Homework Set 6: Normal Faults

1. Consider the attached figure from the Utah Geological Survey showing the locations of earthquakes along the Wasatch fault over the past 6000 years (Figure 1).

   (a) What type of fault is the Wasatch fault and in what type of tectonic setting does it occur? (2)

   (b) Why is the Wasatch fault not a continuous, unbroken line on the map, and why is it so irregular (i.e., not linear)? (provide a detailed discussion about fault geometries) (2)

   (c) Why is it that earthquakes occur at different times on different segments rather than the entire Wasatch fault all rupturing at once? (2)

   (d) Where would you expect recurrence intervals along the segments to be the lowest, and why? (2)

   (e) How is it possible that we know when earthquakes occurred along this fault over the past 6000 years when historic records in the region only go back 150-200 years? (2)

   (f) Use the time scale at the top of the chart to estimate the exact number of years before the present when each earthquake occurred and write this number of years next to each earthquake star. (6)

   (g) Now calculate the recurrence intervals for each fault segment. You should estimate the recurrence intervals in the form of a range of potential values (i.e., by looking at the changing recurrence interval between consecutive events on each segment) as well as providing an average value for each segment. (18)

   (h) Based on your results in (f), which segments rupture with a fairly regular recurrence interval? (2)

   (i) How do the recurrence intervals for each fault segment differ, and what are possible reasons for these differences? (4)

   (j) Based on your calculated recurrence intervals and the earthquake history shown in Figure 1, suggest a future earthquake likelihood for the fault system, indicating the order in which segments are likely to rupture and how many years from the present this could happen. Project at least 8 earthquake events into the future. (10)
Figure 1.