

**SMALL VENTIFACTS AT GREAT SAND DUNES, COLORADO, A NEW SOURCE FOR MARS ANALOGUES.** S.G. Fryberger<sup>1</sup> and A.D. Valdez<sup>2</sup>, <sup>1</sup> Consultant, 4319 Cape Cod Circle, Fort Collins, CO 80525, [steve.fryberger@gmail.com](mailto:steve.fryberger@gmail.com), <sup>2</sup> National Park Service, Great Sand Dunes National Park & Preserve, 11500 Hwy 150, Mosca, CO 81146, [andrew\\_valdez@nps.gov](mailto:andrew_valdez@nps.gov)

**Introduction:** A variety of ventifacts (wind abraded rocks) have recently been discovered at Great Sand Dunes National Park, Colorado, USA. These ventifacts are scattered across sandy fluvial terraces that are now dominated by aeolian processes. The terraces and ventifacts lie along the northwest side of Medano Creek. The ventifacts are formed from pebbles and cobbles that were originally transported down the creek during floods. The rocks were first buried, along with recycled dune sands, on an active bed of the creek. Over time, this active bed was abandoned, to become a fluvial terrace as Medano Creek entrenched southward. On the terraces, and in some abandoned channels, the small rocks have been exposed by aeolian deflation, then



ventifacted.

**Geology:** The fluvial terraces on which the ventifacts exist are overlain in part by a younger aeolian sand sheet with barchanoid dunes up to 6 meters high. Some ventifacts are more or less continuously exposed on the terrace along Medano Creek; others occur within interdune areas where they are repeatedly buried, then re-exposed as the dunes migrate toward the northeast.

The ventifacts consist mainly of granite, gneiss, a few carbonates, and a few volcanics. Most were deposited by stream flows as sub-angular to sub-rounded pebbles and cobbles. They have subsequently been exposed by aeolian scour to the wind and thermal regime of the surface, as well as to moisture from precipitation and (when buried) to moisture within the migrating dunes. This process framework, including the high variability of moisture, temperature and local wind strength and direction, has created a wide range of ventification: from simple polish to pits, fluting, grooves, fretting and keels.

Many of the ventifacts have broken apart in-place; a process we have proven by re-assembling groups of related fragments in the field. Additionally, many coarse sand grains have been released onto the ventifact terraces as the more labile lithologies have broken down under thermal and chemical weathering. This process has supplied light-colored grains (commonly quartz and feldspar) to the wind transport system. These mostly light-colored, coarse sand grains are a formative component of the granule ripples that are commonly associated with the ventifact areas. The ventification and weathering processes are ongoing at the present time. A key question remains, however. For how long have the ventifacts been forming? Our future work will hopefully shed light on this question.

**Distribution of ventifacts:** The area with the most intense ventification (based on our mapping to date) appears to be immediately west of the remote automatic weather station (RAWS) located on a hillside below Mosca Pass. This station has recorded strong easterly winds during sandstorms. Many of the highly-ventifacted rocks we have observed in the field have surfaces that face this east wind. Some rocks, however, have several ventifacted surfaces, a phenomenon that we attribute to multiple wind directions, and perhaps, to rolling of the rocks due to wind scour of sand from beneath the rock. Evenly-scattered small pebbles and coarse sand grains commonly form a single-grain lag over most of the surfaces where ventifacts are found. Many of the geological features of the ventifact areas at Great Sand Dunes appear similar to those seen on sandy areas of Mars; including the lag surfaces, the in-place weathering and fracturing of rocks, extensive ventification, and repeated exposure and burial by migrating eolian bedforms [1], [2], [3], [4], [5], [6], [7]

**References:** [1] Bridges, et al. (1999) *JGR*, 104, 8595-8615. [2] Bridges et al. (2014) *JGR: Planets*, 119, 1374-1389. [3] Bridges et al. (2004) *Planetary and Space Science*, 52, 199-213. [4] Greeley et al. (2006) *JGR*, 111, E02S09 29pp. [5] Greeley, et al. (1999) *JGR*, 104, 8573-8584. [6] Thomson et al (2008) *JGR*, 113, E08010 13 pp. [7] Yingst et al. (2016) *Icarus*, 280, 72-92.