

METEORITE-CONCENTRATING PROCESS OBSERVED AND RECORDED ON A DESERT PLAYA.

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Introduction: A variety of processes have been proposed to account for tracks left by moving rocks on several seasonally wet playas in the Southwest USA. Active rock movement was first observed in 2013 at the Racetrack, in Death Valley National Park [1]. We report moving rocks on the eastern shore of a playa in Superior Valley, an area of dense meteorite concentration.

Observations: We recorded video of a thin sheet of ice as it was blown across the surface of a shallow (0-6 cm) intermittent lake, and up onto the lake's rocky shore. The ice moved rocks in a few distinct ways: it pushed rocks before it, loosely entrained them in a floe of ice fragments, and dragged submerged rocks as it slid over them. At the shoreline, rocks were sometimes lifted onto the surface of the ice and carried short distances (< 1 m). Tracks up to 7 m long were preserved in the playa, and stones were found concentrated along stranding lines approximately parallel to the shore, reflecting the maximum extent of advancing ice sheets [2].

Lake Dynamics: Playas are seasonally wet over all or part of their surface. The degree of cover and maximum depth of the water is controlled by wind and local topographic variation. The Racetrack, in Death Valley, is unusually flat and it is often completely inundated by a thin sheet of water. Superior Valley West is a more typical playa, with some topographic relief. Water seasonally pools along the south and east sides of the lake; in the winter, some of this water freezes, forming buoyant sheets of ice. Data recorded nearby show average maximum daily wind speeds around 30 kph in December-January [3]. This wind propels the water and ice across the surface of the lakebed; the position of the patch of water can move on a daily basis.

Shore Dynamics: When windblown ice and water reaches the shore, the natural incline drives the ice into smaller rocks. The ice drags over the tops of the rocks, slowly pulling them in the same direction as the prevailing wind, while forcing them uphill and into the underlying mud. The ice-sheet can drive rocks in front of it. This occurs primarily below the well-defined lakeshore; the abundance of rocks on the shore impedes this process. We did not observe any rocks entrained in solid ice. Rarely, rocks were flipped out of the mud and onto the surface of the ice. These stones were carried short distances, but would melt through the ice within 3-5 minutes due to their low albedo. This mode of transportation may be more efficient at night.

Implications for Meteorite Recovery: Most lakebeds exhibit a slight natural incline towards the shore. Water preferentially pools at the lowest possible elevation; ice that forms on this surface will drive stones in the direction of prevailing winds. If prevailing winds are not present, rocks will blow in apparently random directions, without being concentrated (e.g., the Racetrack). Prevailing winds concentrate meteorites along particular shorelines [4]. Over the course of several days, we recovered ten meteorites along a densely rocky stretch of lake shore 0.8 km long and 1-2 m wide. Most appear to be grossly dissimilar; classifications are pending.

References: [1] Norris R. D. et al. 2014. *PloS one* 9.8:e105948. [2] Sharp R. P. and Carey D. L. 1976. *GSAB* 87.12. [3] Weather data accessed April 10, 2015: <https://weatherspark.com/> [4] Gessler P. et al. 2002. Abstract #5263. 65th Annual Meteoritical Society Meeting.