

## **An Earthquake-Induced Flash Flood Event within the Early Jurassic Navajo Sandstone, White Pocket, Vermillion Cliffs National Monument, Arizona**

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The Early Jurassic Navajo Sandstone, well exposed in portions of Utah and Arizona, has attracted many students of aeolian sedimentation. The White Pocket area of the Paria Plateau is anything but typical for the Navajo Sandstone.

Recent observations have been woven together with the tectonic history of the region to offer a novel interpretation for what took place on this portion of the Paria Plateau during Navajo time.

Some of the observations in the area include fluid escape structures, sand volcanoes, grand scale soft sediment deformation features, two distinct genetic types of rip up clasts, and an amorphous sandstone facies which blankets much of the area. A feature which is unique to the Navajo Sandstone at White Pocket is a large scale scour, a “channel-like” unit approximately 65 feet thick and 825’ across. The feature is filled in its entirety with homogeneous, white sandstone that does not exhibit obvious sedimentary structures. Large-scale sandstone rip up clasts occurring at the base of this feature are evidence of early cementation possibly due to perched water tables within the sand dunes which flanked a large area of water, likely an oasis.

Syndepositional faulting within the Navajo Sandstone of the Paria Plateau indicates that active seismicity during Navajo time may have been the mechanism which triggered the sand slide that breached perched aquifers within the dune complex. Once triggered, the water sand mixture surged down slope and quickly filled in a portion of the oasis. The sudden loading of the already water-saturated sediments in the downslope areas created large sand volcanoes and soft sediment deformation features; as many as 25 of these sand volcanoes or sand blows can be identified using Landsat imagery.

The amorphous sand facies can be divided into two subfacies. One of the facies is local and due to the liquefaction effects and sudden loading; this subfacies is typically associated with features that exhibit verticality because of the dragging up of sediment from below; rip up clasts tend to be angular because of minor lateral transport. The second amorphous sandstone subfacies contains huge rounded rip up clasts that were transported from the upslope areas; the basal portion of this latter facies contains rip up clasts locally derived from erosion of the surface directly beneath it.

A very interesting feature of the White Pocket area of the Paria Plateau is the presence of tracks which have been interpreted as having been made by Mormon Pioneers, modern day cattle and solution pits, however, it is likely that these are the poorly preserved tracks of sauropods which roamed the southern portion of the Navajo Desert in search of water; dinosaur tracks are not uncommon in the Navajo Sandstone on the Paria Plateau.

A potential modern day analog for this water-rich portion of the Navajo Desert can be found along the Northeast coast of Brazil where seasonal rain collects between the dune ridges providing linear chains of oases.