

HISTORICAL GEOLOGY – fall 2016

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FIELD TRIP REPORT: **Friday, October 21, 2016: Coso Red Hill & Playa, Coso Junction CA**

YOUR NAME _____

part 1: COSO RED HILL (you can sample at this location)

Looking north, you are at the eastern foot of a conical mountain (3940 ft, or 1201 m) named Red Hill. You look around and see why this feature is so aptly named. Red Hill stands up from a relatively flat terrain whose elevation is around 3360 ft, or 1024 m), originating a relief of 580 ft, or 177 m.

West of Red Hill is the eastern margin of the Sierra Nevada, east of Red Hill is a small playa basin (Coso Playa) surrounded by a variegated landscape and, in the distance, more mountains. A dark lava flow is visible on these mountains to the east. More lava flows are present south of the area, where they create beautiful columnar basalts (visible from US 395 as we approached Red Hill from the south) and that show spectacular erosion forms in the nearby Fossil Falls.

Stop 1: at the base of Red Hill

1a. What kind of geomorphologic feature is Red Hill? Be specific.

A cinder cone

1b. Describe the red/brown and gray sediment scattered at the foot of Red Hill, in terms of size and maturity (list type of sediment, clastic or chemical; its sorting, rounding, and tentative composition; any other observation you think might be useful)

Clastic sediment: gravel and sand. Angular, unsorted, compositionally immature. Composition is dependent on the source rock (volcanics)

1c. In general, suggest one reason (or maybe more) why this sediment is found at the present location; in other words, do you see any evidence for an agent (or maybe for multiple agents) of sediment transportation at this location?

Coarser sediment can get here by mass wasting or because of flash floods. Sand-size sediment can also be carried by winds. Sand dunes are evidence for wind actions

1d. Could this (or these) agent(s) of transportation have acted also as agents of sorting and rounding for this sediment? (hint: look at the kind of sediment and its maturity; think of how the agent works, think of the time the agent(s) had to work on these sediment)

They could, but we are so close to the source that there was no possibility for sorting or rounding. Still, there are no mud particles, indicating that they have been removed by these agents.

- 1e. It is not difficult to identify grains bigger than the average size in this sediment. What do you think is the origin of the bigger blocks/grains?

They could be volcanic blocks, or volcanic bombs

- 1f. Does this sediment show any sedimentary structure (both big-scale and small-scale)? If so, which structure(s)? How would these structures form?

There are sand dunes, and ripples on sand dunes. They would be formed by very strong winds blowing from the west (Sierra Nevada)

- 1g. If this sediment were to be lithified and become a sedimentary rock, what would its name be?

Sandstones. Please note that some of these materials are volcanic in origin and could be forming a volcanic tuff or a volcanic breccia

Stop 2: the Coso playa

- 2a. Describe all the sediments that you see in the playa (list and state what kind of sediment they are, clastic or chemical, texture – size, composition, maturity when applicable)

All sediment in the playa is clastic in origin at the time of our visit. There are immature gravel size particles at the edge of the playa. There are some sands extending onto the playa (and can also be seen when digging into the playa bottom). There is of course plenty of mud. Both gravels and sands are immature and come from the nearby Coso Hill

- 2b – In terms of energy, what kind of conditions would lead to the deposition of said sediment? (list the sediments described above in your answer to question 2a and indicate if they deposited in high energy or in a low energy environment)

Gravel and sand require high energy and probably deposited after mass wasting and flash flood currents. Mud deposited in the playa when water stood still, and clay minerals could flocculate

- 2c. Walk at the edge of the small playa lake, then directly on it. You should be able to see a variety of sedimentary structures in the playa. Name them all

Mud cracks, ripples (mostly asymmetrical), horizontal bedding

- 2d. Indicate how and why (under what conditions) would these structures form

Mud cracks would form from desiccation. Ripples when winds are blowing on the lake and water depth is minimal. Horizontal bedding when water stands still and deposition takes place without currents of sort

2e. Why, in general, would there be a playa lake at this location?

