
At 1:30 p.m. Mars time, on September 10, 1978, an event was captured in the Valles Marineris. On the cliff bordering the west side of Baetis Mensa in central Candor Chasma (lat 5.65° S, long 72.6), a bright cloud casting a dark shadow suddenly appeared on the scene. The area was depicted in a stereoscopic set of Viking high-resolution images (fig. 1). The first image shows the plateau surface of Baetis Mensa, the plateau edge forming a steep scarp, and a bright slope below. The second image shows the same scene, but also an additional bright feature on the plateau edge and an additional adjacent dark feature on the plateau surface. The bright feature measures about 1 x 0.5 km and is elongated parallel to the scarp. The dark feature is about 1 x 1 km. The second image was acquired 2 min and 23 s after the first one.

The first image is of very good quality, but the second image is degraded and contains only two pixel rows of recorded image information for every seven rows of pixels. Nevertheless, a careful study of the original DN (data number) values of the pixels in the degraded image clearly shows DN values reflecting the bright feature; it is not an artifact of the process used to fill in the missing pixels. The adjacent dark feature contains more dark DN values than the surroundings, but the relation is not quite as obvious. We think that the bright feature is a cloud. The sun azimuth in the image (69°) places the dark feature downsun from the bright feature, consistent with an interpretation as the shadow of the cloud. The length of the shadow (about 1 km) and a sun-elevation angle of 31° indicate that the cloud was 600 m high when the second image was acquired. If the cloud rose from the surface, it must have done so with a minimum average speed of 4 m/s in the time between image acquisitions.

We believe that the cloud was composed of dust. It appeared too quickly to be reasonably explained as a vapor cloud. It could have been a dust devil or an updraft on the slope, generating a plume; these explanations are consistent with the local time of the event. If this were the case, however, one would expect to see more such features along the plateau edge. Alternatively, the dust cloud could have come from a landslide. The slopes on Baetis Mensa below the plateau are only 8° [1], but the images show steeper slopes lining the plateau edge. Also, the cloud is located where diagonal and horizontal layers in the slope converge, perhaps indicating structural weakness. The event happened at L, 141°, which is late southern winter. The sublimation of volatiles precipitated in the previous winter might have loosened the soil at this season. However, the location near the equator makes this hypothesis suspect. On the other hand, the timing of the event in early afternoon may be significant; thermal stresses may have been high enough to disrupt the soil matrix.

If the event was indeed a landslide, it would be unlikely that the sliding was captured in the act unless such sliding events are a common occurrence in the Valles Marineris. If so, we can conclude that the slopes of the troughs are still being actively eroded by mass wasting at the present time.

Figure 1. Ephemeral features in Valles Marineris.

(a) Plateau edge on Baetis Mensa showing pristine scarp where ephemeral features (arrow) appeared 2 min 23 s later (Viking Orbiter image 815A48, resolution 26 m/pixel). (b) Same plateau edge showing bright and dark features (arrow), interpreted as dust cloud casting shadow. Dashed line is sun azimuth. (Viking Orbiter image 815A66, resolution 21 m/pixel).