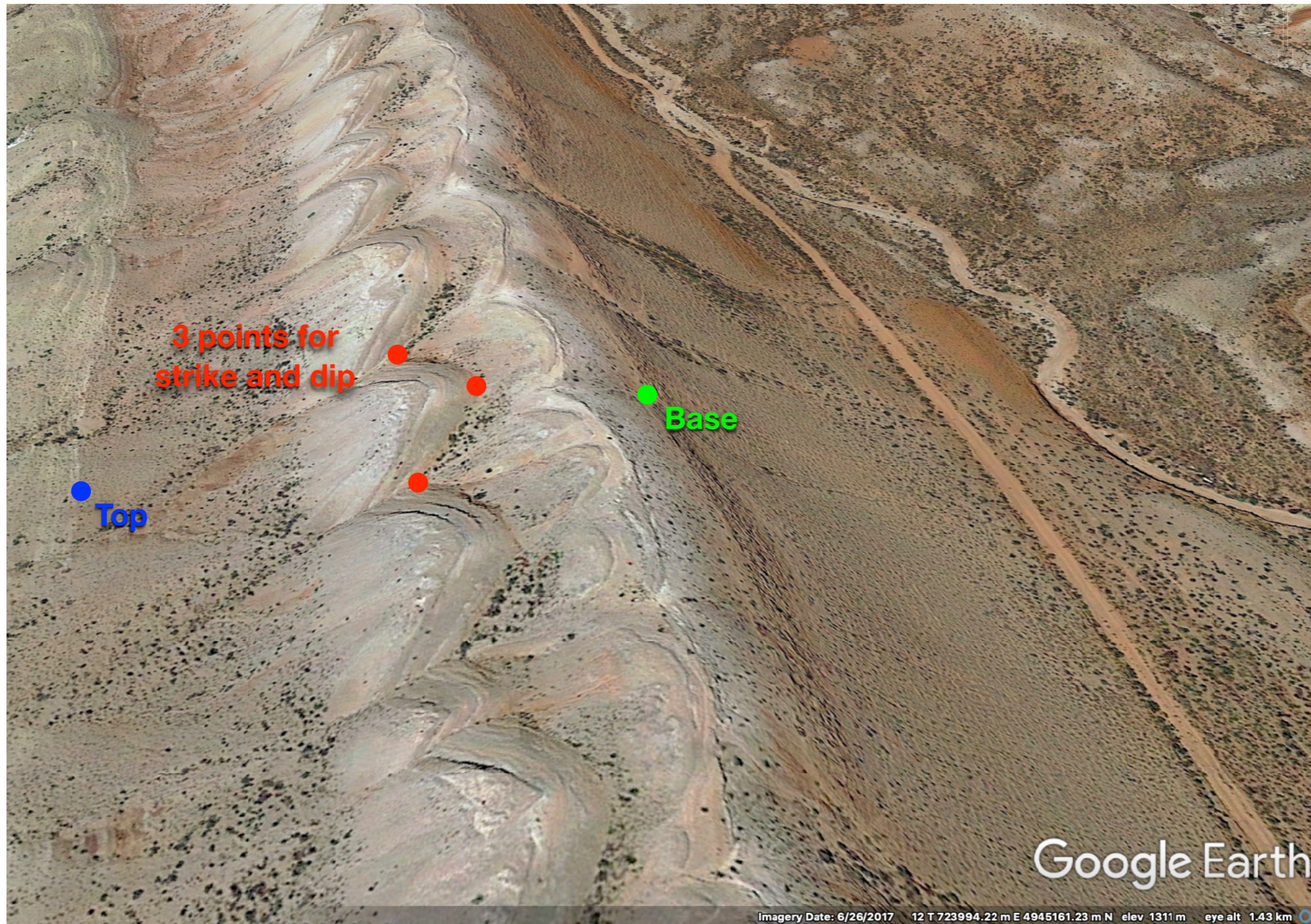
$$[\text{str}, \text{dip}] = \text{ThreePoint}(p1, p2, p3)$$

2. Write a Matlab function that computes the thickness of a sedimentary unit given the strike and dip of the unit and two points with coordinates **ENU**, one at the top and another at the base of the unit. The function should do something like this:

$$t = \text{TrueThickness}(\text{str}, \text{dip}, p\text{Top}, p\text{Base})$$

3. Type the following coordinates in Google Earth: 44°37'N, 108° 09'W. You will fly to a beautiful anticline, the Sheep Mountain anticline, in Wyoming. For unit Js in the geologic map overlay (Big Horn Map.kmz in Files -> Del 2-Geology in Canvas), calculate the strike and dip, and thickness **at least at 100 localities** along the anticline (see the next page for instructions). Also contact the instructor to agree on the extent of these measurements.
4. In Matlab, make a plot of (i) calculated dip and (ii) measured dip in the field (from the geologic map overlay) versus northings. Use different colour points for calculated and measured dips. How accurate are the calculated dips in unit Js?
5. In Matlab, make a plot of calculated thickness versus northings, and another plot of calculated thickness versus calculated dip. Does the unit Js vary in thickness along the structure? Is there a correlation between the unit thickness and dip?
6. Folds that do not change in units' thickness are known as "parallel" folds. With respect to unit Js, is the Sheep Mountain anticline a parallel fold?

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In Google Earth Preferences, set the Show Lat/Long to Universal Transverse Mercator to display eastings and northings. At each locality: **1.** Use flatirons and a single bed to pick the three points for strike and dip. **2.** Use the geologic map as a guide for picking the base and top of the unit. Make a file for each unit including the localities (each locality contains the **ENU** coordinates of the 5 points). Load these data in Matlab. Use functions `ThreePoint` and `TrueThickness` to estimate the strike and dip, and thickness of the units at the localities.