Because of a) dry conditions in the area, associated to sporadic precipitation; b) no connection to a draining system, so that water would pond; c) this would cause evaporation and consequent formation of a playa lake

2f. If you walk eastward on this small playa lake or around its edge, you will see that it is connected through a narrow opening to a much larger playa. If you were looking for evaporites, where would you go, stay in the smaller playa, or move to the bigger expanse to the east? Why?

Move to the bigger playa, because that would be where water would evaporate last, and concentrate salts

2g. If this playa sediment were to become a lithified sedimentary rock, what kind of rock would it form?

Likely a mudstone (claystone); possibly a shale if conditions are right

2h. Provided that, without knowing its origin or provenance, you had a sample in your hands of the hypothetical rock of question 2g, what other interpretations might come to your mind?

A normal, non-playa, lake; a floodplain; a lagoon; a swamp; a marsh; a deep marine environment

2i. We might be able to use an auger in the playa and retrieve a few sediments from underneath its surface. Describe what we observed at these three locations: close to the base of Red Hill, in the middle of Coso Playa, and at its exit, by the narrow opening into the larger playa to the east.

We always found mud, but at the first location we also had gravel and sand; at the second some sand; at the third just mud

2j. If possible, quickly sketch three simplified stratigraphic columns representing the retrieved sediments at the three locations. Put columns in order from left to right: base of Red Hill, middle of Coso Playa, narrows of Coso Playa

please do so according to instructions; answers may vary in time

2k. Based on what you saw in the three samples, explain where would these sediments come from (north, south, east, west) and why.

From the west. It shows a decrease in size from Red Hill towards the playa

Stop 3: the Coso Playa sand dunes

3a. Describe the sediment that makes up these dunes, in terms of size and maturity (sorting, rounding, abundance of quartz, etc.)

A very well sorted, rounded, and of variable composition sand

3b. How is this sediment (3a) different from the sediment of question 1a/1b?

This sediment is more mature, sorted

3c. How is this sediment (3a) similar to the sediment of question 1a?

This sediment is also clastic and partially the same size

3d. Are the sediments of questions 1a/1b and 3a related one to the other as for their possible origin? What observations did you make to answer this?

Yes, but those of question 3a have been transported by winds (they are sands) and have been sorted. The source is the same. I can see it from composition, analysis of provenance

3e. What do you think caused the formation of these sand dunes?

Wind action

3f. Why do some of these sand dunes seem more stable than others?

They have been "fixed" by plant roots

Stop 4: back to vehicles: general questions

4a. What would happen to the playa lake(s) in this region if climate were to become wetter?

It would become a freshwater lake

4b. What could be possible reasons for climate change in this area?

An increase in greenhouse gases and Milankovitch cyclicity

4c. Would the same rocks (or similar ones) still form?

Mudstones would still form, but without desiccation structures like mud cracks. Sand dunes would still form, very likely.

4d. If the rocks would still form, would they form in the same place? Why, or why not? Explain

The lake would probably be bigger, thus reducing the area available for sand dunes, and possibly expanding the area for sands and muds in the lake itself

4e. As a consequence, would the same environment of today still exist in this hypothetical wetter future, or would they be replaced by others? Explain

No, it would be replaced by a more humid, greener environment due to different climate conditions

4f. Can you put the existence of (dry) Fossil Falls in relation to a wetter climate in this area? Where would the water for Fossil Falls come from?

These falls were formed by a prehistoric river that used to flow at this location during the more humid period of the last Ice Age. The water would probably come from the area where our playa lakes are currently existing

- 4g. Use the last page of this handout to draw a sketch of the landscape at this location. Use an approximate numerical scale. Even if not an artist, you should try to convey an image that could be understood by other geologists, or even by the general public. While pictures are of great help, your particular observations in the field might be reported in a field sketch to provide greater accuracy or simply complement your images and observations.

Just draw a sketch