GLY433/533 Welded Tuff Laboratory M.F. Sheridan

Part I Density Profiles

You are given two sets of data representing density profiles measured from the base to the top of the Bishop Tuff in Owens Gorge, California (section 17 and section 25).

- plot the data as a density profile. Indicate the zones of non-welding, partial-welding, and dense welding on the profiles.
- Give a short description of the welding history for each section. Are the histories similar or different for the two sections? They are separated by about 6 km. Explain your answer.
- Estimate the depth of erosion for each section. Note, the Bishop Tuff is about 0.74 my old. Does your calculated erosional depth seem reasonable?
- What was the emplacement thickness of each cooling unit before welding?
- What is the dense-rock equivalent thickness for each cooling unit?

Bishop Tuff, section 25

Elevation, meters	Sp. G.
0.0	1.00
24.0	1.63
30.1	1.79
37.7	2.01
39.5	2.07
47.4	2.20
56.0	2.32
64.2	2.33
122.4	2.03
130.3	1.92
135.7	1.75

Bishop Tuff section 17

elevation, meters	Sp.G.
0.0	1.00
90.2	2.28
97.2	2.28
103.3	2.08
104.8	1.85
110.6	1.49
146.6	1.64
153.9	1.81
157.9	1.96
166.1	2.20
172.5	2.31
177.4	2.04
184.1	1.81
190.2	1.85
193.2	1.72
198.7	1.44

Part II Welding compaction

- You have three blocks cut from tuff labeled HF-3, HF-4, and HF-10. Determine the density (and hence compaction) for each block. An easy method is to measure the dimensions of the blocks and determine their mass using a balance.
- Measure the minimum and maximum pumice dimension on faces cut perpendicular to the rock foliation to determine the flattening ratio (R_f).
- How does the flattening ratio of the pumice compare with the bulk strain (R_s) determined by the density? Explain any differences.
- Examine the samples and thin sections of Bishop tuff provided (BT-1 thorough BT-6). These were collected in sequence with 1

being from the top of Owens Gorge and 6 being from the base of the gorge. Measure the flattening ratios of bubbles and pumice in these samples and thin sections. How do the shape ratios of these features compare? Was it difficult to make the measurements in some sections? Why?

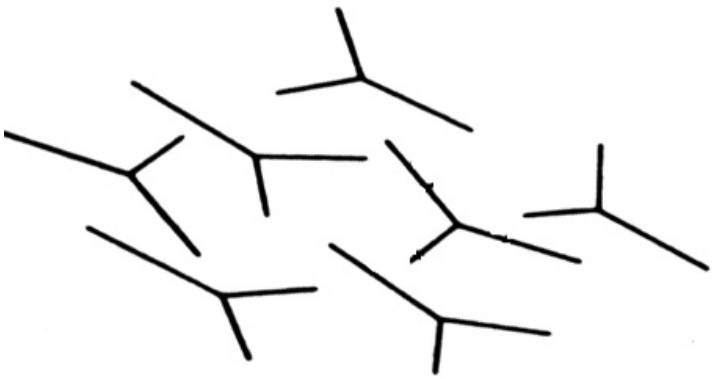
- Plot the probable location of these five samples in the measured section 25.

Part III Secondary crystallization

- Determine the type of secondary crystallization (vitric, vapor-phase, devitrification) in the 6 samples of Bishop Tuff. Describe the features that helped you arrive at your conclusions.
- Using the above answer, sketch the zone of secondary crystallization in your plotted density profile of section 25.

Part IV Three-pronged shards

- Use the Mohr circle method of Ragan (1984) to determine the strain in the image of shards given below. Be sure to record both the orientation and axial ratio for your determinations.



Below is a brief explanation of the Mohr circle solution for deformation of 3-pronged shards.

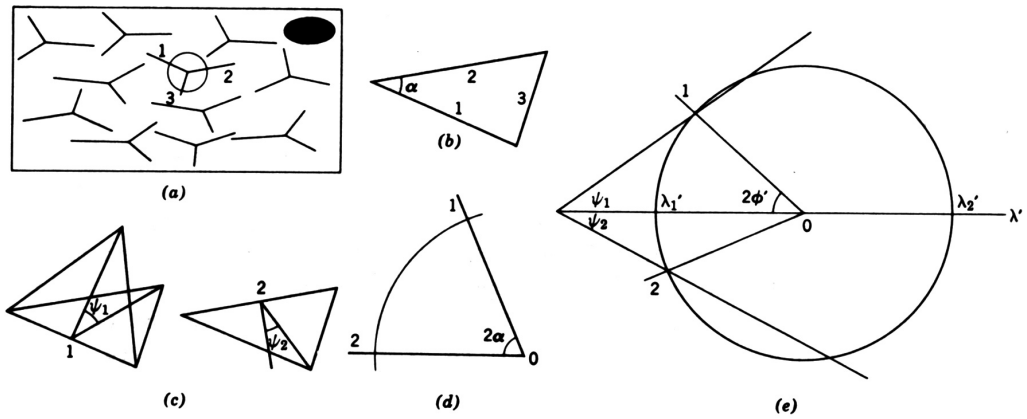


FIGURE 10.15 Strain from deformed glass shards in welded tuff: (a) simulated shards (after Ragan and Sheridan, 1972); (b) equivalent scalene triangle; (c) constructed angles of shear; (d) relative orientation of shard limbs using angle α'; (e) Mohr circle.